1.1.3 Average percentage of courses having focus on employability/ entrepreneurship/ skill development offered by the institution during the last five years

1.1.3.1 Number of courses having focus on employability/ entrepreneurship/ skill development year-wise during the last five years.

Year	2021-22	2020-21	2019-20	2018-19	2017-18
Number	1166	1106	985	922	984

List of courses courses having focus on employability/ entrepreneurship/ skill development offered by the institution during 2021-22 from S. No. 583-1170

583	Linear Algebra & Calculus	20MT C01
584	English	20EG C01
585	Optics and Semiconductor Physics	20PY C01
586	Programming for Problem Solving	20CS C01
587	Linear Algebra & Calculus Lab	20MT C02
588	English lab	20EG C02
589	Optics and Semiconductor Physics Lab	20PY C03
590	Programming for problem Solving Lab	20CS C02
591	CAD and Drafting	20ME C01
592	Community Engagement	20MB C02
593	Differential Equations & Transform Theory	20MT C03
594	Chemistry	20CY C01
595	Data Structures and Algorithms	20IT C01
596	Object Oriented Programming using Python	20IT C02
597	Differential Equations & Transform Theory Lab	20MT C04
598	Chemistry Lab	20CY C02
599	Data Structures and Algorithms Lab	20IT C03
600	Object Oriented Programming using Python Lab	20IT C04
601	Workshop / Manufacturing Practice	20ME C02
602	Engineering Exploration	20ME C03
603	DC Circuits, Sensors and Transducers	20ECC34
604	Digital Logic and Computer Architecture	20ITC05
605	Discrete Mathematics and Applications	20ITC06
606	Java Programming & Enterprise Frameworks	20ITC07
607	Database Management Systems	20ITC08
608	Indian Constitution and Fundamental Principles	20EGM01
609	Indian Traditional Knowledge	20EGM02
610	Java Programming & Enterprise Frameworks Lab	20ITC09
611	DBMS Lab	20ITC010
612	IT Workshop	20ITC11
613	Mini Project-1	20ITC12
614	MOOCs/Training/Internship	20ITI01

615	Probability and Queueing Theory	20MTC12
616	Software Engineering	20MTC13
617	Automata Theory and Compiler Design	20MTC14
618	Design and Analysis of Algorithms	20MTC15
619	Digital Image Processing	20ITE01
620	Data Analysis and Visualization	20ADE01
621	Engineering Economics & Accountancy	20MBC01
622	Environmental Science	20CEM01
623	Mobile Application Development with Android and Kotlin	20ITE02
624	Software Engineering Lab	20ITC16
625	Design and Analysis of Algorithms Lab	20ITC17
626	Artificial Intelligence & Machine Learning Tools, Techniques and Applications	20ADC03
627	Mini Project – II	20ITC18
628	Operating Systems	18IT C15
629	Theory of Automata	18IT C16
630	Computer Networks	18IT C17
631	Software Engineering	18IT C18
632	Data Warehousing and Data Mining	18IT E01
633	UNIX and Shell Programming	18IT E04
634	Predictive Analytics with ‗R‘	18IT E05
635	Web Technologies	18IT E06
636	Operating Systems and Computer Networks Lab	18IT C19
637	Software Engineering Lab	18IT C20
638	Mini Project - III	18IT C21
639	Artificial Intelligence	18IT C22
640	Information Security	18IT C23
641	Social Media Analytics	18IT E09
642	Mobile Commerce	18IT E12
643	Data Science with Python	18IT E13
644	Cyber Security	18IT E16
645	Engineering Economics and Accountancy	18MB C01
646	Gender Sensitization	18EG O02
647	Indian Traditional Knowledge	18EE M01
648	Artificial Intelligence Lab	18IT C24
649	Information Security Lab	18IT C25
650	Mini Project - IV	18IT C26
651	Big Data Analytics	18IT C27
652	Embedded Systems	18IT C28
653	Internet of Things	18IT C29
654	Distributed Systems	18IT C30
655	Cloud Computing	18IT E17
656	Block Chain Technology	18IT E20
657	Big Data Analytics Lab	18IT C31
658	Embedded Systems and IoT Lab	18IT C32
659	Distributed Systems Lab	18IT C33
660	Project Part - 1	18IT C34
661	Intellectual Property Rights	18MEO07

662	Entrepreneurship	18ME O04
663	Technical Writing Skills	18EG O01
664	Technical Seminar	18IT C35
665	Project Part-2	18ITC36
666	Linear Algebra & Calculus	20MT C01
667	English	20EG C01
668	Optics and Semiconductor Physics	20PY C01
669	Programming for Problem Solving	20CS C01
670	Linear Algebra & Calculus Lab	20MT C02
671	English lab	20EG C02
672	Optics and Semiconductor Physics Lab	20PY C03
673	Programming for problem Solving Lab	20CS C02
674	CAD and Drafting	20ME C01
675	Community Engagement	20MB C02
676	Differential Equations & Transform Theory	20MT C03
677	Chemistry	20CY C01
678	Data Structures and Algorithms	20IT C01
679	Object Oriented Programming using Python	20IT C02
680	Differential Equations & Transform Theory Lab	20MT C04
681	Chemistry Lab	20CYC02
682	Data Structures and Algorithms Lab	20IT C03
683	Object Oriented Programming using Python Lab	20IT C04
684	Workshop / Manufacturing Practice	20ME C02
685	Engineering Exploration	20ME C03
686	DC Circuits, Sensors and Transducers	20ECC34
687	Probability and Statistics	20MTC09
688	Database Management Systems	20ITC08
689	Java Programming	20ADC01
690	Digital Logic and Computer Architecture	20ITC05
691	Indian Constitution and Fundamental Principles	20EGM01
692	Indian Traditional Knowledge	20EGM02
693	DBMS Lab	20ITC10
694	Java Programming Lab	20ADC02
695	Artificial Intelligence & Machine Learning Tools, Techniques and Applications	20ADC03
696	Mini Project - I	20ITC12
697	MOOCs/Training/Internship	20ADI01
698	Stochastic Process and Queueing Theory	20MTC10
699	Discrete Mathematics and Applications	20ITC06
700	Design and Analysis of Algorithms	20ITC15
701	Machine Learning	20ADC 04
702	Image Processing	20ITE01
703	Data Analysis and Visualization	20ADE01
704	Mobile Application Development with Android and Kotlin	20ITE02
705	Engineering Economics and Accountancy	20EGM01
706	Environmental Science	20CEM01
707	Stochastic Process and Queueing Theory Lab	20MTC11
708	Design and Analysis of Algorithms Lab	20ITC17

709	Machine Learning Lab	20ADC05
710	Mini Project-II	20ITC12
711	Mathematical Foundations of Data Science	20MTC101
712	Artificial Intelligence	20ITC101
713	Information Retrieval Systems	20ITE103
714	Predictive Analytics with R	20ITE116
715	Research Methodology and IPR	20MEM103
716	English for Research Paper Writing	20EGA101
717	Mathematical Foundations of Data Science Lab	20MTC102
718	Artificial Intelligence Lab	20ITC104
719	Predictive Analytics with R Lab	20ITE126
720	Introduction to data science	20ITC102
721	Machine Learning	20ITC103
722	Social Network Analytics	20ITE105
723	Big Data Analytics	20ITE114
724	Value Education	20ECA101
725	Introduction to data science Lab	20ITC105
726	Machine Learning Lab	20ITC106
727	Big Data Analytics Lab	20ITE124
728	Mini Project with Seminar	20ITC107
729	Business Analytics (Open Elective)	20CSO101
730	Block Chain technology	20ITE106
731	Dissertation/Phase-I	20ITC108
732	Dissertation/Phase-II	20ITC109
733	Calculus	20MT C05
734	Chemistry	20CY C01
735	Engineering Mechanics-I	20CE C01
736	Programming for Problem Solving	20CS C01
737	Chemistry Lab	20CY C02
738	Programming for Problem Solving Lab	20CS C02
739	Workshop/ Manufacturing Practice	20ME C02
740	Engineering Exploration	20ME C03
741	Vector Calculus and Differential Equations	20MT C06
742	English	20EG C01
743	Electromagnetic Theory and Quantum Mechanics	20PY C06
744	Basic Electrical Engineering	20EE C01
745	English lab	20EG C02
746	Electromagnetic Theory and Quantum Mechanics Lab	20PY C09
747	Basic Electrical Engineering Lab	20EE C02
748	CAD and Drafting	20ME C01
749	Community Engagement	20MB C02
750	Core- 1: Electrical Circuit Analysis	20EE C03
751	Core- 2: Analog Electronic Circuits	20EE C04
752	Core- 3: Electrical Measurements and Instrumentation	20EE C05
753	Core- 4: Signals & Systems	20EE C06
754	AEC Lab	20EE C07
755	ECM Lab	20EE C08

756	Digital Electronics	20EEC09
757	Electrical Machines-I	20EEC10
758	Electromagnetic Fields	20EEC11
759	Power Electronics	20EEC12
760	Power Systems-I	20EEC13
761	Digital Electronics Lab	20EEC14
762	Electrical Machines-I Lab	20EEC15
763	Power Electronics Lab	20EEC16
764	Electrical Machines-II	18EEC14
765	Power Systems-II	18EEC15
766	Power Electronics	18EEC16
767	Wind and Solar Energy	18EEE01
768	Optimization Techniques	18EEE02
769	Electrical Engineering Materials	18EEE03
770	Simulation Techniques in Electrical Engineering	18EEE05
771	Industrial Electrical Systems	18EEE07
772	Electrical Estimation & Costing	18EEE08
773	Electrical Machines-II Lab	18EEC17
774	Power Systems-I Lab	18EEC18
775	Power Electronics Lab	18EEC19
776	Control Systems	18EEC20
777	Microprocessors and Microcontrollers	18EEC21
778	Power Systems Operation and Control	18EEC22
779	Power Quality	18EEE09
780	Electrical Distribution Systems	18EEE11
781	HVDC Transmission Systems	18EEE12
782	AI Techniques in Electrical Engineering	18EEE13
783	Electric Hybrid Vehicles	18EEE14
784	Waste Management	18EEO05
785	Control Systems Lab	18EEC23
786	Microprocessors Lab	18EEC24
787	Power System Protection	18EEC25
788	Electrical Drives	18EEC26
789	Signals & Systems	18EEC27
790	Electrical Machine Design	18EEE19
791	High Voltage Engineering	18EEE20
792	Energy Management Systems	18EEO02
793	Energy Conservation	18EEO04
794	Power Systems-II Lab	18EEC28
795	Electrical Drives Lab	18EEC29
796	Project: Part-1	18EEC30
797	Digital Signal Processing	18EEE22
798	Smart Grid	18EEE23
799	Technical Seminar	18EEC31
800	Project: Part-2	18EEC32
801	Waste Management	18EEO05
802	Energy Auditing	18EEO03
803	Real Time Applications for Power systems	20EEC101

804	Power Electronic Converters	20EEC102
805	Artificial Intelligence Techniques	20EEE108
806	Power Quality	20EEE110
807	Research Methodology and IPR	20MEC103
808	English for Research Paper Writing	20EGA101
809	Power Systems Lab	20EEC103
810	Power Electronics Simulation Lab	20EEC104
811	Power System dynamics	20EEC105
812	Advanced Power Electronic Circuits	20EEC106
813	Renewable Energy System	20EEE107
814	Energy Auditing & Management	20EEE113
815	Disaster Mitigation and Management	20CEA101
816	Power Electronics Lab	20EEC107
817	Power Systems Simulation Lab	20EEC108
818	Mini Project with Seminar	20EEC109
819	Electric and Hybrid Vehicles	20EEE116
820	Introduction to Optimization Techniques	20MEO102
821	Industrial Project/Dissertation Phase I	20EEC110
822	Dissertation Phase II	20EEC111
823	Calculus	20MTC05
824	Chemistry	20CYC01
825	Engineering Mechanics-I	20CEC01
826	Programming for Problem Solving	20CSC01
827	Chemistry Lab	20CYC02
828	Programming for Problem Solving Lab	20CSC02
829	Workshop/ Manufacturing Practice	20MEC02
830	Engineering Exploration	20MEC03
831	Vector Calculus and Differential Equations	20MTC06
832	English	20EGC01
833	Electromagnetic Theory and Quantum Mechanics	20PYC06
834	Basic Electrical Engineering	20EEC01
835	English lab	20EGC02
836	Electromagnetic Theory and Quantum Mechanics Lab	20PYC09
837	Basic Electrical Engineering Lab	20EEC02
838	CAD and Drafting	20MEC01
839	Community Engagement	20MBC02
840	Applied Mathematics	20MTC07
841	Basics of Data Structures	20CSC06
842	Electromagnetic Theory and Transmission Lines	20ECC01
843	Electronic Devices	20ECC02
844	Network Theory	20ECC03
845	Signals and Systems	20ECC04
846	Environmental Science	20CEM01
847	Basics of Data Structures Lab	20CSC07
848	Electronic Devices Lab	20ECC05
849	Electronic Workshop and Networks Lab	20ECC06
850	MOOCs/Training/Internship	20ECI01
851	Analog Circuits	20ECC07

852	Analog Communication	20ECC08
853	Antennas and Wave Propagation	20ECC09
854	Control Systems	20ECC10
855	Digital Systems Design	20ECC11
856	Universal Human Values II: Understanding Harmony	20EGM03
857	Indian Constitution and Fundamental Principles	20EGM01
858	Indian Traditional Knowledge	20EGM02
859	Analog Circuits Lab	20ECC12
860	Analog Communication Lab	20ECC13
861	Digital Systems Design Lab	20ECC14
862	Computer Architecture and Microprocessors	18ECC15
863	Digital Communication	18ECC16
864	Linear and Digital Integrated Circuits	18ECC17
865	Principles of Management	18MEC09
866	Electronic Measurements and Instrumentation	18ECE01
867	Optical Communication	18ECE03
868	Telecommunication Switching Systems	18ECE04
869	Fundamentals of Virtual Reality	18CSO05
870	Object Oriented Programming Using Java	18ITO01
871	Quantum Computing	18MTO04
872	Digital Communication Lab	18ECC18
873	Linear and Digital Integrated Circuits Lab	18ECC19
874	Digital Signal Processing	18ECC20
875	Microcontrollers	18ECC21
876	Microwave and Radar Engineering	18ECC22
877	Principles and Applications of AI	18ECE07
878	CPLD and FPGA Architectures	18ECE11
879	Data Analytics for signal processing	18ECE12
880	Satellite Communication	18ECE13
881	Engineering Economics and Accountancy	18MBC01
882	Digital Signal Processing Lab	18ECC23
883	Microcontrollers Lab	18ECC24
884	Microwave Engineering Lab	18ECC25
885	Computer Networks	18ECC26
886	VLSI Design	18ECC27
887	Cryptography and Blockchain Technology	18ECE15
888	DSP Processors and Architectures	18ECE16
889	Digital Image Processing	18ECE21
890	Embedded Systems	18ECE22
891	5G Communications	18ECE24
892	Entrepreneurship	18MEO04
893	Fundamentals of DBMS	18CSO06
894	Python Programming	18ITO02
895	Computer Networks Lab	18ECC28
896	Electronic Design and Automation Lab	18ECC29
897	Electronics Measurement and Simulation Lab	18ECC30
898	Project: Part-1	18ECC31
899	Industrial Visit	18ECC32

900	IoT and its Applications	18ECE25
901	Principles of Wireless Sensor Networks	18ECE27
902	Gender Sensitization	18EGO02
903	Machine Learning using Python	18CSO10
904	Technical Seminar	18ECC33
905	Project: Part-2	18ECC34
906	Advanced Digital Signal Processing	20EC C102
907	Wireless and Mobile Communication	20EC C104
908	Research Methodology and IPR	20ME C103
909	Global Navigation Satellite Systems	20EC E103
910	Software Defined and Cognitive Radio	20EC E112
911	English for Research Paper Writing	20EG A101
912	Advanced Digital Signal Processing Lab Lab	20EC C106
913	Wireless and Mobile Communication Lab	20EC C108
914	Advanced Communication Networks	20EC C101
915	Antennas and Radiating Systems	20EC C103
916	Signal Intelligence Systems	20EC E111
917	Internet of Things	20EC E106
918	Value Education	20EC A101
919	Advanced Communication Networks lab	20EC C105
920	Antennas and Radiating Systems Lab	20EC C107
921	Mini Project with Seminar	20EC C109
922	MIMO Wireless Communications	20EC E111
923	Business Analytics	20CS O101
924	Industrial Project / Dissertation Phase I	20EC C110
925	Industrial Project /Dissertation Phase II	20EC C111
926	Analog and Digital CMOS VLSI Design	20EC C201
927	Microcontrollers and Programmable Digital Signal Processors	20EC C203
928	Research Methodology and IPR	20ME M103
929	Advanced Computer Organization	20EC E201
930	VLSI Technology and Physical Design Automation	20EC E213
931	English for Research Paper Writing	20EG A101
932	Analog and Digital CMOS VLSI Design Lab	20EC C205
933	Microcontrollers and Programmable Digital Signal Processors Lab	20EC C206
934	Embedded System Design using RTOS	20EC C202
935	VLSI Design Verification and Testing	20EC C204
936	Low Power VLSI Design	20EC E205
937	SoC Design	20EC E210
938	Value Education	20EC A101
939	RTL Simulation and Synthesis with PLDs Lab	20EC C207
940	RTOS and VLSI Design Verification Lab	20EC C208
941	Mini Project with Seminar	20EC C209
942	FPGA & CPLD Architectures	20EC E204
943	Business Analytics	20CS O101
944	Industrial Project /Dissertation Phase I	20EC C210
945	Industrial Project /Dissertation Phase II	20EC C211
946	Management and Organization Behaviour	20MBC101
947	Managerial Economics	20MBC102

948	Financial Accounting for Management	20MBC103
949	Marketing Management	20MBC104
950	Statistics for Management	20MBC105
951	Digital Technology	20MBC106
952	Business Communication Lab	20MBC107
953	Statistics Lab	20MBC108
954	Business Environment	20MBO101
955	Corporate Social Responsibility	20MBO102
956	Business Law and Ethics	20MBO103
957	Human Resource Management	20MBC201
958	Financial Management	20MBC202
959	Business Research Methods	20MBC203
960	Operations Research	20MBC204
961	Operations Management	20MBC205
962	Business Analytics	20MBC206
963	Logistics and Supply Chain Management	20MBC207
964	Personality Development and Career Guidance	20MBSD201
965	E-Business	20MBO201
966	Banking Management	20MBO202
967	Customer Relationship Management	20MBO203
968	Strategic Management	20MBC301
969	Investment Management	20MBE301
970	Financial Markets and Services	20MBE302
971	Performance and Compensation Management	20MBE303
972	Business Data Mining	20MBE307
973	Python Programming	20MBE308
974	Entrepreneurship Development	20MBC401
975	Financial Risk Management	20MBE401
976	Project Appraisal and Financing	20MBE402
977	Industrial Relations and Labour Laws	20MBE403
978	Services and Retail Marketing	20MBE406
979	Machine Learning and Artificial Intelligence	20MBE407
980	Cloud Computing	20MBE408
981	E-Commerce Logistics	20MBE409
982	International Logistics	20MBE410
983	Calculus	20MTC05
984	Chemistry	20CYC01
985	Engineering Mechanics-I	20CE C01
986	Programming for Problem Solving	20CS C01
987	Chemistry Lab	20CYC02
988	Programming for Problem Solving Lab	20CS C02
989	Workshop/ Manufacturing Practice	20MEC02
990	Engineering Exploration	20MEC03
991	Vector Calculus and Differential Equations	20MT C06
992	English	20EG C01
993	Physics	20PY C07
994	Basic Electrical Engineering	20EEC01
995	English lab	20EG C02

996	Physics Lab	20PY C10
997	Basic Electrical Engineering Lab	20EEC02
998	CAD and Drafting	20ME C01
999	Community Engagement	20MB C02
1000	Mathematics III(PDE & S)	20MTC08
1001	Basics of Data Structures	20CSC06
1002	Chemical Engineering Thermodynamics I	20CHC01
1003	Fluid Mechanics	20CHC02
1004	Material and Energy Balance Calculations	20CHC03
1005	Mechanical Unit Operations	20CHC04
1006	Basics of Data Structures Lab	20CSC07
1007	Fluid Mechanics Lab	20CHC05
1008	Mechanical Unit Operations Lab	20CHC06
1009	MOOCs/Training/ Internship	20CHI01
1010	Chemical Reaction Engineering I	20CHC07
1011	Chemical Technology	20CHC08
1012	Heat Transfer	20CHC09
1013	Mass Transfer Operations I	20CHC10
1014	Indian Constitution & Fundamental Principles	20EGM01
1015	Indian Traditional Knowledge	20EEM01
1016	Environmental Science	20CEM01
1017	Energy Engineering	20CHE01
1018	Food Processing Technology	20CHE02
1019	Material Science for Chemical Engineers	20CHE03
1020	Pulp and Paper Technology	20CHE04
1021	Chemical Reaction Engineering Lab	20CHC11
1022	Heat Transfer Lab	20CHC12
1023	Chemical Reaction Engineering I	18CH C 10
1024	Mass Transfer I	18CH C 11
1025	Heat Transfer	18CH C 12
1026	Particle and Fluid Particle Processing	18CH C 13
1027	Water Conservation and Management	18CH E 01
1028	Renewable Energy	18CH E 02
1029	Experimental and Analytical Techniques	18CH E 03
1030	Polymer Science and Technology	18CH E 04
1031	Green Technology	18CH E 05
1032	Catalysis	18CH E 06
1033	Chemical Engineering Lab IA - MUO	18CH C 14
1034	Chemical Engineering Lab IB - FM and HT	18CH C 15
1035	Chemical Reaction Engineering II	18CH C 16
1036	Mass Transfer II	18CH C 17
1037	Process Control	18CH C 18
1038	Fluidization Engineering	18CH E 07
1039	Petrochemical Technology	18CH E 08
1040	Biochemical Engineering	18CH E 09
1041	Sugar Technology	18CH E 10
1042	Pulp and Paper Technology	18CH E 11
1043	Food Technology	18CH E 12

1044	Waste Management	18EE O 05
1045	Entrepreneurship	18ME O 04
1046	Basics Of Artificial Intelligence	18CS O 09
1047	Nanomaterials and Technology	18ME O 06
1048	Intellectual Property Rights	18ME O 07
1049	Chemical Engineering Lab IIA - CRE	18CH C 19
1050	Chemical Engineering Lab IIB - MTO and TD	18CH C 20
1051	Transport Phenomena	18CH C 21
1052	Process Technology and Economics	18CH C 22
1053	Process Instrumentation	18CH C 23
1054	Mineral Processing Technology	18CH E 13
1055	Corrosion Engineering	18CH E 14
1056	Scale-up Methods	18CH E 15
1057	Modern Manufacturing Processes	18ME O 11
1058	Energy Management Systems	18EE O 02
1059	Research Methodologies	18ME O 03
1060	Disaster Mitigation and Management	18CE O 02
1061	Machine Learning using Python	18CS O 10
1062	Process Instrumentation and Control Lab	18CH C 24
1063	Process Modeling and Simulation Lab	18CH C 25
1064	Project: Part I	18CH C 26
1065	Chemical Process Safety	18CH E 16
1066	Fertilizer Technology	18CH E 17
1067	Chemical Process Synthesis	18CH E 18
1068	Histories of Science and Technology	18PYO 01
1069	Gender Sensitization	18EG O 02
1070	Technical writing skills	18EG O 01
1071	IoT and Applications	18CSO 03
1072	Basics of Data Science using R	18CSO 04
1073	Technical Seminar	18CH C 27
1074	Project Part II	18CH C 28
1075	Partial Differential Equations and Statistics	20MT C08
1076	Surveying-I	20CE C03
1077	Solid Mechanics	20CE C04
1078	Fluid Mechanics	20CE C05
1079	Building Construction Practices & Concrete Technology	20CE C06
1080	Universal Human Values -II Understanding Harmony	20EG M03
1081	Solid Mechanics Lab	20CE C07
1082	Fluid Mechanics Lab	20CE C08
1083	MOOCs/Training/ Internship	20CE I01
1084	Hydraulic Engineering	20CE C09
1085	Surveying II	20CE C10
1086	Structural Analysis I	20CE C11
1087	Reinforced Concrete Design - I	20CE C12
1088	Hydraulic Engineering Lab	20CE C13
1089	Surveying & Geomatics Lab	20CE C14
1090	Computer Aided Drafting (CAD)	20CE C15
1091	Indian Constitution & Fundamental Principles (MC)	20EG M01

1092	Indian Traditional Knowledge (MC)	20EE M01
1093	Green Building Technologies	20CE E01
1094	Principles of Geographical information systems	20CE E02
1095	Solid and Hazardous Waste Management	20CE E03
1096	Ground Water Engineering	20CE E04
1097	Transportation Engineering	18CE C13
1098	Geotechnical Engineering	18CE C14
1099	Structural Analysis-II	18CE C15
1100	Engineering Economics and Accountancy	18MB C01
1101	Transportation Engineering Lab	18CE C16
1102	Geotechnical Engineering Lab	18CE C17
1103	Auto CAD Lab	18CE C18
1104	Prestressed Concrete	18CE E01
1105	Green Building Technologies	18CE E02
1106	Principles of Geographical Information Systems	18CE E03
1107	Masonry Structures	18CE E04
1108	Solid and Hazardous Waste Management	18CE E05
1109	Mechanics of Materials	18CE E06
1110	Repair and Rehabilitation of Structures	18CE E07
1111	Concrete Technology	18CE E08
1112	Design of Steel Structures-I	18CE C 19
1113	Environmental Engineering	18CE C20
1114	Engineering Geology	18CE C21
1115	Environmental Engineering Lab	18CE C22
1116	Engineering Geology lab	18CE C23
1117	Advanced Structural Analysis	18CE E09
1118	Foundation Engineering	18CE E10
1119	Water Shed Management	18CE E11
1120	Urban Transportation Planning	18CE E12
1121	Finite Element Methods	18CE E13
1122	Reinforced Concrete Design-II	18CE E14
1123	Railway Engineering	18CE E15
1124	Ground Water	18CE E16
1125	Fundamentals of DBMS	18CS O06
1126	Entrepreneurship	18ME O04
1127	Technical Writing Skills	18EG O01
1128	Energy Management Systems	18EE O04
1129	Construction Engineering and Management	18CE C24
1130	Hydrology and Water Resources Engineering	18CE C25
1131	Estimation, Specifications and Costing	18CE C26
1132	Concrete Technology Lab	18CE C27
1133	Computer Applications Lab	18CE C28
1134	Project: Part 1	18CE C29
1135	Design of Steel Structures-II	18CE E17
1136	Airport Engineering	18CE E18
1137	River Engineering	18CE E19
1138	Water and Air Quality Modelling	18CE E20
1139	Intellectual Property Rights	18ME O07

1140	Gender Sensitization	18EG O02
1141	Basics of Artificial Intelligence	18CS O01
1142	Energy Conservation	18EE O04
1143	Earthquake Resistant Design of Structures	18CE E21
1144	Ground Improvement Techniques	18CE E22
1145	Design of Hydraulic Structures/ Irrigation Engineering	18CE E23
1146	Rural Water Supply and Onsite Sanitation Systems	18CE E24
1147	Nano Materials and Technology	18ME O06
1148	Principles of Internet of Things	18IT O03
1149	Waste Management	18EE O05
1150	Neural Networks and Fuzzy Logic	18EC O08
1151	Project: Part 2	18CE C31
1152	Structural Dynamics	20CE C101
1153	Finite Element Method in Structural Engineering	20CE C102
1154	Advanced Structural Analysis	20CE E102
1155	Structural Health Monitoring	20CE E104
1156	Research Methodology and IPR	20ME103
1157	English for Research Paper Writing	20EG A101
1158	Structural Design Lab	20CE C103
1159	Advanced Concrete Lab	20CE C104
1160	Design of High Rise Structure	20CE C105
1161	Advanced Solid Mechanics	20CE C106
1162	Repair and Retrofitting of Structure	20CE E107
1163	Design of Advanced Concrete Structure	20CE E109
1164	Disaster Mitigation and Management	20CE A101
1165	Modal Testing Lab	20CE C107
1166	Numerical Analysis Lab	20CE C108
1167	Mini Project and Seminar	20CE C109
1168	Design of Bridges	20CEE115
1169	Business Analytics	20CS O101
1170	Waste to Energy	20EE O103

20MT C01

LINEAR ALGEBRA & CALCULUS

(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block chain Technology))

Instruction	3 L Hours per week
Duration of SEE	3Hours
SEE	60Marks
CIE	40Marks
Credits	3

Course Objectives:

1. To explain the solutions of system of linear equations by Matrix Methods.
2. To discuss the convergence and divergence of the Series.
3. To explain the Partial Derivatives and the extreme values of functions of two variables
4. To discuss Physical interpretations on Scalars and vector functions
5. To discuss vector line, surface and volume integrals.

Course Outcomes:

Upon completing this course, students will be able to:

1. Apply the Matrix Methods to solve the system of linear equations
2. Test the convergence and divergence of the infinite Series.
3. Determine the extreme values of functions of two variables.
4. Apply the vector differential operator to scalar and vector functions
5. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.

UNIT-I

Matrices: Rank of a matrix, Echelon form, consistency of linear System of equations, Linear dependence of vectors, Eigen values, Eigenvectors, Properties of Eigen values, Cayley-Hamilton theorem, Quadratic forms, Reduction of quadratic form to canonical form by linear transformation, Nature of quadratic form.

UNIT-II

Infinite Series: Definition of Convergence of sequence and series. Series of positive terms –Necessary condition for convergence, Comparison tests, limit form comparison test, D'Alembert's Ratio test, Raabe's test, Cauchy's root test, alternating series, Leibnitz's rule, absolutely and conditionally convergence.

UNIT-III

Partial Differentiation and Its Applications : Functions of two or more variables, Partial derivatives, Higher order partial derivatives, Total derivative, Differentiation of implicit functions, Jacobians, Taylor's expansion of functions of two variables, Maxima and minima of functions of two variables.

UNIT-IV

Vector Differential Calculus: Scalar and vector point functions, vector operator Del, Gradient, Directional derivative, Divergence, Curl, Del applied twice to point functions, Del applied to product of point functions (vector identities). Applications: Irrotational fields and Solenoidal fields.

UNIT-V

Vector Integral Calculus: Line integral, Surface integral and Volume integral. Green's theorem in the plane, verifications of Stroke's theorem (without proof) and Gauss's divergence theorem (without proof).

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

Head Dept. of IT
CBIT, Hyderabad

Suggested Reading:

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw- Hill, New Delhi, 2008.
2. R.K. Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th edition, 2016.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/ Cole, 2005.

Head Dept. of IT
CBIT, Hyderabad

20 EG C01

ENGLISH
(Common to all branches)

Instruction	2 Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	60Marks
CIE	40Marks
Credits	2

Course Objectives: This course will introduce the students:

1. To the role and importance of communication while developing their basic communication skills in English.
2. To basics of writing coherent paragraphs and formal emails.
3. To techniques of writing a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. To description, definition and classification of processes while enabling them to draft formal reports following a proper structure.
5. To gaining adequate reading comprehension techniques.

Course Outcomes: After successful completion of the course the students will be able to:

1. Illustrate the nature, process and types of communication and communicate effectively without barriers.
2. Construct and compose coherent paragraphs, emails and adhering to appropriate mobile etiquette.
3. Apply techniques of precision to write a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. Distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.
5. Critique passages by applying effective reading techniques

UNIT-I Understanding Communication in English:
Introduction, nature and importance of communication; Process of communication; Types of communication - verbal and non-verbal; Barriers to communication; Intrapersonal and interpersonal communication; Understanding Johari Window.
Vocabulary &Grammar: The concept of Word Formation; Use of appropriate prepositions and articles.

UNIT-II Developing Writing Skills I:
Paragraph writing. – Structure and features of a paragraph; Cohesion and coherence. Rearranging jumbled sentences. Email and Mobile etiquette.
Vocabulary & Grammar: Use of cohesive devices and correct punctuation.

UNIT-III Developing Writing Skills II:
Précis Writing; Techniques of writing precisely. Letter Writing – Structure, format of a formal letter; Letter of request and the response
Vocabulary and Grammar: Subject-verb agreement.
Use of prefixes and suffixes to form derivatives. Avoiding redundancies.

UNIT-IV Developing Writing Skills III:
Report writing – Importance, structure, elements of style of formal reports ; Writing a formal report.
Vocabulary and Grammar: Avoiding ambiguity - Misplaced modifiers. Use of synonyms and antonyms.

Head Dept. of IT
CBIT, Hyderabad

UNIT-V Developing Reading Skills:
The reading process, purpose, different kinds of texts; Reading comprehension; Techniques of comprehension – skimming, scanning, drawing inferences and conclusions.
Vocabulary and Grammar: Words often confused; Use of standard abbreviations.

Text Books:

1. Language and Life: A Skills Approach, Board of Editors, Orient Black Swan,2017.
2. Swan Michael, Practical English Usage.OUP.1995.

Suggested Readings:

1. Wood F.T, Remedial English Grammar,Macmillan,2007
2. Zinsser William, On Writing Well, Harper Resource Book, 2001
3. Sanjay Kumar and PushpLata, Communication Skills. Oxford University Press,2011.

Head Dept. of IT
CBIT, Hyderabad

Code: 20PY C01

OPTICS AND SEMICONDUCTOR PHYSICS

(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block chain Technology))

Instruction	3L/week
Duration of SEE	3Hours
SEE	60Marks
CIE	40Marks
Credits	3

Course Objectives: The objectives of the course is to make the student

1. Understand the fundamentals of wave nature of light
2. Acquire knowledge of lasers, holography and fiber optics
3. Familiarize with quantum mechanics
4. Learn the fundamental concepts of solids

Course Outcomes: At the end of the course, the student will be able to

1. Demonstrate the physical properties of light.
2. Explain characteristic properties of lasers and fiber optics
3. Find the applications of quantum mechanics
4. Classify the solids depending upon electrical conductivity
5. Identify different types of semiconductors

UNIT-I

Wave Optics: Huygens' principle –Superposition of waves –Interference of light by wave front splitting and amplitude splitting–Fresnel's biprism – Interference in thin films in reflected light– Newton's rings–Fraunhofer diffraction from a single slit –Double slit diffraction – Rayleigh criterion for limit of resolution– Concept of N-slits–Diffraction grating and its resolving power.

UNIT-II

Lasers & Holography: Characteristics of lasers – Einstein's coefficients –Amplification of light by population inversion –Different types of lasers: solid-state lasers: Ruby &Nd:YAG; gas lasers: He-Ne & CO_2; semiconductor laser –Applications of lasers in engineering and medicine. Holography: Principle – Recording and reconstruction–Applications.

Fiber Optics: Introduction –Construction –Principle –Propagation of light through an optical fiber – Numerical aperture and acceptance angle –Step-index and graded-index fibers –Pulse dispersion –Fiber losses–Fiber optic communication system –Applications.

UNIT-III

Principles of Quantum Mechanics: Introduction –Wave nature of particles – de-Broglie hypothesis – Physical significance of ψ –Time-dependent and time-independent Schrodinger equations – Born interpretation – Probability current –Wave packets –Uncertainty principle –Particle in infinite square well potential –Scattering from potential step – Potential barrier and tunneling.

UNIT-IV

Band Theory of Solids: Salient features of free electron theory of metals (Classical and Quantum) – Fermi level –Density of states – Bloch's theorem for particles in a periodic potential – Kronig-Penney model – Classification of solids: metals, semiconductors and insulators.

UNIT-V

Semiconductors: Intrinsic and extrinsic semiconductors –Charge carrier concentration in intrinsic semiconductors –Dependence of Fermi level on carrier concentration and temperature in extrinsic semiconductors (qualitative) –Carrier generation and recombination –Carrier transport: diffusion and drift – P-N junction – Thermistor – Hall effect – LED –Solar cell.

Head Dept. of IT
CBIT, Hyderabad

TEXT BOOKS:

1. B.K. Pandey and S. Chaturvedi, *Engineering Physics*, Cengage Publications, 2012.
2. M.N. Avadhanulu and P.G. Kshirsagar, *A Text Book of Engineering Physics*, S. Chand Publications, 2014.
3. M. Arumugam, *Materials Science*, Anuradha Publications, 2015.
4. S.L. Gupta and Sanjeev Gupta, *Modern Engineering Physics*, Dhanpat Rai Publications, 2011.

SUGGESTD READING:

1. R. Murugeshan and Kiruthiga Sivaprasath, *Modern Physics*, S. Chand Publications S. Chand Publications, 2014.
2. V. Rajendran, *Engineering Physics*, McGraw-Hill Education Publications, 2013.
3. P.K. Palanisamy, *Engineering Physics*, Scitech Publications, 2012.
4. V. Raghavan, *Materials Science and Engineering*, Prentice Hall India Learning Private Limited; 6th Revised edition, 2015.

Head Dept. of IT
CBIT, Hyderabad

20CS C01

PROGRAMMING FOR PROBLEM SOLVING
(Common to all Programs)

Instruction	3 Periods per week
Duration of End Examination	3Hours
Semester End Examination	60 Marks
Sessional	40 Marks
Credits	3

Course Objectives: The objectives of this course are
1. Identification of computer components, Operating environments, IDEs.
2. Understanding the steps in problem solving and formulation of algorithms to problems.
3. Develop programming skills as a means of implementing an algorithmic solution with appropriate control and data structures.
4. Develop in tuition to enable students to come up with creative approaches to problems.
5. Manipulation of text data using files.

Course Outcomes: On Successful completion of the course, students will be able to
1. Identify and understand the computing environments for scientific and mathematical problems.
2. Formulate solutions to problems with alternate approaches and represent them using algorithms / Flowcharts.
3. Choose data types and control structures to solve mathematical and scientific problem.
4. Decompose a problem into modules and use functions to implement the modules.
5. Apply arrays, pointers, structures, and unions to solve mathematical and scientific problems.
6. Develop applications using file I/O.

UNIT -I
Introduction to computers and Problem Solving: Components of a computer, Operating system, compilers, Program Development Environments, steps to solve problems, Algorithm, Flowchart / Pseudocode with examples.
Introduction to programming: Programming languages and generations, categorization of high-level languages.
Introduction to C: Introduction, structure of C program, keywords, identifiers, Variables, constants, I/O statements, operators, precedence, and associativity.

UNIT – II
Introduction to decision control statements: Selective, looping, and nested statements.
Functions: Introduction, uses of functions, Function definition, declaration, passing parameters to functions, recursion, scope of variables and storage classes, Case study using functions and control statements.

UNIT – III
Arrays: Introduction, declaration of arrays, accessing and storage of array elements, 1-dimensional array, Searching (linear and binary search algorithms) and sorting (Selection and Bubble) algorithms, 2-D arrays, matrix operations.
Strings: Introduction, strings representation, string operations with examples. Case study using arrays.

UNIT – IV
Pointers: Understanding computer's memory, introduction to pointers, declaration pointer variables, pointer arithmetic, pointers and strings, array of pointers, dynamic memory allocation, advantages, and drawbacks of pointers.
Structures: Structure definition, initialization and accessing the members of a structure, nested structures, structures and functions, self- referential structures, unions, and enumerated data types.

Head Dept. of IT
CBIT, Hyderabad

UNIT-V

Files: Introduction to files, file operations, reading data from files, writing data to files, error handing during file operations.

Preprocessor Directives: Types of preprocessor directives, examples.

Text Books:

1. M.T. Somashekar “Problem Solving with C”, 2nd Edition, Prentice Hall India Learning Private Limited 2018
2. AK Sharma, “Computer Fundamentals and Programming”, 2nd Edition, University Press, 2018
3. Pradeep Deyand Manas Ghosh, “Programming in C”, Oxford Press,2nd Edition,2017

Suggested Reading:

1. Byron Gottfried, Schaum’s Outline of Programming with C”, Mc Graw-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
4. Reema Tharaja “Introduction to C Programming”, Second Edition, OXFORD Press, 2015.

Online Resources:

1. https://www.tutorialspoint.com/cprogramming/index.htm.
2. https://onlinecourses.nptel.ac.in/noc18-cs10/preview

Head Dept. of IT
CBIT, Hyderabad

20MT C02

LINEAR ALGEBRA & CALCULUS (LAB)

(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block chain Technology))

Instruction	2P Hours per week
Duration of SEE	3Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:
1. To explain basic operations of matrix algebra.
2. To discuss the behavior of the infinite Series.
3. To discuss the maxima and minima of the functions of two variables
4. To discuss Physical interpretations on Scalars and vector functions.
5. To explain vector line, surface and volume integrals.

Course Outcomes:

Upon completing this course, students will be able to:
1. Apply the Matrix operations in executing various programmes.
2. Test the convergence and divergence of the infinite Series.
3. Explore the extreme values of functions of two variables.
4. Determine the gradient, divergent and curl of scalar and vector point functions.
5. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems

LIST OF EXPERIMENTS:

1. Addition and multiplication of higher order matrices.
2. Determinant and Inverse of the matrices
3. Eigen values and Eigenvectors of Matrix.
4. Nature of quadratic form of Matrix.
5. Solution of system of linear equations.
6. Data plotting (2D,3D)
7. Test the convergence of infinite series
8. Examine the extreme values of given function
9. Examine the rotational, irrotational and divergence of the flows
10. Verify inter connection between vector theorems (Green's, Gauss and Stoke's Theorems)

Text Books / Suggested Reading / Online Resources:

1. https://www.scilab.org/sites/default/files/Scilab_beginners_0.pdf
2. https://www.scilab.org/tutorials\
3. https://nptel.ac.in/courses/106102064/
4. https://www.udemy.com/algorithms-and-data-structures-in-python/

Head Dept. of IT
CBIT, Hyderabad

20EG C02

ENGLISH LAB
(Common to all branches)

Instruction	2 Hours per week
Duration of SEE	3Hours
SEE	50Marks
CIE	50Marks
Credits	1

Course Objectives: This course will introduce the students:

1. To nuances of Phonetics and give them sufficient practice in correct pronunciation.
2. To word stress and intonation.
3. To IELTS and TOEFL material for honing their listening skills.
4. To activities enabling them overcome their inhibitions while speaking in English with the focus being on fluency rather than accuracy.
5. To team work, role behavior while developing their ability to discuss in groups and making oral presentations.

Course Outcomes: After successful completion of the course the students will be able to:

1. Define the speech sounds in English and understand the nuances of pronunciation in English
2. Apply stress correctly and speak with the proper tone, intonation and rhythm.
3. Analyze IELTS and TOEFL listening comprehension texts to enhance their listening skills.
4. Determine the context and speak appropriately in various situations.
5. Design and present effective posters while working in teams ,and discuss and participate in Group discussions.

Exercises

1. **Introduction to English Phonetics**: Introduction to auditory, acoustic and articulatory phonetics, organs of speech: the respiratory, articulatory and phonatory systems.
2. **Sound system of English**: Phonetic sounds and phonemic sounds, introduction to international phonetic alphabet, classification and description of English phonemic sounds, minimal pairs . The syllable: types of syllables, consonant clusters.
3. **Word stress**: Primary stress, secondary stress, functional stress, rules of word stress.
4. **Rhythm &Intonation** : Introduction to Rhythm and Intonation. Major patterns, intonation of English with the semantic implications.
5. **Listening skills** – Practice with IELTS and TOEFL material
6. **Public speaking –** Speaking with confidence and clarity in different contexts on various issues.
7. **Group Discussions -** Dynamics of a group discussion, group discussion techniques, body language.
8. **Pictionary –** weaving an imaginative story around a given picture.
9. **Information Gap Activity –** Writing a brief report on a newspaper headline by building on the hints given
10. **Poster presentation –** Theme, poster preparation, team work and presentation.

Suggested Reading

1. T Balasubramanian. A Textbook of English Phonetics for Indian Students, Macmillan, 2008.
2. J Sethi et al. A Practical Course in English Pronunciation (with CD), Prentice Hall India, 2005.
3. Priyadarshi Patnaik. Group Discussions and Interviews, Cambridge University Press Pvt. Ltd., 2011
4. Aruna Koneru, Professional Speaking Skills, Oxford University Press, 2016

Head Dept. of IT
CBIT, Hyderabad

20PY C03

OPTICS AND SEMICONDUCTOR PHYSICS LAB
(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block Chain Technology))

Instruction	4Periods/week
Duration of SEE	3Hours
SEE	50Marks
CIE	50Marks
Credits	2

Course Objectives: The objectives of the course is to make the student
1. Apply theoretical physics knowledge in doing experiments
2. Understand the behaviour of the light experimentally
3. Analyze the conduction behaviour of semiconductor materials and optoelectronic devices

Course Outcomes: At the end of the course, the student will be able to
1. Interpret the errors in the results of an experiment.
2. Demonstrate physical properties of light experimentally
3. Make use of lasers and optical fibers for engineering applications
4. Explain the V-I characteristics of some optoelectronic and semiconductor devices
5. Find the applications thermistor

Experiments

1.	Error Analysis	:	Estimation of errors in the determination of time period of a torsional pendulum
2.	Fresnel's Biprism	:	Determination of wavelength of given monochromatic source
3.	Newton's Rings	:	Determination of wavelength of given monochromatic source
4.	Single Slit Diffraction	:	Determination of wavelength of given monochromatic source
5.	Diffraction Grating	:	Determination of wavelengths of two yellow lines of light of mercury lamp
6.	Laser	:	Determination of wavelength of given semiconductor laser
7.	Holography	:	Recording and reconstruction of a hologram
8.	Optical Fiber	:	Determination of numerical aperture and power losses of given optical fiber
9.	Energy Gap	:	Determination of energy gap of given semiconductor
10.	P-N Junction Diode	:	Study of V-I characteristics and calculation of resistance of given diode in forward bias and reverse bias
11.	Thermistor	:	Determination of temperature coefficient of resistance of given thermistor
12.	Hall Effect	:	Determination of Hall coefficient, carrier concentration and mobility of charge carriers of given semiconductor specimen
13.	LED	:	Study of I-V characteristics of given LED
14.	Solar Cell	:	Study of I-V characteristics of given solar cell and calculation of fill factor, efficiency and series resistance
15.	Planck's Constant	:	Determination of Planck's constant using photo cell

NOTE: A minimum of TWELVE experiments should be completed.

Head Dept. of IT
CBIT, Hyderabad

with effect from the Academic Year 2020-21

20CS C02

PROGRAMMING FOR PROBLEM SOLVING LAB
(Common to All Programs)

Instruction	4 Periods per week
Duration of SEE	3Hours
SEE	50Marks
CIE	50Marks
Credits	2

Course Objectives: The objectives of this course are
1. Setting up programming environment.
2. Develop Programming skills to solve problems.
3. Use of appropriate C programming constructs to implement algorithms.
4. Identification and rectification of coding errors in program.
5. Develop applications in a modular fashion.
6. Manage data using files.

Course Outcomes: On Successful completion of the course, students will be able to
1. Identify and setup program development environment.
2. Design and test programs to solve mathematical and scientific problems.
3. Identify and rectify the syntax errors and debug program for semantic errors
4. Implement modular programs using functions.
5. Represent data in arrays, pointers, structures and manipulate them through a program.
6. Create, read, and write to and from simple text files.

Lab Experiments
1. Familiarization with programming environment.
2. Simple computational problems using arithmetic expressions.
3. Problems involving if-then-else structures.
4. Iterative problems e.g., sum of series.
5. 1D Array manipulation.
6. 2D arrays and strings.
7. Matrix problems, String operations.
8. Simple functions.
9. Recursive functions.
10. Pointers and structures.
11. Dynamic memory allocation and error handling.
12. File handling:

Text Books:

1. Pradeep Dey and Manas Ghosh, "Programming in C", Oxford Press, 2nd Edition, 2017.
2. Reema Tharaja "Introduction to C Programming", Second Edition, OXFORD Press, 2015.

Online Resources:
1. https://www.tutorialspoint.com/cprogramming/index.htm
2. https://www.w3resource.com/c-programming/programming-in-c.php
3. https://www.w3schools.in/c-tutorial/

Head Dept. of IT
CBIT, Hyderabad

20ME C01

CAD AND DRAFTING

Instruction	1 T + 3 D Hours per week
Duration of SEE	3Hours
SEE	50Marks
CIE	50Marks
Credits	2.5

Course Objectives:
1. To get exposure to a cad package and its utility.
2. Understanding orthographic projections.
3. To visualize different solids and their sections in orthographic projection
4. To prepare the student to communicate effectively by using isometric projection.
5. To prepare the student to use the techniques, skills, and modern tools necessary for practice.

Outcomes: At the end of the course, the Students are able to
1. Become conversant with appropriate use of CAD software for drafting.
2. Recognize BIS, ISO Standards and conventions in Engineering Drafting.
3. Construct the projections of points, lines, planes, solids
4. Analyse the internal details of solids through sectional views
5. Create an isometric projections and views

List of Exercises:
1. Introduction to CAD package: Settings, draw, modify tools, dimensioning and documentation
2. Construction of Conic Sections by General method
3. Orthographic projection: Principles, conventions, Projection of points
4. Projection of straight lines: Simple position, inclined to one plane
5. Projection of straight lines inclined to both the planes (without traces and mid-point)
6. Projection of planes: Perpendicular planes
7. Projection of planes: Oblique planes
8. Projection of solids: Simple position
9. Projection of solids: Inclined to one plane
10. Sections of solids: Prism, pyramid in simple position
11. Sections of solids: Cone and cylinder in simple position
12. Isometric projections and views
13. Conversion of isometric views to orthographic projections and vice versa.

Text Books:

1. N.D.Bhatt, “Elementary Engineering Drawing”, Charotar Publishers,2012.
2. K.Venugopal, “Engineering Drawing and Graphics + AutoCAD”, New Age International Pvt.Ltd,2011.
3. Basanth Agrawal and C M Agrawal, “Engineering Drawing”, 2/e, McGraw-Hill Education (India) Pvt. Ltd.

Suggested Reading:

1. Shaw M.B and Rana B.C., “Engineering Drawing”, 2/e, Pearson, 2009.
2. K.L. Narayana and P.K. Kannaiah, “Text Book of Engineering Drawing”, Scitech Publications, 2011.

20MBC02

COMMUNITY ENGAGEMENT

Instruction	3 Hours per week (30 hours field work & 2 hours per week)
SEE	Nil
CIE	50 Marks
Credits	1.5 Credits

Course Objectives: The main Objectives of this Course are to:

1. Develop an appreciation of Rural culture, life-style and wisdom among the Students.
2. Learn about the various livelihood activities that contribute to Rural economy.
3. Familiarize the Rural Institutions and the Rural Development Programmes in India.

Course Outcomes: After the completion of this Course, Student will be able to:

1. Gain an understanding of Rural life, Culture and Social realities.
2. Develop a sense of empathy and bonds of mutuality with Local Communities.
3. Appreciate significant contributions of Local communities to Indian Society and Economy.
4. Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economic improvements.
5. Utilise the opportunities provided by Rural Development Programmes.

Module I Appreciation of Rural Society

Rural life style, Rural society, Caste and Gender relations, Rural values with respect to Community, Nature and Resources, elaboration of 'soul of India lies in villages' (Gandhi), Rural Infrastructure.

Module II Understanding Rural Economy and Livelihood

Agriculture, Farming, Landownership, Water management, Animal Husbandry, Non-farm Livelihood and Artisans, Rural Entrepreneurs, Rural markets, Rural Credit Societies, Farmer Production Organization/Company.

Module III Rural Institutions

Traditional Rural organizations, Self-Help Groups, Panchayati Raj Institutions (Gram Sabha), Gram Panchayat, Standing Committees, Local Civil Society, Local Administration.

Module IV Rural Development Programmes

History of Rural Development in India, Current National Programmes: Sarva Shiksha Abhiyan, Beti Bhachao, Beti Padhao, Ayushman, Bharat, Swachh Bharat, PM Awas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA etc.

Text Books:

1. Singh, Katar, Rural Development: Principles, Policies and Management, Sage Publications, New Delhi, 2015.
2. A Hand book on Village Panchayat Administration, Rajiv Gandhi Chair for Panchayati Raj Studies, 2002.
3. United Nations, Sustainable Development Goals, 2015, un.org/sdgs
4. M.P Boraia, Best Practices in Rural Development, Shanlax Publishers, 2016.

Journals:

1. Journal of Rural development (published by NIRD & PR, Hyderabad).
2. Indian Journal of Social Work, (by TISS, Bombay).
3. Indian Journal of Extension Educations (by Indian Society of Extension Education).
4. Journal of Extension Education (by Extension Education Society).
5. Kurukshetra (Ministry of Rural Development, GOI).
6. Yojana (Ministry of Information & Broadcasting, GOI).

Head Dept. of IT
CBIT, Hyderabad

20MT C03

DIFFERENTIAL EQUATIONS &TRANSFORM THEORY
(CSE,IT, CSE (AI&ML), AI&DS, CSE (IOT &Cyber Security including Block Chain Technology))

Instruction	3 L per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
1. To explain the relevant methods to solve first order differential equations.
2. To explain the relevant methods to solve higher order differential equations.
3. To discuss the properties of Legendre's Polynomials and Bessel's functions
4. To explain the Z-Transform and InverseZ-Transforms.
5. To discuss Fourier transform for solving engineering problems.

Course Outcomes:

Upon completing this course, students will be able to:
1. Calculate the solutions of first order linear differential equations.
2. Calculate the solutions of higher order linear differential equations.
3. Examine the series solutions for higher order differential equations.
4. Evaluate the Improper integrals by Fourier Transform.
5. Solve the difference equations byZ-transforms.

UNIT - I

Differential Equations of First Order: Exact Differential Equations, Equations Reducible To Exact Equations, Linear Equations, Bernoulli's Equations, Riccati's and Clairaut's Equations, Orthogonal trajectories.

UNIT-II

Higher Order Linear Differential Equations: Solutions of higher order linear equations with constants coefficients, Method of variation of parameters, solution of Cauchy's homogeneous linear equation. applications: LR and LCRcircuits.

UNIT-III

Series Solutions of Differential Equations: Ordinary point, singular point and regular singular point, Series solution when **x=a** is an ordinary point of the equation. Legendre's equation, Legendre's Polynomial of first kind (without proof), Rodrigue's formula, orthogonality of Legendre polynomials. Bessel's equation, Bessel's function of the first kind of order n (without proof), recurrence formulae for **Jn(x)** and related problems (i.e$J_0(x)$, $J_1(x)$, $J_{1/2}(x)$, $J_{-1/2}(x)$, $J_{3/2}(x)$, $J_{-3/2}(x)$).

UNIT-IV

Fourier Transforms: Fourier integral theorem (statement), Complex form of Fourier integrals. Fourier transforms, Inverse Fourier Transforms, Fourier Sine and Cosine transforms, Inverse Fourier Sine and Cosine Transforms. Properties of Fourier transforms: Linear property, change of scale property, shifting property and Modulation theorem.

UNIT-V

Z-Transforms: Definition, some standard Z-transforms, linearity property, damping rule, shifting U_n to the right, shifting U_n to the left, multiplication by 'n', initial and final value theorems. Inverse Z-Transform: evaluation of Inverse Z-transform by Convolution theorem, partial fractions method. Z- Transform application to difference equations.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. R.K.Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th edition, 2016.

Head Dept. of IT
CBIT, Hyderabad

Suggested Reading:

1. N.P.Bali and Manish Goyal, Atext book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. A.R.Vasishtha, and R.K.Guptha Integral transforms, Krishna Prakashan Media, Reprint, 2016

Head Dept. of IT
CBIT, Hyderabad

20CY C01

CHEMISTRY

(Common to all branches)

Instruction:	3Hours per Week
Duration of SEE:	3 Hours
SEE	60 Marks
CIE:	40 Marks
Credits:	3

Course Objectives

1. This syllabus helps at providing the concepts of chemical bonding and chemical kinetics to the students aspiring to become practicing engineers
2. Thermodynamic and Electrochemistry units give conceptual knowledge about processes and how they can be producing electrical energy and efficiency of systems.
3. To teach students the value of chemistry and to improve the research opportunities knowledge of stereochemistry and organic reactions is essential.
4. Water chemistry unit impart the knowledge and understand the role of chemistry in the daily life.
5. New materials lead to discovering of technologies in strategic areas for which an insight into Polymers, nanomaterials and basic drugs of modern chemistry is essential.

Course Outcomes

At the end of the course student will be able to:

1. Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions.
2. Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells.
3. Illustrate the major chemical reactions that are used in the synthesis of organic molecules.
4. Classify the various methods used in treatment of water for domestic and industrial use.
5. Outline the synthesis of various Engineering materials & Drugs.

UNIT-I Atomic and molecular structure and Chemical Kinetics:

Atomic and molecular structure: Molecular Orbital theory - atomic and molecular orbitals. Linear combination of atomic orbitals (LCAO) method. Molecular orbitals of diatomic molecules. Molecular Orbital Energy level diagrams (MOED) of diatomic molecules & molecular ions (H_2 , He_2^+ ,N_2 , O_2 , O_2^- , CO, NO). Pi- molecular orbitals of benzene and its aromaticity.

Chemical Kinetics: Introduction, Terms involved in kinetics: rate of reaction, order & molecularity; First order reaction-Characteristics: units of first order rate constant & its half-life period, second order reaction-Characteristics: units of second order rate constant & its half- life period. Numericals.

UNIT-II Use of free energy in chemical equilibria

Use of free energy in chemical equilibria: Thermodynamic functions: Internal energy, entropy and free energy. Significance of entropy and free energy (criteria of spontaneity). Free energy and emf (Gibbs Helmholtz equations and its applications). Cell potentials, electrode potentials, – Reference electrodes (NHE, SCE)-electrochemical series. Nernst equation and its applications. Determination of pH using combined Glass & Calomel electrode. Potentiometric Acid base & Redox Titrations. Numericals.

Battery technology: Rechargeable batteries & Fuel cells.

Lithium batteries: Introduction, construction, working and applications of Li-MnO_2 and Li-ion batteries.
Fuel Cells: Introduction, difference between conventional cell and fuel cell, limitations & advantages.
Construction, working & applications of methanol-oxygen fuel cell.

UNIT- III Stereochemistry and Organic reactions

Stereochemistry: Representations of 3 dimensional structures, Types of stereoisomerism- Conformational isomerism – confirmations of n-butane (Newman and sawhorse representations), Configurational isomerism - Geometrical (cis-trans) isomerism & Optical isomerism- optical activity, Symmetry and chirality: Enantiomers (lactic acid) & Diastereomers (Tartaric acid), Absolute configurations, Sequence rules for R&S notation.

Types of Organic reactions: Substitution Reactions- Electrophilic substitution (Nitration of Benzene); Nucleophilic Substitution (S_N1& S_N2); Free Radical Substitution (Halogenation of Alkanes)

Head Dept. of IT
CBIT, Hyderabad

Addition Reactions: Electrophilic Addition – Markonikoff's rule, Free radical Addition - Anti Markonikoff's rule (Peroxide effect), Nucleophilic Addition – (Addition of HCN to carbonyl compounds)
Eliminations-E1 and E2 (dehydrohalogenation of alkyl halides)
Cyclization (Diels - Alder reaction)

UNIT–IV Water Chemistry:
Hardness of water – Types, units of hardness, Disadvantages of hard water, Alkalinity and Estimation of Alkalinity of water, Boiler troubles - scales & sludge formation, causes and effects, Softening of water by lime soda process (Cold lime soda process),ion exchange method and Reverse Osmosis. Specifications of potable water & industrial water. Disinfection of water by Chlorination; break point chlorination, BOD and COD definition, Estimation (only brief procedure) and significance, Numericals.

UNIT-V Engineering Materials and Drugs:
Introduction, Terms used in polymer science; Thermoplastic polymers (PVC) &Thermosetting polymers (Bakelite); Elastomers (Natural rubber). Conducting polymers- Definition, classification and applications.
Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography.
Nano materials-Introduction to nano materials and general applications, basic chemical methods of preparation-Sol-gel method. Carbon nanotubes and their applications. Characterisation of nanomaterials by SEM and TEM (only Principle).
Drugs-Introduction, Synthesis and uses of Aspirin (analgesic), Paracetamol (Antipyretic), Atenolol (antihypertensive).

Text Books:

1. P.C. Jain and M. Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company Ltd., New Delhi,16th edition (2015).
2. W.U. Malik, G.D.Tuli and R.D.Madan, "Selected topics in Inorganic Chemistry", S Chand & Company Ltd, New Delhi, reprint (2009).
3. R.T. Morrison, R.N. Boyd and S.K. Bhattacharjee, "Organic Chemistry", Pearson, Delhi, 7th edition (2019).
4. A Textbook of Polymer Science and Technology , Shashi Chawla, Dhanpat Rai & Co. (2014)
5. T. Pradeep, Nano: The Essentials, Tata McGraw-Hill Education, Delhi, 2012
6. G.L. David Krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K.L.N. Reddy and C.Sudhakar, "Drugs", Universities Press (India) Limited, Hyderabad (2007).

Suggested Readings:

1. B. H. Mahan, "University Chemistry", Narosa Publishing house, New Delhi, 3rd edition (2013).
2. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", S. Nagin Chand & Company Ltd., 46th edition (2013).
3. T.W. Graham Solomons, C.B. Fryhle and S.A. Snyder, "Organic Chemistry", Wiley, 12th edition (2017).
4. P.W. Atkins, J.D. Paula, "Physical Chemistry", Oxford, 8th edition (2006).

Head Dept. of IT
CBIT, Hyderabad

20ITC01

DATA STRUCTURES AND ALGORITHMS

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To introduce representation, specification, and applications of various linear and nonlinear data structures.
2. To familiarize with asymptotic analysis of iterative and recursive functions.
3. To acquaint with various pattern matching algorithms.
4. To present different sorting algorithms.
5. To explain hashing and collision handling.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Analyse time complexity of both iterative and recursive functions.
2. Understand various sorting algorithms and their performance
3. Build optimal solutions using linear and nonlinear data structures.
4. Apply pattern matching.
5. Understand hash functions and collision handling

UNIT-I

Introduction: Data Structures, Abstract Data Types, Algorithm, Analysis of Algorithms, Running Time Analysis, Commonly Used Rates of Growth, Big O Notation, Omega Notation, Theta Notation, Guidelines for Asymptotic Analysis

Recursion: Introduction, Recursion and Memory, Recursion versus Iteration, Example algorithms of Recursion

Sorting: Introduction, Classification of Sorting Algorithms, Selection Sort, Insertion Sort, Merge Sort, Heap Sort, Quick Sort, Radix sort, Comparison of Sorting Algorithms

Searching: Introduction, Types of Searching, Unordered Linear Search, Sorted/Ordered Linear Search, Binary Search

UNIT-II

Linked Lists: Linked List ADT, Comparison of Linked Lists with Arrays and Dynamic Arrays, Singly Linked Lists, Doubly Linked Lists, Circular Linked Lists

Stacks: Stack ADT, Applications, Implementation, Comparison of Implementations, Stacks: Problems & Solutions

UNIT-III

Queues: Queue ADT, Exceptions, Applications, Implementations, Queues: Problems & Solutions

Trees: Introduction, Glossary, Binary Trees, Types of Binary Trees, Properties of Binary Trees, Binary Tree Traversals, Binary Search Trees (BSTs), Balanced Binary Search Trees, AVL Trees: Properties, rotations, insertion

UNIT-IV

Priority Queues and Heaps: Priority Queue *AD*T, Priority Queue Applications, Priority Queue Implementations, Heaps and Binary Heaps, Binary Heaps, Heap Sort

String Algorithms: Introduction, String Matching Algorithm, Brute Force Method, String Matching with Finite Automata, KMP, Tries, Ternary Search Trees, Suffix Trees

UNIT-V

Graph: Introduction, Applications of Graphs, Graph Representation, Graph Traversals, Minimal Spanning Tree

Hashing: Hash Table ADT, Components of Hashing, Hash Table, Hash Function, Load Factor, Collisions, Collision Resolution Techniques, Separate Chaining, Open Addressing, Comparison of Collision Resolution Techniques, Hashing Techniques, Limitations of Hash Tables.

Head Dept. of IT
CBIT, Hyderabad

Text Book:

1. Narasimha Karumanchi, "Data Structures And Algorithmic Thinking With Python", Career Monk Publications, 2016

Suggested Reading:

1. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, “Data Structure and Algorithms in Python”, Wiley, 2013.
2. Kenneth A. Lambert, " Fundamentals of Python: Data Structures", Cengage Learning, 2018.
3. Narasimha Karumanchi, “Data Structures and Algorithms for GATE”, Career Monk Publications, 2011.
4. D. Samantha, “Classic Data Structures”, Prentice Hall India, 2^{nd} Edition, 2013.

Web Resources:

1. https://visualgo.net/en
2. https://www.coursera.org/specializations/data-structures-algorithms
3. https://nptel.ac.in/courses/106/106/106106182/
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms
5. https://www.edx.org/course/algorithms-and-data-structures

Head Dept. of IT
CBIT, Hyderabad

20ITC02

OBJECT ORIENTED PROGRAMMING USING PYTHON

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

Course Objectives:

1. To describe the principles of Object-Oriented Programming.
2. To familiarize with basics of python programming
3. To explain the usage of OOP concepts to provide solutions
4. To introduce exception handling, and file operations in python
5. To acquaint with tkinter module to develop GUI applications.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the concepts Object-Oriented Programming
2. Make use of Python programming constructs to implement solutions to problems
3. Model the problem using OOP strategies and handle exceptions
4. Make use of files and perform file handling operations.
5. Develop GUI's

UNIT - I

Introduction to Object Oriented Programming (OOP): Computer Programming and Programming Languages, Features of Object Oriented Programming, Merits and Demerits of Object, Applications of Object Oriented Programming, Differences between Popular Programming Languages

Basics of Python Programming: Features, History, Future, Writing and Executing First Python Program, Literal Constants, Variables and Identifiers, Data Types, Input Operation, Comments, Reserved Words, Indentation, Operators and Expressions, Expressions in Python, Operations on Strings, Other Data Types, Type Conversion

UNIT - II

Decision Control Statements: Introduction to Decision Control Statements, Selection/Conditional Branching Statements, Basic Loop Structures/ Iterative Statements, Nested Loops, The break Statement, The continue Statement, The pass Statement, The else Statement used with Loops

Functions and Modules: Introduction, Function Definition, Function Call, Variable Scope and Lifetime, The return statement, More on Defining Functions, Lambda Functions or Anonymous Functions, Documentation Strings, Good Programming Practices, Recursive Functions, Greatest Common Divisor, Finding Exponents, The Fibonacci Series, Recursion vs Iteration, Modules, Packages in Python, Standard Library modules, Globals(), Locals(), and Reload(), Function Redefinition

UNIT – III

Classes and Objects: Introduction, Classes and Objects, init method, Class variables, and Object variables, Public and Private Data members, calling methods from other methods, built-in class attributes, garbage collection, class methods, static methods.

File Handling: Introduction, File Path, Types of Files, Opening and Closing Files, Reading and Writing Files

UNIT-IV

Inheritance: Introduction, Inheriting classes, Types of Inheritance, Composition or Containership or complex objects, Abstract classes and interfaces.

Operator Overloading: Introduction, Implementation of Operator Overloading, Reverse Adding, Overriding __getitem__() and __ setitem__() Methods, Overriding the in Operator, Overloading Miscellaneous Functions, Overriding the __call__() method

Head Dept. of IT
CBIT, Hyderabad

UNIT-V

Error and Exception Handling: Introduction to errors and exceptions, Handling Exceptions, Multiple Except Blocks, Multiple Exceptions in a Single Block, Except Block Without Exception, The else Clause, Raising Exceptions, Instantiating Exceptions, Handling Exceptions in Invoked Functions, Built-in and User-defined Exceptions, The finally Block, Pre-defined Clean–up Action, Re-raising Exception, Assertions in Python

GUI Programming with tkinter package

Text Book:

1. Reema Thareja "Python Programming: Using Problem Solving Approach" , Oxford University Press, 2019

Suggested Reading:

1. Tony Gaddis, "Starting Out With Python", 3rd edition, Pearson, 2015.
2. Kenneth A. Lambert, " Fundamentals of Python: Data Structures", Cengage Learning, 2018.
3. Alan D. Moore, "Python GUI programming with Tkinter", 2018

Web Resources:

1. https://www.python.org/
2. https://nptel.ac.in/courses/106/106/106106182/
3. https://www.coursera.org/learn/python
4. https://learnpythonthehardway.org/book/

Head Dept. of IT
CBIT, Hyderabad

20MT C04

DIFFERENTIAL EQUATIONS &TRANSFORM THEORY LAB

(CSE, IT, CSE (AI&ML), AI&DS, CSE (IOT & Cyber Security including Block Chain Technology)

Instruction	2P Hours per week
Duration of SEE	3Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To explain the relevant methods to solve first order differential equations.
2. To explain the relevant methods to solve higher order differential equations.
3. To discuss the properties of Legendre's Polynomials and Bessel's functions
4. To explain the Z-Transform and InverseZ-Transforms.
5. To discuss Fourier transform for solving engineering problems.

Course Outcomes:

Upon completing this course, students will be able to:

1. Explore all the possible solutions of first order differential equation.
2. Analyse the solutions of higher order linear differential equations.
3. Examine the series solutions for higher order differential equations.
4. Evaluate the Improper integrals by Fourier Transform.
5. Apply the Z-transform to solve the difference equations.

List of Programmes:

1. Solution of first order liner differential equations.
2. Solution of first order non liner differential equations
3. Geometrical view of Particular integral of higher order differential equations.
4. Simulations of Legendre's differential equations.
5. Geometrical view of Rodrigue's theorem.
6. Simulations of Bessel's first kind solution.
7. Solutions of Bessel's first kind (i.e. $J_0(x)$, $J_1(x)$, $J_{1/2}(x)$, $J_{3/2}(x)$, $J_{-1/2}(x)$, $J_{-3/2}(x)$)
8. Waveform generation continuous signals
9. Computation of Fourier Transformations
10. Discrete Cosine Transforms
11. Digitization of continuous functions.

Text Books / Suggested Reading / Online Resources:

1. https://www.scilab.org/sites/default/files/Scilab_beginners_0.pdf
2. https://www.scilab.org/tutorials\
3. https://nptel.ac.in/courses/106102064/
4. https://www.udemy.com/algorithms-and-data-structures-in-python/

Head Dept. of IT
CBIT, Hyderabad

20CY C02

CHEMISTRY LAB

(Common to all branches)

Instruction:	4 Hours per Week
Duration of SEE	3 Hours
SEE:	50 Marks
CIE	50 Marks
Credits:	2

Course Objectives

1. To impart fundamental knowledge in handling the equipment / glassware and chemicals in chemistry laboratory.
2. To provide the knowledge in both qualitative and quantitative chemical analysis
3. The student should be conversant with the principles of volumetric analysis
4. To apply various instrumental methods to analyse the chemical compounds and to improve understanding of theoretical concepts.
5. To interpret the theorical concepts in the preparation of new materials like drugs and polymers.

Course Outcomes

At the end of the course student will be able to:

1. Identify the basic chemical methods to analyse the substances quantitatively & qualitatively.
2. Estimate the amount of chemical substances by volumetric analysis.
3. Determine the rate constants of reactions from concentration of reactants/ products as a function of time.
4. Calculate the concentration and amount of various substances using instrumental techniques.
5. Develop the basic drug molecules and polymeric compounds.

Chemistry Lab

1. Introduction: Preparation of standard solution of oxalic acid and standardisation of NaOH.
2. Estimation of metal ions (Co^{+2}& Ni^{+2}) by EDTA method.
3. Estimation of temporary and permanent hardness of water using EDTA solution
4. Determination of Alkalinity of water
5. Determination of rate constant for the reaction of hydrolysis of methyl acetate. (first order)
6. Determination of rate constant for the reaction between potassium per sulphate and potassium Iodide. (second order)
7. Estimation of amount of HCl Conductometrically using NaOH solution.
8. Estimation of amount of HCl and CH_3COOH present in the given mixture of acids Conductometrically using NaOH solution.
9. Estimation of amount of HCl Potentiometrically using NaOH solution.
10. Estimation of amount of Fe^{+2} Potentiometrically using $KMnO_4$ solution
11. Preparation of Nitrobenzene from Benzene.
12. Synthesis of Aspirin drug and Paracetamol drug.
13. Synthesis of phenol formaldehyde resin.

Text Books:

1. J. Mendham and Thomas , "Vogel's text book of quantitative chemical analysis", Pearson education Pvt. Ltd. New Delhi , 6th ed. 2002.
2. Senior practical physical chemistry by B.D.Khosla, V.C.Garg & A.Gulati,; R. Chand & Co. : New Delhi (2011).

Suggested Readings:

1. Dr.Subdharani , "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing, 2012.
2. S.S. Dara , "A Textbook on experiment and calculation in engineering chemistry", S.Chand and Company, 9th revised edition, 2015.

20IT C03 **DATA STRUCTURES AND ALGORITHMS LAB**

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:
1. To introduce predefined data structures of Python
2. To introduce Linked Lists and operations
3. To present Stacks, Queues and their applications
4. To familiarise with Sorting Algorithms and Hashing
5. To gain knowledge of Trees, Graphs, Tries and related algorithms

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Make use of predefined data structures of python to process data.
2. Evaluate the performance of Sorting algorithms
3. Demonstrate Arrays, Linked lists, Stacks, Queues, Binary Search Trees, Graphs
4. Make use of Hashing and perform data storing and retrieval
5. Build optimal solutions using linear and nonlinear data structures to real world problems.

List of Programs
1. Demonstrate the usage of predefined data structures of Python: List, Tuple, String, Set, Dictionary.
2. Implementation of recursive and iterative functions.
3. Implement the following sorting algorithms: Selection Sort, Insertion Sort, Merge Sort, Heap Sort, Quick Sort, Radix Sort.
4. Define Single Linked List ADT and perform all standard operations.
5. Define Doubly Linked List ADT and perform all standard operations.
6. Define Stack and Queue ADTs and implement standard operations.
7. Applications of Stacks and Queues.
8. Implementation of Binary Search Tree.
9. Implementation of Graph traversal techniques.
10. Implementation of Hashing.
11. Implementation of Tries.

Text Book:

1. Narasimha Karumanchi, "Data Structures And Algorithmic Thinking With Python", Career Monk Publications, 2016

Suggested Reading:

1. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, “Data Structure and Algorithms in Python”, Wiley, 2013.
2. Kenneth A. Lambert, " Fundamentals of Python: Data Structures", Cengage Learning, 2018.
3. Narasimha Karumanchi, “Data Structures and Algorithms for GATE”, Career Monk Publications, 2011.
4. D. Samantha, “Classic Data Structures”, Prentice Hall India, 2ndEdition, 2013.

Web Resources:
1. https://www.geeksforgeeks.org/data-structures/
2. https://www.coursera.org/specializations/data-structures-algorithms
3. https://nptel.ac.in/courses/106/106/106106182/
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms

Head Dept. of IT
CBIT, Hyderabad

20IT C04

OBJECT ORIENTED PROGRAMMING USING PYTHON LAB

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To familiarize with basics of python programming
2. To explain the usage of OOP concepts to provide solutions
3. To acquaint with Functions and Modules
4. To explain exception handling, file operations in python
5. To introduce library modules to develop GUI applications.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Make use of Python programming constructs to implement solutions to problems
2. Model the problem using OOP strategies and handle exceptions
3. Make use of files and perform file handling operations.
4. Develop GUI's
5. Build solutions to real world problems

List of Programs

1. Demonstrate the use of basic data types and operators.
2. Demonstrate the use of control structures.
3. Implementations of Functions, Lambda functions and parameter passing.
4. Demonstrate the usage of predefined Modules.
5. Implementation of classes with attributes and methods.
6. Demonstration of inheritance.
7. Implementation of Overloading.
8. Implementation of file operations
9. Implementation of Exception Handling
10. Building GUIs.

Text Book:

1. Reema Thareja, "Python Programming: Using Problem Solving Approach" , Oxford University Press, 2019

Suggested Reading:

1. Tony Gaddis, "Starting Out With Python", 3rd edition, Pearson, 2015.
2. Kenneth A. Lambert, " Fundamentals of Python: Data Structures", Cengage Learning, 2018.
3. Alan D. Moore, "Python GUI programming with Tkinter", 2018

Web Resources:

1. https://www.python.org/
2. https://nptel.ac.in/courses/106/106/106106182/
3. https://www.coursera.org/learn/python
4. https://learnpythonthehardway.org/book/

Head Dept. of IT
CBIT, Hyderabad

20ME C02

WORKSHOP / MANUFACTURING PRACTICE

Instruction	5 P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2.5

Course Objectives:

1. Give a feel of Engineering Practices & develop holistic understanding of various Engineering materials and Manufacturing processes.
2. Develop skills of manufacturing, safety, precision, quality, intelligent effort, optimization, positive &team work attitude to get things right the first time.
3. To provide basic knowledge of Steel, Plastic, Composite and other materials for suitable applications.
4. Study of Principle and hands on practice on techniques of fabrication, welding, casting, manufacturing, metrology, and allied skills.
5. To advance important hard & pertinent soft skills, productivity, create skilled manpower which is cognizant of industrial workshop components and processes and can communicate their work in a technical, clear and effective way.

Course Outcomes: At the end of the course, the students are able to

1. Understand safety measures to be followed in workshop to avoid accidents.
2. Identify various tools used in fitting, carpentry, tin smithy, house wiring, welding, casting and machining processes.
3. Make a given model by using workshop trades including fitting, carpentry, tinsmithy and House wiring.
4. Perform various operations in welding, machining and casting processes.
5. Conceptualize and produce simple device/mechanism of their choice.

List of Exercises

CYCLE 1

Exercises in Carpentry

1. To plane the given wooden piece to required size
2. To make a lap joint on the given wooden piece according to the given dimensions.
3. To make a dove tail-joint on the given wooden piece according to the given dimensions.

Exercises in Tin Smithy

1. To make a rectangular box from the given sheet metal with base and top open. Solder the corners.
2. To make a scoop.
3. To make a pamphlet box.

Exercises in Fitting

1. To make a perfect rectangular MS flat and to do parallel cuts using Hacksaw
2. To make male and female fitting using MSflats-Assembly1
3. To make male and female fitting using MSflats-Assembly2

Exercises in House Wiring

1. Wiring of one light point controlled by one single pole switch, a three pin socket controlled by a single pole switch, and wiring of one buzzer controlled by a bellpush
2. Wiring of two light points connected in series and controlled by single pole switch. Verify the above circuit with different bulbs. Wiring of two light points connected in parallel from two single pole switches and a three pin socket
3. Stair case wiring-wiring of one light point controlled from two different places independently using two 2- ways witches.

Head Dept. of IT
CBIT, Hyderabad

CYCLE 2

Exercises in Casting

1. Study of Sand casting process and its applications.
2. Green sand moulding practice for a single piece pattern
3. Green sand moulding practice for a split pattern with a horizontal core

Exercises in Welding

1. Study of gas welding equipment and process. Identification of flames, making of Butt joint with gas welding.
2. Study of Arc welding process, making Butt joint with DCSP, DCRP
3. Study of Arc welding process, making Lap joint with A.C

Exercises in Machine shop

1. Study of Machine Tools like Lathe, Drilling, Milling and Shaper.
2. Facing, Plain turning and Step turning operations on Lathe machine.
3. Knurling and Taper turning on Lathe machine

Open ended Exercise:

1. Student should produce a component /mechanism by applying the knowledge of any one trade or combination of trades.

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I, 2008 and Vol. II, 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology",4th edition, Pearson Education India Edition, 2002.
3. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.

Suggested Reading:

1. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I", Pearson Education, 2008.
2. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.

Head Dept. of IT
CBIT, Hyderabad

20ME C03

ENGINEERING EXPLORATION
(PRACTICAL)

Instruction	4 Hours per week
Duration of SEE	Nil
SEE	Nil
CIE	50Marks
Credits	1.5

Prerequisites: Nil

Course Outcomes: At the end of the course, the students are able to

1. Understand the role of an engineer as a problem solver.
2. Identify multi-disciplinary approaches in solving an engineering problem.
3. Build simple systems using engineering design process.
4. Analyze engineering solutions from ethical and sustainability perspectives.
5. Use basics of engineering project management skills in doing projects.

UNIT- I

Role of Engineers: Introduction, science, engineering, technology, engineer, scientist, role of engineer, various disciplines of engineering, misconception of engineering, expectations for the 21st century engineer and NBA graduate attributes.

Engineering problems and Design: Multidisciplinary facet of design, pair wise comparison chart, introduction to econometrics system, generation of multiple solution, Pugh chart, motor and battery sizing concepts, introduction to PCB design.

UNIT- II

Mechanisms: Basic components of a mechanism, degrees of freedom or mobility of a mechanism, 4-bar chain, crank rocker mechanism, slider crank mechanism, simple robotic arm building.

Platform-based development: Introduction to programming platforms (Arduino) and its essentials, sensors, transducers and actuators and their interfacing with Arduino.

UNIT- III

Data Acquisition and Analysis: Types of data, descriptive statistics techniques as applicable to different types of data, types of graphs and their applicability, usage of tools (MS-Office /Open Office/ Libre Office / Scilab) for descriptive statistics, data acquisition (temperature and humidity) using sensors interfaced with Arduino, exporting acquired data to spreadsheets, and analysis using representation.

UNIT- IV

Process Management: Introduction to Agile practice, significance of team work, importance of communication in engineering profession, project management tools, checklist, timeline, Gantt chart, significance of documentation.

UNIT -V

Engineering Ethics & Sustainability in Engineering: Identifying Engineering as a profession, significance of professional ethics, code of conduct for engineers, identifying ethical dimensions in different tasks of engineering, applying moral theories and codes of conduct for resolution of ethical dilemmas.

Sustainability in Engineering: Introduction, sustainability leadership, life cycle assessment, carbon foot print.

Text Books:

1. Clive L. Dym, Patric Little, Elizabeth J Orwin, “Engineering Design: A project-based introduction”, 4th edition, Willey.
2. Matthew Python, “Arduino programming for beginners”, Independently published, 2020.
3. Patrick F. Dunn , “Measurement and data Analysis for engineering and science”, third edition, 2014.
4. Andrew Stellman, Jennifer Greene, “Head First Agile: A brain-friendly guide to Agile principles, ideas, and real-world practices”, Kindle Edition.

Suggested Reading:

1. Charles B. Fleddermann, “Engineering ethics”, fourth edition, Prentice Hall, 2012.
2. Rob Lawlor, “Engineering in society”, second edition, Royal academy of engineering.
3. Richard Dodds, Roger Venables, “Engineering for sustainable development: Guiding principles”, The Royal Academy of engineering, 2005.
4. Richard S. Paul, “Robot Manipulators: Mathematics, Programming, and Control”, MIT Press.

ENGINEERING EXPLORATION ASSESSMENT SCHEME				
S. No	**Name of the module**	**Work Hours**	**Marks**	**Evaluation**
1	Role of Engineers	4	-	Evaluation - I
2	Engineering Design	16	5	
3	Mechanisms	6	3	
4	Engineering Ethics	2	2	
5	Platform-based Development	16	5	Evaluation - II
6	Data Acquisition and Analysis	6	4	Evaluation-III
7	Project Management	4	4	
8	Sustainability in Engineering	6	2	
9	Course Project Reviews	12	20	Final Evaluation
10	Code of conduct	-	5	
	Total	**72**	**50**	

Head Dept. of IT
CBIT, Hyderabad

20ECC34 **DC CIRCUITS, SENSORS AND TRANSDUCERS**

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Concepts of Semiconductor Physics and Applied Physics.

Course Objectives:
1. Understand DC circuit theory for sensors and transducers.
2. Describe semiconductor device's principles and understand the characteristics of junction diode and transistors.
3. Understand working principles of Oscillators, Sensors, and Transducers.
4. Understand Interfacing of various modules of DAQ with myDAQ and myRIO

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Understand about the basics of lower power systems, DC circuits.
2. Use semiconductor devices in making circuits like rectifiers, filters, regulators, etc.
3. Design transistorized circuits of amplifiers and oscillators
4. Acquire the data from various sensors and transducers with the help of DAQ.
5. Analyze usage of sensors/transducer for the development of real-time applications.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	2	3	2	3	2	3	2	1	-	1
CO2	3	3	3	2	1	2	3	2	3	2	3	2	1	-	1
CO3	3	2	3	2	3	3	3	2	3	2	3	2	2	2	1
CO4	3	3	3	3	3	3	3	2	3	2	3	2	2	2	1
CO5	3	3	3	3	3	3	3	2	3	2	3	2	2	2	1

UNIT-I
DC Circuit theory: Basic DC theory, Voltage and Current relationship, Power in Electronics and its calculation, Types of Current - Direct Current (DC) and Alternating Current (AC), DC Voltage, Conventional Current Flow Vs. Electron Flow. Measurement of DC current and power in a circuit, Parallel and Series circuits, Batteries and alternative sources of energies.

UNIT-II
Introduction to semiconductor: Characteristics of P-N Junction diode, current equation. Characteristics of Zener Diode
Applications: Zener Diode as a voltage regulator, Half Wave Rectifier and Full Wave Rectifier
Introduction to Transistors: Classification, Bipolar Junction Transistors Configurations.

Head Dept. of IT
CBIT, Hyderabad

UNIT-III

Feedback Circuits: Principles of Negative Feedback Amplifiers, Advantages, Types, Topologies of negative feedback, Outline the Effect of negative feedback on Gain, Input Impedance and Output Impedance; Principle of Oscillator, Operation of LC Type- Hartley, Colpitts; RC phase shift Oscillator.

Op-Amps Circuits: Basic Principle, Ideal and practical Characteristics and Applications: Summer, Integrator, Differentiator.

UNIT-IV

Sensors: Definition, classification of sensors

Proximity Sensors: Eddy current proximity sensors and its Applications, Inductive proximity switch and its Applications

Velocity, motion, force and pressure sensors: Tacho generator, Optical encoders, Strain Gauge as force Sensor, Fluid pressure: Tactile sensors

Temperature and light sensors: Resistance Temperature detectors, Photo Diodes, Applications of Photo Diodes.

UNIT-V

Transducers: Definition, classification of Transducers

Mechanical Transducers: Displacement-to-Pressure, Seismic Displacement Transducers

Passive Electrical Transducers: LVDT, Resistor Moisture Transducer

Active Electrical Transducers: Hall Effect Transducer, Piezoelectric transducer

Data Acquisition methods: myDAQ, MyRIO-1900 Architecture, myDAQ Interfacing: Interfacing LED's, Seven segment display, temperature sensors, IR Sensors, Range Finder sensors, Motors, motor driver interfaces, Thermistors, Buzzers.

Text Books:

1. John Bird, Electrical Circuit Theory and Technology, Fifth Edition, 2014.
2. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuits Theory", Pearson Education, 9th edition, LPE, Reprinted, 2006.
3. D Patranabis, Sensors and Transducers, PHI 2nd Edition 2013.
4. DVS Murthy, Transducers and Instrumentation, PHI 2nd Edition 2013
5. Ed Doering, NI myRIO Project Essentials Guide, Feb.2016

Suggested Reading:

1. Arun K. Ghosh, Introduction to measurements and Instrumentation, PHI, 4th Edition 2012.
2. Anindya Nag, Subhas Chandra Mukhopadhyay, JurgenKosel ,Printed Flexible Sensors: Fabrication, Characterization and Implementation, Springer International Publishing, Year: 2019, ISBN: 978-3-030-13764-9,978-3-030-13765-6
3. User guide, NI myDAQ
4. User guide and specifications NI myRIO-1900

Head Dept. of IT
CBIT, Hyderabad

20ITC05 **DIGITAL LOGIC AND COMPUTER ARCHITECTURE**

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To familiarize with logic gates, combinational and Sequential logic circuits.
2. To provide understanding of Data representation.
3. To present the operation of the Central Processing Unit.
4. To facilitate with the techniques that computers use to communicate with input and output devices.
5. To introduce the concept of memory hierarchy and memory management.

Course Outcomes:

Upon completing this course, students will be able to:

1. Understand simplification of logic gates, fundamentals of combinational and sequential logic gates.
2. Design of registers, counters and representation of data using numbers.
3. Understand the architecture and functionality of central processing unit.
4. Discuss the technique s that computers use to communicate with I/O devices for data transfer.
5. Comprehend memory hierarchy, cache memory and virtual memory.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	1	-	-	-	1	-	-	1	2	-	3
CO2	2	1	1	-	1	-	-	-	-	-	-	1	1	-	3
CO3	2	2	1	-	-	-	-	-	-	-	2	2	-	-	3
CO4	2	1	-	-	-	-	-	-	-	-	-	2	-	-	3
CO5	2	2	1	-	-	-	1	-	1	-	2	2	1	-	3

UNIT-I

Digital Logic Circuits: Digital Computers, Logic Gates, Boolean Algebra, Map simplification, Product –of-sums Simplification, Don't –Care Conditions, Combinational Circuits, Half-Adder, Full–Adder, Flip-Flops: SR, D, JK, TFlip- Flops, Edge triggered Flip-Flops, Excitation Tables.

UNIT-II

Digital Components: Integrated circuits, Decoders, Encoders, Multiplexers
Registers: Register with Parallel load, Shift Register, Counters.
Data Representation: Data Types, Number Systems, Octal and Hexadecimal Numbers, Decimal Representation, Complements: (r-1)'s Complement, r's Complement, Subtraction of Unsigned Numbers, Fixed–Point Representation, Floating –Point Representation.

Head Dept. of IT
CBIT, Hyderabad

UNIT-III

Central Processing Unit: Computer Registers, General register Organization, Instruction Cycle, Instruction Formats: Three Address Instructions, Two-Address Instructions, One-Address Instructions, Zero-Address Instructions, RISC Instructions, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer(RISC): CISC Characteristics, RISC Characteristics, Multi core Processors and their Performance.

UNIT-IV

Input-Output Organization: Peripheral Devices: ASCII Alphanumeric Characters, Input-output Interface: I/O Bus and Interface Modules, Asynchronous Data Transfer: Strobe Control, Handshaking, Asynchronous Communication Interface, First-In-First-Out Buffer, Modes of Transfer: Interrupt-Initiated I/O, Priority Interrupt: Daisy Chaining Priority, Parallel Priority

Interrupt, Priority Encoder, Direct Memory Access(DMA): DMA Controller.

UNIT- V

Memory Organization: Memory Hierarchy, Main Memory: RAM and ROM Chips, Memory Address Map, Memory Connection to CPU, Auxiliary memory: Magnetic Disks, solid state drive and Linear Tape Open Technology, Associative Memory: Hardware Organization, Match Logic, Read and Write Operations, Cache Memory: Associative Mapping, Direct Mapping, Set-Associative Mapping, Virtual Memory: Address Space and Memory Space, Address Mapping using Pages, Associative Memory Page Table, Page Replacement.

Text Books:

1. M.MorrisMano,"ComputerSystemArchitecture",3^{rd}Edition,Pearson Education, 2016.
2. John L. Hennessy, David A. Patterson Morgan Kaufman, "Computer Architecture - A Quantitative Approach", 5^{th} edition,, Elsevier,2012
3. William Stallings, "Computer Organization and Architecture", 9^{th} edition, Pearson Education, 2013

Suggested Reading:

1. Stephen Brown, Zvonko Vranesic, "Fundamentals of Digital Logic with VHDL design", 2^{nd}Edition, McGrawHill, 2009.
2. ZVI Kohavi, "Switching and Finite Automata Theory", 2^{nd}Edition, Tata McGrawHill, 1995.
3. William Stallings, "Computer Organization and Architecture", 8^{th}Edition, PHI.
4. Carl Hamachar, Vranesic, Zaky,"ComputerOrganization",5^{th}Edition, McGraw Hill.

Web Resources:

1. https://nptel.ac.in/courses/117106114Week1%20Slides1.1Introduction.pdf
2. https://ece.gmu.edu/coursewebpages/ECE/ECE545/F10/viewgraphs/ ECE545_lecture1_digital_logic_review.ppt
3. http://www.nptelvideos.in/2012/11/computer-organization.html

Head Dept. of IT
CBIT, Hyderabad

20ITC06 **DISCRETE MATHEMATICS AND APPLICATIONS**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To introduce Propositional Logic, Proof strategy concepts and gain knowledge in Sets and Functions.
2. To acquire knowledge in Induction, Recursion and Number theory applications.
3. To gain knowledge in Counting, Permutations, Combinations and Solving recurrence relations.
4. To introduce basic concepts of graphs, digraphs and relations and their properties.
5. To familiarize with Algebraic Structures.

Course Outcomes:

Upon completing this course, students will be able to:

1. Symbolize the given sentence using propositional logic and apply the onto and one-to-one functions between the sets.
2. Understand the mathematical induction and apply the modular arithmetic for cryptography and congruence applications.
3. Apply permutations and combinations to handle different types of objects, understand Solving homogeneous and Non-homogeneous recurrence using generating functions.
4. Apply relations and graph concepts for basic problem solving.
5. Demonstrate Algebraic systems and their Properties.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	2	3	-	-	1	1	1	3	3	3
CO2	3	3	2	3	1	2	-	-	-	1	-	1	3	3	3
CO3	3	3	3	3	1	2	2	-	-	1	1	1	3	3	3
CO4	3	3	2	3	1	2	3	-	-	1	-	1	3	3	3
CO5	3	3	2	3	-	2	-	-	-	1	-	1	3	3	3

UNIT-I

The Foundations: Logic and Proofs: Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy

Basic Structures: Sets, Functions, Sequences, Sums, and Matrices: Sets, Set Operations, Functions, Sequences and Summations, Cardinality of Sets, Matrices

UNIT-II

Number Theory and Cryptography: Divisibility and Modular Arithmetic, Integer Representations and Algorithms, Primes and Greatest Common Divisors, Solving Congruences, Applications of Congruences, Cryptography.

Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms.

Head Dept. of IT
CBIT, Hyderabad

UNIT-III

Counting: The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients and Identities, Generalized Permutations and Combinations, Generating Permutations and Combinations.

Advanced Counting Techniques: Applications of Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion–Exclusion, Applications of Inclusion–Exclusion.

UNIT-IV

Relations: Relations and Their Properties, *n*-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.

UNIT-V

Algebraic Structures: Algebraic Systems: Examples and General Properties, Semi groups and Monoids.
Groups: Definitions and Examples, Subgroups, Homomorphisms and cyclic groups.

Text Books:

1. Kenneth H Rosen, "Discrete Mathematics and its applications", 8th Edition, McGraw Hill, 2019.
2. R.K. Bishit, H.S. Dhami, "Discrete Mathematics", Oxford University Press, 2015.

Suggested Reading:

1. J.P.Trembly, R.Manohar, "Discrete Mathematical Structure with Application to Computer Science", McGraw- Hill, 1997.
2. J. K. Sharma, "Discrete Mathematics", 2nd Edition, Macmillan, 2005.
3. Joel. Mott.AbrahamKandel, T.P.Baker, "Discrete Mathematics for Computer Scientist & Mathematicians", 2nd Edition, Macmillan Prentice Hall.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs37/
2. https://www.coursera.org/learn/discrete-mathematics

Head Dept. of IT
CBIT, Hyderabad

20ITC07 **JAVA PROGRAMMING AND ENTERPRISE FRAMEWORKS**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To familiarize with fundamentals of object-oriented programming paradigm.
2. To impart the knowledge of string handling, interfaces, packages and inner classes.
3. To acquaint with Exception handling mechanisms and Multithreading.
4. To gain knowledge on collection framework, stream classes.
5. To familiarize web application environment using Servlets and JSP

Course Outcomes:

Upon completing this course, students will be able to:

1. To understand fundamentals of object-oriented programming paradigm.
2. To apply knowledge of string handling, interfaces, packages and inner classes.
3. To implement Exception handling mechanisms and Multithreading.
4. To demonstrate knowledge on collection framework, stream classes.
5. To develop web applications using Servlets and JSP.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	-	-	-	-	-	-	1	-	-	-	-	-
CO2	-	2	1	1	-	-	-	-	-	-	-	-	2	-	-
CO3	-	1	1	1	-	-	-	-	-	-	3	-	2	3	2
CO4	1	2	1	1	-	-	-	-	-	-	3	1	2	-	2
CO5	1	2	1	2	3	-	-	1	3	-	3	1	3	3	2

UNIT-I

Introduction to Java: Objects, Classes, structure a java program, difference between jdk and jre, Java Primitive Types, Basic Operators, Conditional and Logical statements. Defining Classes: Adding Instance Fields and Methods, Constructors, Access Modifiers (Visibility Modes), Object Creation Examples, Method Overloading and Constructor Overloading, Use of static and final keywords, Objects as parameters, Difference between local variable and instance field, importance of Object class.

UNIT-II

Inheritance, Interfaces and Packages in Java: Defining super / sub classes, Abstract classes, Method overriding, Interfaces and new features in latest version. Packages: Defining, Creating and Accessing a Package, importing packages.

Arrays, Strings in Java: How to create and define arrays, Introduction to java.util.Array class, Difference between String &String Buffer classes, String Tokenizer class and Wrapper classes and conversion between Objects and primitives, Autoboxing and unboxing

Head Dept. of IT
CBIT, Hyderabad

Inner classes in Java: Types of inner classes, Creating static / non-static inner classes, Local and anonymous inner classes.

UNIT-III

Exception Handling in Java: What are exceptions, Error vs. Exception, usage of try, catch, throw throws and Finally clauses, writing your own exception classes, Difference between checked vs. unchecked Exceptions.
Generics: Need of Generics concept, Generic classes, bounded types, Generic methods and interfaces.
Multithreading in Java: The java Thread Model, How to create threads, Thread class in java, Thread priorities, Inter thread communication, Thread synchronization

UNIT-IV

Collections: Overview of Java Collection Framework, Collection Interfaces – Collection, Set, List, Map, Commonly used Collection classes – Array List, Linked List, Hash Set, Tree Set, Hash Map, Tree Map, legacy and class, Iteration over Collections – Iterator and List Iterator, Enumeration interfaces, differentiate Comparable and Comparator
File Handling: Stream classes, Reader and Writer classes, File and Directory class, How to read user input from keyboard. New Features in java 8 and 9.

UNIT-V

Java Servlets: Overview of Java Servlet API, Servlet Implementation, Servlet Configuration, Servlet Exceptions, Servlet Life cycle, Request and Response methods, Approaches to Session tracking, Servlet Context, Servlet Collaboration.
JSP Basics: Introduction to JSP, Directives, Scripting Elements, Standard Actions.
Databases: Connect servlet to MySQL, Connect JSP to MySQL.
Spring Boot 2.0: Introduction to Spring Boot, Spring Web MVC Application Flow in Spring Boot, Spring Boot Data JPA. **Hybernate:** Advantages of Hibernate compared to JDBC, ORM (Object Relational Mapping), Hibernate architecture, Connecting with Multiple Databases.

Text Books:

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, Tata McGraw Hill Publications, 2020.
2. Kathy Sierra, Bryan Basham, Bert Bates, "Head First Servlets and JSP", 2nd Edition, O'Reilly Media, Inc, 2008.
3. Cay S. Horstmann, Gary Cornell,"Core Java, Volume I— Fundamentals", 8th Edition, Prentice Hall, 2008.
4. Jens Boje, "Spring Boot 2: How To Get Started and Build a Microservice", 3rd Edition, CodeBoje Pubishers.
5. Christian Bauer, Gavin King, and Gary Gregory. "Java Persistence with Hibernate, 2nd Edition", Manning Publications, 2005.

Suggested Reading:

1. Sachin Malhotra, Saurabh Choudhary, "Programming in Java", Oxford University Press, 2nd Edition, 2014.
2. C.ThomasWu, "An Introduction to Object-Oriented Programming with Java", TataMcGraw-Hill, 4th Edition, 2010.

Web Resources:

1. https://www.cse.iitb.ac.in/~nlp-ai/javalect_august2004.html
2. https://nptel.ac.in/courses/106106147/2
3. https://ocw.mit.edu/courses/electrical-engineering-and-computerscience/6-092-introduction-to-programming-in-java-january-iap-2010/ lecture-notes/

With effect from the Academic Year 2021-22

Head Dept. of IT
CBIT, Hyderabad

20ITC08 **DATABASE MANAGEMENT SYSTEMS**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To introduce the fundamental concepts of a database system and its role in an organization
2. To acquire knowledge on Database design models, constraints and notations.
3. To familiarize with querying databases using SQL.
4. To acquaint with design and implementation issues of a database system.
5. To discuss the concepts of database security, concurrency and recoverability.

Course Outcomes:

Upon completing this course, students will be able to:

1. Understand the purpose of database systems and design any domain specific database using E-R model.
2. Design and implement a database using Relational data model, formulate Relational algebra expressions. Use SQL for efficient data retrieval.
3. Access databases from high level languages, define triggers and apply normalization.
4. Understand the concepts of database transactions, locking protocols and concurrency control
5. Efficiently organize and manage data using indexing, hashing, and recovery techniques.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	1	1	-	-	-	1	1	1	1	3	-	3
CO2	2	1	2	1	2	-	-	-	-	-	1	-	2	-	3
CO3	2	1	2	2	1	-	-	-	-	-	-	-	3	-	3
CO4	2	1	1	1	1	-	-	-	-	-	-	1	1	-	3
CO5	2	1	1	1	1	-	-	-	-	-	-	1	1	-	3

UNIT-I

Introduction: Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, Database Design, Database Engine, Database and Application Architecture, Database Users and Administrators and History of Database Systems.

Database Design Using the E-R Model: Overview of the Design Process, The Entity- Relationship Model, Complex Attributes, Mapping Cardinalities, Primary Key, Removing Redundant Attributes in Entity Sets, Reducing E-R Diagrams to Relational Schemas, Extended E-R Features and Entity-Relationship Design Issues,

UNIT-II

Introduction to the Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages and The Relational Algebra.

Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub queries, Modification of the Database.

Intermediate SQL: Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Index Definition in SQL and Authorization.

Head Dept. of IT
CBIT, Hyderabad

UNIT-III
Advanced SQL: Accessing SQL from a Programming Language, Functions and Procedures, Triggers, Recursive Queries, Advanced Aggregation Features.
Relational Database Design: Features of Good Relational Designs, Decomposition using Functional Dependencies, Normal Forms, Functional-Dependency Theory, Algorithms for Decomposition Using Functional Dependencies, More Normal Forms, Atomic Domains and First Normal Form, Database-Design Process.

UNIT-IV
Transactions: Transaction Concept, a Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity.
Concurrency Control: Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Timestamp-Based Protocols and Validation-Based Protocols.

UNIT-V
Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management and ARIES.
Indexing and Hashing: Basic Concepts, Ordered Indices, B+ -Tree Index Files, Hash Indices, Multiple-Key Access, Creation of Indices and Bitmap Indices.

Text Book:
1. Abraham Silberschatz, Henry F Korth, S. Sudarshan, "Database System Concepts", 7th Edition, McGraw-Hill International Edition, 2020.

Suggested Reading:
1. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database System", 6th Edition, Addison-Wesley, 2011.
2. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", 3rd Edition, McGraw-Hill International Edition, 2014.
3. Rick F Vander Lans, "Introduction to SQL", 4th Edition, Pearson Education, 2007.
4. Benjamin Rosenzweig, Elena Silvestrova, "Oracle PL/SQL by Example", 5th Edition, Pearson Education, 2015.

Web Resources:
1. http://db-book.com/
2. https://www.tutorialspoint.com/dbms/
3. https://www.w3schools.in/dbms/
4. http://www.oracle-dba-online.com/sql/oracle_sql_tutorial.htm.
5. http://www.tutorialspoint.com/plsq

Head Dept. of IT
CBIT, Hyderabad

20EGM01 **INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES**

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	-
Credits	No Credits

Course Objectives

1. History of Indian Constitution and how it reflects the social, political and economic perspectives of the Indian society.
2. Growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. Various Organs of Governance and Local Administration.

Course Outcomes

Upon completing this course, students will be able to:

1. Understand the making of the Indian Constitution and its features.
2. Identify the difference among Right To equality, Right To freedom and Right to Liberty.
3. Analyze the structuring of the Indian Union and differentiate the powers between Union and States.
4. Distinguish between the functioning of Lok Sabha and Rajya Sabha while appreciating the importance of Judiciary.
5. Differentiate between the functions underlying Municipalities, Panchayats and Co-operative Societies.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-		-	-	-
CO2	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
CO5	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-

UNIT-I

Constitution of India: Constitutional history-Govt of India Act 1909, 1919 and 1935, Constitution making and salient features. Directive Principles of State Policy - Its importance and implementation.

UNIT-II

Scheme of the Fundamental Rights & Duties: The Fundamental Rights **-** To Equality, to certain Freedom under Article 19, to Life and Personal Liberty Under Article 21. Fundamental Duties - the legal status.

UNIT-III

Union Government and its Administration - Structure of the Indian Union: Federalism, distribution of legislative and financial powers between the Union and the States.
Parliamentary form of government in India: Executive-President's role, power and position.

UNIT-IV

Legislature and Judiciary: Central Legislature-Powers and Functions of Lok Sabha and Rajya Sabha.
Judiciary: Supreme Court-Functions, Judicial Review and Judicial Activism

Head Dept. of IT
CBIT, Hyderabad

UNIT-V

Local Self Government - District's Administration Head (Collector): Role and Importance.
Municipalities: Introduction, Mayor and Role of Elected Representative, CEO of Municipal Corporation.
Panchayati Raj: Introduction, Zilla Panchayat, Elected Officials and their roles, CEO Zilla Panchayat: Position and Role. Block level: Organizational Hierarchy (Different departments). Village level: Role of Elected and Officials.

Text Books:

1. **Indian Government & Politics**, Ed Prof V RavindraSastry, Telugu Academy, 2nd edition, 2018.
2. **Indian Constitution at Work,** NCERT, First edition 2006, Reprinted- January 2020.

Suggested Reading:

1. **The Constitution of India**, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, **Framing of Indian Constitution**, 1st Edition, 2015.
3. M. P. Jain, **Indian Constitution Law**, 7th Edn., Lexis Nexis,2014.
4. D.D. Basu**, Introduction to the Constitution of India**, Lexis Nexis, 2015.

Web Resources:

1. http://www.nptel.ac.in/courses/103107084/Script.pdf

Head Dept. of IT
CBIT, Hyderabad

20EGM02 **INDIAN TRADITIONAL KNOWELDGE**

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	No Credits

Course Objectives:
1. To get a knowledge in Indian Culture
2. To Know Indian Languages and Literature and the fine arts in India
3. To explore the Science and Scientists of Medieval and Modern India

Course Outcomes:
Upon completing this course, students will be able to:
1. Understand philosophy of Indian culture
2. Distinguish the Indian languages and literature
3. Learn the philosophy of ancient, medieval and modern India
4. Acquire the information about the fine arts in India
5. Know the contribution of scientists of different eras.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	--	-	1	-	-	3	-	-	-	-	-	-	-	-	-
CO2	--	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	1	-	2	-	-	-	-	-	2	-	-	-

UNIT-I

Culture and Civilization: Culture, civilization and heritage, general characteristics of culture, importance of culture in human literature, Cultural diversity, Aesthetics, Women seers, Indus culture, Indian cuisine, Martial arts

UNIT-II

Education system: Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

UNIT-III

Linguistic Wealth: Indian Languages and Literature: the role of Sanskrit, Paleography, Significance of scriptures to current society, Indian semantics and lexicography, Bhakti literature, Darsanas

UNIT-IV

Art, Technology& Engineering: Sculpture, Painting and Handicrafts, Indian Music, Dance Drama and Theatre, Introduction to Mayamatam, Iron and steel technology, Use of metals in medicinal preparations

Head Dept. of IT
CBIT, Hyderabad

UNIT-V

Science and Logic: Helio-centic system, Sulbasutras, Katapayadi, Hindu calendar, 6 pramanas in Indian logic, Scientific method applied to therapeutics, Fallacies, Tarka – Induction &Deduction, Ayurvedic biology, Definition of health

Essential Readings:

1. Kapil Kapoor, **Text and Interpretation: The Indian Tradition,** ISBN: 81246033375, 2005
2. Samskrita Bharati, **Science in Samskrit**, ISBN-13: 978-8187276333, 2007
3. Satya Prakash, **Founders of sciences in Ancient Indi**a, Govindram Hasanand, ISBN-10: 8170770009, 1989
4. Brajendranath Seal, **The Positive Sciences of the Ancient Hindus**, Motilal Banarasidass, ISBN-10: 8120809254, 1915

Suggested Reading:

1. Swami Vivekananda, *Caste, Culture and Socialism,* Advaita Ashrama, Kolkata ISBN-9788175050280
2. Swami Lokeswarananda, *Religion and Culture*, Advaita Ashrama, Kolkata ISBN-9788185843384
3. Kapil Kapoor,*Language, Linguistics and Literature: The Indian Perspective*, ISBN-10: 8171880649, 1994.
4. Karan Singh, *A Treasury of Indian Wisdom: An Anthology of Spiritual Learn*,ISBN: 978-0143426158, 2016
5. Swami Vivekananda, *The East and the West*, Advaita Ashrama, Kolkata 9788185301860
6. Srivastava R.N., *Studies in Languages and Linguistics*, Kalinga Publications ISBN-13: 978-8185163475
7. SubhashKak and T.R.N. Rao, Computation in Ancient India, Mount Meru Publishing ISBN-1988207126
8. R.N Misra, *Outlines of Indian Arts Architecture, Painting, Sculpture, Dance and Drama,* IIAS, Shimla & Aryan Books International, ISBN 8173055149
9. S. Narain, *Examinations in ancient India*, Arya Book Depot, 1993
10. M. Hiriyanna, Essentials of Indian Philosophy, MotilalBanarsidass Publishers, ISBN-13: 978-8120810990, 2014
11. Ravi Prakash Arya, Engineering and Technology in Ancient India, Indian Foundation for Vedic Science, ISBN-10: 1947593072020

SWAYAM/Nptel:

1. History of Indian Science and Technology - https://onlinecourses.swayam2.ac.in/arp20_ap35/preview
2. Introduction to Ancient Indian Technology – https://onlinecourses.nptel.ac.in/noc19_ae07/preview
3. Indian Culture & Heritage - https://onlinecourses.swayam2.ac.in/nos21_sc11/preview
4. Language and Society - https://nptel.ac.in/courses/109/106/109106091/
5. Science, Technology & Society - https://nptel.ac.in/courses/109/103/109103024/
6. Introduction to Indian Philosophy - https://nptel.ac.in/courses/109/106/109106059/
7. Introduction to Indian Art - An appreciation - https://onlinecourses.nptel.ac.in/noc20_hs09/preview

Head Dept. of IT
CBIT, Hyderabad

20ITC09 **Java Programming & Enterprise Frameworks Lab**

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To gain the fundamental programming knowledge of OOPs.
2. To introduce Exception handing mechanisms in application development.
3. To provide the knowledge of generics and Collections Framework.
4. To Explore the java.io stream, reader and Writer classes
5. To provide the knowledge of Hibernate basics and HQL, Spring boot 2.0

Course Outcomes:

Upon completing this course, students will be able to:

1. To gain the fundamental programming knowledge of OOPs.
2. To use exception handing mechanisms in application development.
3. To apply knowledge of generics and Collections Framework in application development
4. To use the stream, reader and writer classes in applications
5. To build applications using Hibernate and MVC Spring Boot 2.0

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	1	-	-	-	-	-	-	1	-	-	-	-	-
CO2	-	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	1	1	-	-	-	-	-	-	3	-	2	-	2
CO4	-	2	1	1	-	-	-	-	-	-	3	-	-	3	2
CO5	-	2	1	2	3	-	-	-	-	-	3	3	3	3	2

LIST OF PROGRAMS

1. Program(s) to illustrate the concepts of constructor overloading, method overloading, static and final keywords usage.
2. Program(s) to illustrate the concepts of Inheritance, method overriding, super keyword usage, and Dynamic polymorphism.
3. Program(s) to illustrate concept of abstract class & interfaces.
4. Program(s) to demonstrate String handling with String, String Buffer and String Tokenizer classes.
5. Program(s) to demonstrate various types of inner classes, Packages creation and usage.
6. Program(s) to demonstrate concept of exception handling and user defined exceptions.
7. Program(s) to demonstrate concept of Multithreading and Thread synchronization.
8. Program(s) to illustrate the usage of I/O streams.
9. Write program(s) to illustrate List, Set, and Map Implemented classes.

Head Dept. of IT
CBIT, Hyderabad

10. Design web application using Servlets/Session management Techniques, JSP and JDBC.
11. Write program to illustrate the HQL from clause, Select clause, Aggregate functions, Avg(), Min(), where clause, group by clause and order by clause.
12. Write a program to demonstrate Spring MVC with Spring Boot.

Case Study I: Write a java program to simulate a simple wallet parking system.

Case Study II: Write a program in Java that will play the popular game of Battleship either against the computer or against another player on a different computer, running a different program.

Case Study III: Develop a web application for attendance management system using servlets and JSP.

Text Books:

1. Herbert Schildt, "Java: The Complete Reference", 8th Edition, Tata McGraw Hill Publications, 2011.
2. Kathy Sierra, Bryan Basham, Bert Bates, Head First Servlets and JSP, 2nd Edition, O'Reilly Media, Inc, 2008.
3. Cay S. Horstman, Gary Cornell: "Core Java, Volume I— Fundamentals", 8th Edition, Prentice Hall, 2008.

Suggested Reading:

1. Sachin Malhotra, Saurabh Chaudhary : "Programming in Java", Oxford UniversityPress,2nd Edition,2014.
2. C.Thomas Wu, "An Introduction to object-Oriented Programming with Java", Tata McGraw-Hill publishing company Ltd.,4th Edition, 2010.

Web Resources:

1. https://www.cse.iitb.ac.in/~nlp-ai/javalect_august2004.html
2. https://nptel.ac.in/courses/106106147/2
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-092-introduction-to-programming-in-java-january-iap-2010/ lecture-notes/

Head Dept. of IT
CBIT, Hyderabad

20ITC10 **DBMS LAB**

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To introduce the basic commands of SQL.
2. To familiarize with query processing.
3. To impart knowledge on functions, procedures and triggers.
4. To introduce exception handling in PL/SQL.
5. To familiarize with design and development of database applications

Course Outcomes:

Upon completing this course, students will be able to:

1. Design and implement database schemas by enforcing integrity constraints.
2. Use SQL for database administration, data manipulation and retrieval.
3. Develop PL/SQL programs and use cursors for the databases.
4. Design triggers for database validation.
5. Handle Exceptions in PL/SQL programs.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	2	-	-	-	3	1	1	-	2	-	2
CO2	1	1	-	-	1	-	-	-	-	-	-	-	1	-	2
CO3	2	1	2	2	1	-	-	-	1	1	-	-	2	-	2
CO4	2	2	2	2	1	-	-	-	1	1	-	-	2	-	2
CO5	2	2	2	2	1	-	-	-	1	1	-	-	2	-	2

LIST OF PROGRAMS

1. Creation of database (Exercising commands like DDL and DML) (Note: use constraints while creating tables).
2. Exercising Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING clause and Creation and dropping of Views.
3. Exercising Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION INTERSECT constructs.
4. Exercising all types of Joins.
5. Demonstration of PL/SQL Blocks and Cursors.
6. Demonstration of Procedures and Functions.
7. Usage of Triggers (BEFORE and AFTER Triggers, Row and Statement level Triggers and INSTEAD OF Triggers).

Head Dept. of IT
CBIT, Hyderabad

8. Demonstrate Exception Handling in PL/SQL procedures.
9. Creation of Forms and Generation of SQL reports.
10. Creation of full-fledged database application spreading over to 3 sessions.

Text Books:

1. Rick F Vander Lans, "Introduction to SQL", 4th Edition, Pearson Education, 2007.
2. Benjamin Rosenzweig, Elena Silvestrova, "Oracle PL/SQL by Example", 5th Edition, Pearson Education, 2015.
3. Alan Beaulieu, "Learning SQL", 2ndEdition, O'Reilly, 2009.

Suggested Reading:

1. Albert Lulushi, "Oracle Forms Developer's Handbook", Pearson Education, 2006.

Web Resources:

1. http://www.oracle-dba-online.com/sql/oracle_sql_tutorial.htm
2. https://www.javatpoint.com/pl-sql-tutorial

Head Dept. of IT
CBIT, Hyderabad

20ITC11 **IT WORKSHOP**

Instruction	2 Hours per week
CIE	50 Marks
Credits	1

Course Objectives:

1. To introduce the basic components of a computer, assembling and disassembling of a PC.
2. To learn the Virtual machine setup, Installation procedure of Operating Systems, Linux commands.
3. To facilitate knowledge on Internet Services, Networking commands, Antivirus tools.
4. To impart knowledge on productivity tools.
5. To acquaint cloud based productivity collaboration tools, typesetting system.

Course Outcomes:

Upon completing this course, students will be able to:

1. Identify the basic components of a computer, gain knowledge on assembling and disassembling of a PC.
2. Implement with Virtual machine setup, Install operating systems and execute Linux commands.
3. Inspect internet connectivity issues and secure a computer from cyber threats.
4. Outline productivity tools and their usage.
5. Make use of cloud based productivity collaboration tools, typesetting system.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	1	2	1	-	-	1	1	2	3	3	2
CO2	2	1	2	1	1	2	1	-	1	1	1	2	3	3	2
CO3	2	2	2	1	1	2	1	3	3	1	1	2	2	3	3
CO4	2	2	2	2	3	-	1	-	-	3	2	2	1	-	3
CO5	2	2	2	2	3	-	1	-	3	3	2	2	1	-	3

List of Programs

1. **PC Hardware:** Identification of the peripherals of a computer, block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O Devices, A practice on disassembling the components of a PC and assembling them to back to working condition, Introduction to Memory and Storage Devices, I/O Port, Device Drivers, Assemblers, Compilers, Interpreters, Linkers, Loaders.

2. **Operating System:** Setting up and configuring a new Virtual Machine/ Setting up and configuring an existing Virtual Machine,Exporting and packaging an existing Virtual Machine into a portable format, Installing an Operating System such as Linux on Computer hardware.

3. **Linux Operating System commands:** ls, mkdir, cd, touch, chmod, rm, mv, bc, finger, who, whoami, ps, du, df, echo, cat, tac, rev, more, less, head, tail, nl, cut, paste, wc, sort, uniq, cp, cmp, diff, tr, ln, grep, fgrep, egrep, sed, awk, find, xargs, tee, tar, compress, uncompress, split, uuencode, uudecode, gzip, gunzip, read, expr, test, ping, ssh.
4. **Internet Services:** Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/plugins, Antivirus installation, configuring a firewall, blocking pop-ups, Google search techniques (text based, voice based), alexa website traffic statistics, Email creation and usage, google hangout/skype/gotomeeting video conferencing, archive.org for accessing archived resources on the web, Creating a Digital Profile on LinkedIn, Twitter, Github.

Head Dept. of IT
CBIT, Hyderabad

5. **Networking Commands:** ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget,route.

6. **Productivity Tools:** archival and compression tools**,** scanning and image editing tools**,** photography with digital camera and photo editing tools**,** OCR and text extraction**,** audio players, recording using Mic, editing, podcast preparation**,** video players, recording using webcam/camcorder, editing**,** podcast, screencast, vodcast, webcasting.

7. **Google docs:** Document creation and editing text documents in your web browser.

8. **Google Slides**: Create pitch decks, project presentations, training modules.

9. **Google Sheets:** Handle task lists, create project plans, analyze data with charts and filters.

10. **Google Forms:** Manage event registrations, create quizzes, analyze responses.

11. **Google Calendar:** Keep track of important events, sharing one's schedule, and create multiple calendars.

12. **Latex:** Introduction, Latex basics, sections and chapters, table of contents, cross referencing sections, equations, formatting.

Text Books:

1. Peter Norton, “Introduction to Computers”, McGraw Hill Education, 7^{th} edition, 2017.
2. K.L. James, “Computer Hardware, Installation, Interfacing, Troubleshooting and Maintenance”, PHI Learning, 2013.

Suggested Reading:

1. Scott Mueller’s, “Upgrading and Repairing PCs”, 20^{th} Edition, Pearson Education, 2012.
2. M V Narayana, G Praveen Babu, “Basics Concepts of Information Technology Workshop”, BS Publications, 2010.

Web Resources:

1. VMware, https://www.vmware.com/pdf/VMwarePlayerManual10.pdf
2. Thegeekstuff,https://www.thegeekstuff.com/2009/07/linux-ls-command-examples
3. Podcast, https://en.wikipedia.org/wiki/Podcast
4. Cloud computing, productivity and collaboration tools, software and products offered by Google, https://en.wikipedia.org/wiki/G_Suite
5. G Suite Learning Center ,https://gsuite.google.com/learning-center/products/#!/
6. Overleaf, https://www.overleaf.com/learn/latex/Main_Page

Head Dept. of IT
CBIT, Hyderabad

20ITC12 **Mini Projects –I**

Instruction	2 Hours per week
CIE	50 Marks
Credits	1

Course Objectives:
1. To enable students learning by doing.
2. To develop capability to analyse and solve real world problems.
3. To inculcate innovative ideas of the students.
4. To impart team building and management skills among students.
5. To instill writing and presentation skills for completing the project.

Course Outcomes:
Upon completing this course, students will be able to:
1. Interpret Literature with the purpose of formulating a project proposal.
2. Plan, Analyse, Design and implement a project.
3. Find the solution of identified problem with the help of modern Technology and give priority to real time scenarios.
4. Plan to work as a team and to focus on getting a working project done and submit a report within a stipulated period of time.
5. Prepare and submit the Report and deliver presentation before the departmental Committee.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	3	2	1	2	3	3	2	3	3
CO2	3	3	3	3	3	3	3	2	1	2	3	3	3	3	3
CO3	3	3	3	3	3	3	3	2	-	2	3	3	3	3	3
CO4	2	2	2	3	3	3	3	2	3	3	2	3	2	3	3
CO5	1	2	1	2	3	3	-	-	2	3	-	-	-	3	-

The Students are required to choose a topic for mini project related to the courses of the current semester or previous semester. The student has to implement and present the project as per the given schedule. During the implementation of the project, Personnel Software Process (PSP) has to be followed. Report of the project work has to be submitted for evaluation.

Schedule

S No	Description	Duration
1.	Problem Identification / Selection	2 weeks
2.	Preparation of Abstract	1 week
3.	Design, Implementation and Testing of the Project	7 weeks
4.	Documentation and Project Presentation	4 weeks

Head Dept. of IT
CBIT, Hyderabad

Guidelines for the Award of marks

S No	Description	Max. Marks
1.	Weekly Assessment	20
2.	PPT Preparation	5
3.	Presentation	10
4.	Question and Answers	5
5.	Report Preparation	10

Final Mini Project demonstration and PPT presentation is to be evaluated for the entire class together by all the faculty handling Mini Project for that class.

Head Dept. of IT
CBIT, Hyderabad

20ITI01

MOOCs/Training/Internship

Instruction/Demonstration/Training	3-4 Weeks/90 Hours
Duration of Semester End Presentation	--
Semester End Evaluation	60 Marks
Mid Term Evaluation	40 Marks
Credits	2

Prerequisite: Knowledge of basic Sciences

MOOCs/Training/Internship **Objectives:**
This MOOCs/Training/Internship aims to:

1.
2.
3.

MOOCs/Training/Internship Outcomes:
Upon completion of this MOOCs/Training/Internship, students will be able to:

1.
2.
3
4.
5.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2															
CO3															
CO4															
CO5															

Head Dept. of IT
CBIT, Hyderabad

20MTC12 **PROBABILITY AND QUEUEING THEORY**

Instruction	3 L+1T Hours per week
Duration of Semester End Examination	4 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives:

1. Able to learn and Analyzing data in Linear and Non-Linear form.
2. Able to fit the hypothetical data using probability distribution.
3. Student able to interpretate the continuous probability function
4. Understand the data using the testing of Hypothesis.
5. Able to learn the Queueing model's

Course Outcomes:

On successful completion of this course the students shall be able to

1. Apply the principle of Least Squares approximating for estimating the value
2. Choose the basic probability model's for fitting the Random phenomenon.
3. Analyze the probability function using statistical averages
4. Distinguishing the data using different methods of hypothesis testing.
5. Analyze the Queue model for the probabilistic nature.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	-	-	-	-	-	-	-	1	1	2	-
CO2	2	2	2	-	-	-	-	-	-	-	-	1	1	-	-
CO3	2	2	1	-	-	-	-	-	-	-	-	1	1	-	1
CO4	2	2	1	-	-	-	-	-	-	-	-	1	1	2	2
CO5	2	2	1	-	-	-	-	-	-	-	-	1	1	-	1

UNIT-I: Curve Fitting

Measures of Central Tendency, Measures of Dispersion, Moments (Moments about the mean and moments about a point). Skewness, Karl Pearson's coefficient of skewness and Bowley's coefficient of skewness for frequency distribution, Kurtosis. Correlation, coefficient of correlation, limits of correlation coefficient. Linear Regression, Regression coefficients, Properties of Regression Coefficients. Curve fitting by the Method of Least Squares, Fitting of Straight lines, Second degree parabola and Growth curve ($y = ae^{bx},\ y = ax^b andy = ab^x$).

UNIT-II: Discrete Probability Distribution

Basic Probability, Conditional Probability, Baye's theorem. Random variable, discrete random variable, Probability Mass Function, continuous random variable, probability density function. Mathematical expectation, properties of Expectation, properties of variance and co-variance. Poisson distribution, MGF and Cumulates of the Poisson distribution, Recurrence formula for the probabilities of Poisson distribution (Fitting of Poisson distribution).

UNIT-III: Continuous Probability Distributions

Normal distribution, Characteristics of normal distribution and Normal probability Curve, MGF and CGF of Normal distribution, Areas under normal curve. Uniform distribution, moment generating function, mean and variance of uniform distribution. Exponential distribution, MGF, CGF, Mean and Variance of Exponential distribution.

Head Dept. of IT
CBIT, Hyderabad

UNIT-IV: Large and Small Sample Tests

Parameter and Statistic, Tests of significance, tests of significance for large samples. Tests of significance for single proportion, and difference of proportions. Tests of significance for single mean and difference of means. Small sample test, t-test for single mean and differences of Means. F-test for equality of two population variances.

UNIT-V: Queueing Theory

Introduction-Queueing system-The arrival pattern-The service pattern-The queue discipline, Symbolic Representation of a Queueing Model –Characteristics of Infinite Capacity, Single server Poisson Queue Model Queueing problem-Pure Birth and Death Process-Probability Distribution of Departures(pure death process)-Basic queueing Models-Measures of the (M/M/1):$(\infty/FIFO)\ model$-Characteristic of Finite Capacity,Single Server Poisson Queue Model III (M/M/1):$(N/FCFS)$ Model.

Text Books:

1. S.C.Gupta, V.K.Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.
2. T Veerarajan, Probability, Statistics and Random Processes, 2nd Edition, Tata McGraw-Hill

Suggested Reading:

1. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, 3rd Ed., Wiley, 1968.
2. Sheldon Ross, "A First Course in Probability", 9th Edition, Pearson publications, 2014.

Head Dept. of IT
CBIT, Hyderabad

20ITC13 **SOFTWARE ENGINEERING**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. Describe the various software life cycle models.
2. Explain the concepts of Agile software development concepts.
3. Define the basic structural modelling concepts in UML.
4. Enable the students with UML notations.
5. Acquaint the students with Risk management and Product metrics.

Course Outcomes:

Upon completing this course, students will be able to:

1. Identify the minimum requirements for the development of application.
2. Build a system, component, or process to meet desired needs of a customer.
3. Involve in analysis and design of UML models for various case studies.
4. Acquire thorough knowledge of standard UML notations.
5. Know the risks, formulate and implement software projects.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	1	-	-	-	1	-	-	1	1	-	-
CO2	2	1	1	-	1	-	-	-	-	-	-	1	-	2	-
CO3	1	1	1	-	-	-	-	-	-	-	2	1	1	-	2
CO4	2	1	-	-	-	-	-	-	-	-	-	2	1	-	-
CO5	2	1	1	-	-	-	1	-	1	-	2	1	-	2	2

UNIT-I

Software and Software Engineering: The Nature of Software, Software Engineering. The Software Process, Software Engineering Practice.

A Generic view of Process : Software Engineering -A Layered Technology, A Process frame work, Process Models-Waterfall model, spiral model , The Unified Process, Product and Process, Process Assessment and Improvement, The CMMI ,Introduction to Agile development-Extreme programming.

Understanding Requirements: Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

Requirements Modelling: Requirements Analysis, Scenario-Based Modelling, Problem Analysis, Software Requirement and specifications.

UNIT-II

UML Introduction: Why we Model, Introducing the UML, Elements of UML-Things Relationships and Diagrams.

Basic Behavioural Modelling: Interactions, Use Cases, Use Case Diagrams, Interaction diagrams-Sequence diagrams-components of Sequence diagrams, collaboration diagrams-Components of Collaboration diagrams, Activity

Head Dept. of IT
CBIT, Hyderabad

diagrams-components of activity diagrams, swim lane diagrams, Case studies on Use Case diagrams, Interaction diagrams.

Advanced Behavioural Modelling: State Chart Diagrams-components of state chart diagrams, Case studies on State chart diagrams.

UNIT-III

Basic Structural Modelling: Classes, Relationships, Diagrams, Class Diagrams. **Advanced Structural Modelling**: Advanced Classes, Advanced Relationships, Interfaces, Components, Case studies on class diagrams.

Quality Concepts: Software Quality, Achieving Software Quality. **Software Quality Assurance:** Background Issues, Elements of Software Quality Assurance, SQA Tasks, The ISO 9000 Quality Standards.

UNIT-IV

Software Testing Strategies: A Strategic Approach to Software Testing, Strategic Issues, Validation Testing, System Testing. Testing Tools–Rational functional tester, Selenium software testing tool.

Testing Conventional Applications: Software Testing Fundamentals, White-Box Testing, Basis Path Testing, Black–Box Testing, Alpha testing, Beta testing.

UNIT-V

Product Metrics: A Framework for Product Metrics, Size Metrics like LOC, Function points,

Risk Management: Software Risks, Reactive versus Proactive Risk Strategies, Risk Mitigation, Monitoring, and Management, The RMMM Plan.

Text Books:

1. Roger S.Pressman, "Software Engineering: A Practitioners Approach", 7th edition, McGrawHill, 2017.
2. Grady Booch, James Rumbaugh, Ivor Jacobson, "The Unified Modelling Language-User Guide (Covering UML 2.0)", Third Edition, Pearson Education, India, 2017.
3. Pankaj Jalote "An Integrated Approach to Software Engineering ", 3rdedition, Narosa Publishing house, 2008.

Suggested Reading:

1. Martin Fowler, Kendall Scott , "UML Distilled: A Brief Guide to the Standard Object Modelling
2. Language" Addison Wesley, 4th Edition, 2011.
3. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, "Fundamentals of Software Engineering", PHI, 2nd edition.
4. James F.Peters, WitoldPedrycz, "Software Engineering-An engineering Approach".

Web Resources:

1. SEweb - Software Engineering Education Home Page: http://tuvalu.cs.flinders.edu.au/seweb/se-ed/
2. IBM Rational http://www-306.ibm.com/software/rational/uml/
3. Practical UML - A Hands-On Introduction for Developers http://www.togethersoft.com/services/practical_guides/umlonlinecourse/

Head Dept. of IT
CBIT, Hyderabad

20ITC14 **AUTOMATA THEORY AND COMPILER DESIGN**

Instruction	3 L+1THours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives:

1. To study abstract computing models: Finite Automata, Pushdown Automata and Turning Machines.
2. To learn about various grammars and recognizers for formal languages.
3. To familiarize with decidability and undecidability of computational problems.
4. To acquaint with phases of compiler and parsing techniques.
5. To impart knowledge on intermediate code generation and code optimization.

Course Outcomes:

Upon completing this course, students will be able to:

1. Design deterministic, nondeterministic finite automata and regular expressions.
2. Construct context-free grammars for certain languages, test closure properties, decision properties of CFL‘s, design PDAs and TMs.
3. Identify recursively enumerable languages, undecidable problems. Understand compiler phases and build top-down, bottom-up parsers.
4. Infer syntax directed translation schemes for the CFGs and develop intermediate code for annotated parse trees.
5. Understand runtime environments, translate intermediate code into target code and apply code optimization.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	-	2	-	-	-	-	-	-	-	-	-	3
CO2	2	1	1	-	2	-	-	-	-	-	-	-	-	-	2
CO3	1	1	-	1	1	-	-	-	-	-	-	-	2	-	3
CO4	1	1	-	1	1	-	-	-	-	-	-	-	2	-	2
CO5	1	1	-	-	1	-	-	-	-	-	-	-	2	-	3

UNIT-I

Introduction to Finite Automata, the Central Concepts of Automata Theory: Alphabets, Strings and Languages. **Deterministic Finite Automata:** Definition, Notations, Extending the Transition Function, The Language of a DFA, **Nondeterministic Finite Automata:** Definition, The Extended Transition Function, The Language of an NFA, Equivalence of NFA and DFA, Finite Automata with Epsilon-Transitions: €-closure, Extended Transitions and Languages for €- NFA ‘s, Eliminating €-transitions.

Regular Expression and languages: Definition, Converting DFA ‘s to Regular Expressions, Converting Regular Expressions to €-NFA, Algebraic Laws for Regular Expressions. The pumping lemma for Regular Languages, Closure Properties of Regular Languages, Decision Properties of Regular Languages, Minimization of DFA’s.

UNIT-II

Context Free Grammars and Languages: Definition of Context Free Grammars, Leftmost and Rightmost Derivation, The language of a Grammar, Construction of Parse Trees, Ambiguous Grammars, Inherent Ambiguity.

Head Dept. of IT
CBIT, Hyderabad

Normal Forms for CFG's: Definition of CNF, GNF, Pumping Lemma for CFL 's: Applications of Pumping Lemma for CFL 's, Closure Properties of CFL 's, Decision Properties of CFL 's.

Pushdown Automata: Definition of pushdown automaton, The Language of a PDA: Acceptance by Final State, Acceptance by Empty Stack, conversion from CFG to PDA 's, Deterministic Pushdown Automata: Definition.

Introduction to Turing Machines: Definition, Instantaneous Description, The Language of a TM, Extensions to the Basic Turing machine.

UNIT-III

Undecidability: The Diagonalization Language, Recursive Languages, Compliments of Recursive and RE languages, The Universal Language, Undecidable problems about Turing Machines: Reductions, TM's That Accept The Empty Language, Rice's Theorem and Properties of RE languages, Post's Correspondence Problem: Definition of PCP, The Modified PCP.

Introduction to Compilers: Translation process, Major data structures, Boot strapping and porting. **Lexical analysis:** The role of Lexical Analyzer, Input Buffering. **Syntax Analysis:** Top-Down parsing, Bottom-Up parsing, LR Parsing.

UNIT-IV

Syntax Directed Translation: Syntax Directed Definitions, Evaluation Orders for SDDs, Applications of Syntax Directed Translation.

Intermediate code generation: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Translation of Expressions, Type Checking, Control Flow

UNIT- V

Runtime Environments: Storage Organization, Stack Allocation of Space, Access to Non local Data on the Stack, Heap Management.

Code Generation: Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Peephole Optimization, Register Allocation and Assignment.

Text Books:

1. John E. Hopcroft, Rajeev Motwani, Jeffery D Ullman, "Introduction to Automata Theory Languages and Computation", 3rd Edition, Pearson Education, 2007
2. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman, ―Compilers: Principles, Techniques &Tools‖, 2nd Edition, Pearson Education, 2014.
3. Kenneth C Louden, ―Compiler Construction: Principles and Practice‖, Cengage Learning

Suggested Reading:

1. John C Martin, "Introduction to Language and Theory of Computation", 3rd Edition, TMH, 2003.
2. Mishra K., Chandra sekaran N," Theory of Computer Science (Automata, Languages and Computation)", 3rd Edition, Prentice Hall of India 2008.
3. Keith D Cooper, Linda Torczon, "Engineering a Compiler", 2nd Edition, Morgan Kaufman, 2012.
4. Dick Grune, Kees van Reeuwijk, Henri E. Bal, Ceriel J.H. Jacobs, Koen Langendoen, "Modern Compiler Design", 2nd Edition, Springer, 2012.

Web Resources:

1. http://nptel.ac.in/courses/106106049/
2. http://online.stanford.edu/course/automata-theory
3. http://nptel.ac.in/courses/106108113
4. http://nptel.ac.in/courses/106108052

Head Dept. of IT
CBIT, Hyderabad

20ITC15 **DESIGN AND ANALYSIS OF ALGORITHMS**

Instruction	3 Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To analyse the performance of various algorithms.
2. To illustrate different paradigms of problem solving.
3. To learn about various algorithm design techniques and illustrates them using a number of well-known problems and applications.
4. To familiarize graph traversal and search techniques.
5. To discuss NP hard and NP complete problems and their applications.

Course Outcomes:

Upon completing this course, students will be able to:

1. Analyze best, average and worst case complexities of algorithms and choose appropriate data structure for designing algorithm.
2. Develop solutions using Divide and Conquer, Greedy techniques.
3. Design algorithms using dynamic programming approach, apply traversal and search techniques.
4. Apply backtracking, branch and bound techniques to solve problems.
5. Identify P, NP, NP-Complete and NP-Hard classes to which an algorithm belongs and design a feasible solution.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	-	-	-	-	-	-	2	2	3	3
CO2	3	3	2	2	-	-	-	-	-	-	-	2	2	3	3
CO3	3	3	2	2	-	-	-	-	-	-	2	2	2	-	3
CO4	3	3	2	2	-	-	-	-	-	-	-	2	2	-	3
CO5	3	3	2	2	-	-	-	-	-	-	-	2	2	3	3

UNIT-I

Introduction: Algorithm Specification, Performance analysis: Space Complexity, Time Complexity, Asymptotic Notation (O, Omega, Theta), Searching and Sorting techniques- Performance Measurement.

Elementary Data Structures: Complexity measures for the Data Structures - Stacks and Queues, Trees, Hashing/Dictionaries, Priority Queues, Sets and Disjoint Set Union.

UNIT-II

Divide and Conquer: The general method, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Strassen's Matrix Multiplication.

Greedy Method: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum Cost Spanning Trees, Optimal Storage on Tapes, Optimal Merge Patterns, Single Source Shortest Paths.

Head Dept. of IT
CBIT, Hyderabad

UNIT-III

Dynamic Programming: The General Method, Multistage graphs, All Pair Shortest Paths, Single Source Shortest Paths, Optimal Binary Search Trees, 0/1 Knapsack, Reliability Design, The Traveling Salesperson Problem.

Traversal and Search Techniques: Breadth First Search and Traversal, Depth First Search and Traversal, Connected Components and Spanning Trees, Biconnected Components and DFS.

UNIT-IV

Backtracking: The General Method, 8-Queens Problem, Graph Colouring, Hamilton cycles, Knapsack Problem.

Branch and Bounds: The Method: Least Cost (LC) Search, The 15 puzzle, FIFO Branch and Bound, LC Branch and Bound, 0/1 Knapsack Problem, Traveling Salesperson Problem.

UNIT-V

NP-Hard and NP-Complete Problems: Basic Concepts: Non-Deterministic Algorithms, the Classes NP Hard and NP Complete. Cook's theorem, NP-Hard Graph Problems: Node Cover Decision Problem, Chromatic Number Decision Problem, Directed Hamiltonian Cycle, Traveling Salesperson Decision Problem, NP Hard Scheduling Problems: Job Shop Scheduling.

Text Books:

1. Ellis Horowitz, SartajSahani, SanguthevarRajasekaran, "Fundamentals of Computer Algorithm, 2^{nd} Edition", Universities Press, 2011.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 2^{nd} Edition, Prentice Hall of India Private Limited, 2006.

Suggested Reading:

1. Levitin A, "Introduction to the Design And Analysis of Algorithms", Pearson Education, 2008.
2. Aho, Hopcroft, Ullman, "The Design and Analysis of Computer Algorithm", Pearson Education, 2000.
3. Parag H.Dave, Himanshu B. Dave, "Design and Analysis of Algorithms", 2^{nd} Edition, Pearson Education, 2014.

Web Resources:

1. http://nptel.ac.in/courses/ 106101060
2. http://nptel.ac.in/courses

Head Dept. of IT
CBIT, Hyderabad

20ITE01 **DIGITAL IMAGE PROCESSING**
(Professional Elective – I)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To introduce the fundamental concepts and applications of digital image processing.
2. To impart knowledge on the image processing concepts: intensity transformations, spatial filtering, Smoothing and sharpening both in spatial and frequency domain.
3. To familiarize the image analysis concepts: morphological image processing, image segmentation, image representation and description, and object recognition.
4. To introduce colour image processing techniques.
5. To understand with various image compression methods.

Course Outcomes:

Upon completing this course, students will be able to:

1. Illuminate the fundamental concepts and applications of digital image processing techniques.
2. Demonstrate intensity transformations, spatial filtering, smoothing and sharpening in both spatial and frequency domains, image restoration concepts.
3. Demonstrate image restoration and morphological image processing methods.
4. Apply object recognition techniques by using image segmentation and image representation & description methods.
5. Illustrate the various colour models and Application of image compression methods.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	1	-	1	-	-	-	-	1	2	3	3
CO2	2	2	2	1	-	2	1	-	-	1	-	1	2	3	3
CO3	2	2	2	1	-	2	1	-	-	1	-	1	2	3	3
CO4	2	1	1	2	1	-	1	-	-	-	-	1	2	3	3
CO5	2	2	2	1	-	2	1	-	-	1	-	1	2	3	3

UNIT-I

Introduction: Fundamental Steps in Digital Image Processing, Image Sampling and Quantization, Some Basic Relationships between Pixels; **Intensity Transformations:** Some Basic Intensity Transformation Functions, Histogram Processing - Histogram Equalization, Histogram Matching (Specification)

UNIT-II

Spatial Filtering: Fundamentals of Spatial Filtering, Smoothing Spatial Filters; Sharpening Spatial Filters;
Filtering in the Frequency Domain: The 2-D Discrete Fourier Transform and its inverse; The Basics of Filtering in the Frequency Domain; Image Smoothing Using Frequency Domain Filters - Ideal, Butterworth and Gaussian Low pass Filters; Image Sharpening Using Frequency Domain Filters - Ideal, Butterworth and Gaussian High pass Filters.

Head Dept. of IT
CBIT, Hyderabad

UNIT-III

Image Restoration and Reconstruction: A Model of the Image Degradation/Restoration Process, Noise Models; Restoration in the Presence of Noise Only—Spatial Filtering; Periodic Noise Reduction by Frequency Domain Filtering; Estimating the Degradation Function; Inverse Filtering; Minimum Mean Square Error (Wiener) Filtering;

Morphological Image Processing: Preliminaries; Erosion and Dilation; Opening and Closing, The Hit or Miss Transform

UNIT-IV

Image Segmentation: Fundamentals; Points, Line and Edge Detection, Thresholding; Segmentation by Region Growing, Region Splitting and Merging

Feature Extraction: Boundary Pre-processing, Boundary Feature Descriptors, Some Simple Region Descriptors.

Image Pattern Classification: Patterns and Pattern Classes, Pattern Classification by Prototype Matching

UNIT- V

Colour Image Processing: Colour Fundamentals; Colour Models, Pseudo Colour Image Processing, Basics of full Colour Image Processing;

Image Compression: Fundamentals, Huffman Coding, Arithmetic Coding, LZW Coding

Text Book:

1. Rafael C Gonzalez and Richard E Woods, "Digital Image Processing", Pearson Education, 4th Edition, 2020.

Suggested Reading:

1. Vipula Singh, ―Digital Image Processing with MatLab and lab View‖, Elsevier.
2. Thomas B. Moeslund, ―Introduction to Video and Image Processing: Building Real Systems and Applications‖, Springer, 2012.
3. Milan Sonka, Vaclav Halvac and Roger Boyle, ―Image Processing, Analysis, and Machine Vision‖, 2nd Edition, Thomson Learning Publishers.
4. Kenneth R.Castleman, ―Digital Image Processing‖, Pearson Education, 2006.

Web Resource:

1. www.imageprocessingplace.com
2. https://in.mathworks.com/discovery/digital-image-processing.html
3. https://imagemagick.org/
4. https://nptel.ac.in/courses/117105079/

Head Dept. of IT
CBIT, Hyderabad

20ADE01 **DATA ANALYSIS AND VISUALIZATION**

(Professional Elective – I)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To Introduce the Numpy library in Python to support storage and operations on large multi-dimensional arrays and matrices
2. To Introduce large collection of mathematical functions to operate on multidimensional sequential data structures
3. To Demonstrate the functionality of the Pandas library in Python for open source data analysis and manipulation
4. To Demonstrate Data Aggregation, Grouping and Time Series analysis with Pandas
5. To Introduce the Matplotlib library in Python for resting static, animated and interactive visualizations

Course Outcomes:

Upon completing this course, students will be able to:

1. Efficiently store and manipulate dense data in arrays with Numpy
2. Apply high level mathematical functions to aggregate, broadcast, index and sort multidimensional arrays.
3. Create Series and DataFrame objects to operate on datasets.
4. Perform Data cleaning, transformation, merging, aggregation on datasets.
5. Apply 2-D and 3-D plotting techniques on datasets

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	1	1	-	2	-	2	-	3	-
CO2	-	2	-	1	-	-	1	1	-	2	-	2	-	3	-
CO3	1	3	2	2	3	-	1	1	-	1	-	2	3	3	3
CO4	3	3	2	3	3	-	1	1	-	1	-	3	3	3	3
CO5	1	1	1	1	-	-	1	1	-	2	-	2	-	-	-

UNIT-I

Introduction to Numpy: Data types in Python - Fixed type arrays, creating arrays, array indexing, array slicing, reshaping arrays, array concatenation and splitting, Universal Functions, Aggregations, Broadcasting rules, Comparisons, Boolean Arrays, Masks, Fancy Indexing, Fast Sorting using np.sort and np.argsort, partial sorting - partitioning with K-nearest neighbors, Creating Structured Arrays, Compound types and Record Arrays.

UNIT- II

Introduction to Pandas: Series Object, DataFrame Object, Data Indexing and Selecting for Series and DataFrames, Universal Functions for Index Preservation, Index Alignment and Operations between Series and DataFrames, Handling missing data, Operating on Null values, Hierarchical Indexing.

UNIT-III

Combining Datasets: Concat, Append, Merge and Joins, Aggregation and Grouping, Pivot Tables, Vectorized String Operations, Working with Time Series, High-Performance functions - query() and eval()

Head Dept. of IT
CBIT, Hyderabad

UNIT-IV

Inferential Statistics - Normal distribution, Poisson distribution, Bernoulli distribution, z-score, p-score, One-tailed and two-tailed, Type 1 and Type-2 errors, Confidence interval, Correlation, Z-test vs T-test, F-distribution, Chi-square distribution, the chi-square test of independence, ANOVA, data mining, titanic survivors dataset analysis

UNIT-V

Visualization with Matplotlib : Simple Line plots, Scatter plots, Visualizing errors, Density and Contour plots, Histograms, Binnings, Multiple subplots, Three-dimensional plotting with Matplotlib, Geographic data with Basemap, Visualization with Seaborn.

Text Books:

1. Jake VanderPlas, "Python Data Science Handbook", O'Reilly Media, 2016.
2. Samir Madhavan, "Mastering Python for Data Science", Packt Publishing, 2015.

Web Resources:

1. https://www.coursera.org/learn/python-data-analysis?specialization=data-science-python
2. https://www.coursera.org/learn/python-plotting

Head Dept. of IT
CBIT, Hyderabad

20ITE02 MOBILE APPLICATION DEVELOPMENT WITH ANDROID AND KOTLIN

(Professional Elective – I)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. Introduce the Kotlin Programming Language for Mobile Application Development
2. Demonstrate the development of basic mobile applications on android operating system
3. Demonstrate the Android Application Architecture
4. Introduce basic app design guidelines as well as styles, themes and material design
5. Demonstrate the publishing of a mobile app on Google Play

Course Outcomes:

Upon completing this course, students will be able to:

1. Understand the benefits of using Kotlin for Mobile application development
2. Understand the android project structure
3. Understand activity and fragment life cycles
4. Apply various styles, themes and material design to apps
5. Apply best practices to prepare and publish apps on Playstore

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	1	2	-	2	-	-	-	1	-	-	2	3	-
CO2	-	2	1	2	-	2	-	-	-	-	-	-	1	3	-
CO3	-	2	1	2	-	2	-	-	-	-	-	-	2	3	3
CO4	-	2	1	2	-	2	-	-	-	-	-	-	2	3	-
CO5	-	2	2	2	3	2	-	-	3	-	-	1	2	3	3

UNIT-I

Introduction to Kotlin, Basic expressions, Control flow statements, null safety, Functions, passing functions as arguments, simple lambdas

Object oriented programming in Kotlin, Classes and Objects, Constructors, Visibility modifiers, Subclasses and Inheritance, Interfaces, Data classes, Singleton class enums, Pairs, Triples, Collections and Extensions in Kotlin

UNIT-II

Installing Android Studio, Android app project, deploying app on emulator or device, image resources and click handler, view layouts, adding libraries to module gradle file, layouts using XML and layout editor, app interactivity, Constraint Layout, Data binding, Fragments, Navigation graphs, Navigational paths, Options menu, Safe Args plugin, External activity,

Head Dept. of IT
CBIT, Hyderabad

UNIT-III

Activity and Fragment life cycles, Android lifecycle library, configuration changes, Android App Architecture, Classes of Lifecycle, View Model and View Model Factory, Live Data and Live Data observers, Data binding with View Model and Live Data, Live Data Transformations.

Room Persistence library, Coroutines, Recycler View, Data binding with Recycler View, Retrofit library for web services, Moshi library for parsing JSON response, loading and displaying images from the internet, filtering data from the internet, Offline cache and repository, Work Manager, Background workers and periodic Worker Request

UNIT-IV

Basic App design, Styles and Themes, Material Design, best practices for app design
Permissions, App performance, Security, Handling user data, Compliance with personal data policies, logs, encryption of sensitive data, External storage, IP networking

UNIT-V

Firebase, Firebase analytics, Firebase notifications, Firebase database, App monetization, In-app purchases, Subscriptions, Advertising using Admob
Generate Signed APK, Preparing app for release, Google Play filters, Google Play developer console, Alpha and beta tests on Google Play, Pre-launch reports and Publishing

Text Books / Online Resources:

1. Android Development with Kotlin by Google
2. Android Development with Kotlin online videos

Head Dept. of IT
CBIT, Hyderabad

20MBC01 ENGINEERING ECONOMICS AND ACCOUNTANCY

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To demonstrate the importance of Managerial Economics in Decision Making.
2. To explain the concept of Accountancy and provide basic knowledge on preparation of Final accounts.
3. To understand the importance of Project Evaluation in achieving a firm's Objective.

Course Outcomes:

Upon completing this course, students will be able to:

1. Apply fundamental knowledge of Managerial Economics concepts and tools.
2. Analyze various aspects of Demand Analysis, Supply and Demand Forecasting.
3. Understand Production and Cost relationships to make best use of resources available.
4. Apply Accountancy Concepts and Conventions and preparation of Final Accounts.
5. Evaluate Capital and Capital Budgeting decision based on any technique.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	3	1	1	1	1	1	1	1	-	-	2	-	1
CO2	2	2	2	2	-	1	1	1	-	1	-	1	1	-	-
CO3	1	2	1	2	2	-	2	1	-	1	-	-	2	1	-
CO4	2	2	1	2	2	1	1	3	-	1	-	-	-	-	-
CO5	1	3	1	2	1	1	2	-	-	1	2	1	-	-	-

Unit-I

Introduction to Managerial Economics: Introduction to Economics and itsevolution - Managerial Economics - its Nature and Scope, Importance; Relationship with other Subjects. Its usefulness to Engineers; Basic concepts of Managerial economics - Incremental, Time perspective, Discounting Principle, Opportunity Cost, Equimarginal Principle, Contribution, Negotiation Principle.

Unit-II

Demand and Supply Analysis: Demand Analysis - Concept of Demand, Determinants, Law of demand - Assumptions and Exceptions; Elasticity of demand - Price, Income and Cross elasticity - simple numerical problems; Concept of Supply - Determinants of Supply, Law of Supply; Demand Forecasting - Methods.

Unit-III

Production and Cost Analysis: Theory of Production - Production function - Isoquants and Isocosts, MRTS, Input-Output Relations; Laws of returns; Internal and External Economies of Scale.

Cost Analysis: Cost concepts – Types of Costs, Cost-Output Relationship – Short Run and Long Run; Market structures – Types of Competition, Features, Price Output Determination under Perfect Competition, Monopoly and Monopolistic Competition; Break-even Analysis – Concepts, Assumptions, Limitations, Numerical problems.

Head Dept. of IT
CBIT, Hyderabad

Unit-IV

Accountancy: Book-keeping, Principles and Significance of Double Entry Book Keeping, Accounting Concepts and Conventions, Accounting Cycle, Journalization, Subsidiary books, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments. Ratio Analysis.

Unit-V

Capital and Capital Budgeting: Capital and its Significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Capital Budgeting, Methods: Traditional andDiscounted Cash Flow Methods - Numerical problems.

Text Books:

1. Mehta P.L.,"Managerial Economics: Analysis, Problems and Cases", Sultan Chand & Son's Educational publishers, 2016.
2. Maheswari S.N. "Introduction to Accountancy", Vikas Publishing House, 11th Edition, 2013.

Suggested Reading:

1. Panday I.M. "Financial Management", 11th edition, VikasPublishing House, 2015.
2. Varshney and K L Maheswari, Managerial Economics, Sultan Chand, 2014.
3. M. Kasi Reddy and S. Saraswathi, Managerial Economics and Financial Accounting, Prentice Hall of India Pvt Ltd, 2007.
4. A. R. Aryasri, Managerial Economics and Financial Analysis, McGraw-Hill, 2013.

Head Dept. of IT
CBIT, Hyderabad

20CEM01 **ENVIRONMENTAL SCIENCE**

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	-
Credits	No Credits

Course Objectives:

1. Identify environmental problems arising due to over utilization of natural resources and understand the importance of use of renewable energy sources
2. Become aware about the importance of eco system and interlinking of food chain.
3. Identify the importance of biodiversity in maintaining ecological balance.
4. Learn about various attributes of pollution management and waste management practices.
5. Contribute for capacity building of nation for arresting and/or managing environmental disasters.

Course Outcomes:

Upon completing this course, students will be able to:

1. Identify the natural resources and realise the importance of water, food, forest, mineral, energy, land resources and affects of over utilisation.
2. Understand the concept of ecosystems and realise the importance of interlinking of food chains.
3. Contribute for the conservation of bio-diversity.
4. Suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
5. Follow the environmental ethics and contribute to the mitigation and management of environmental disasters.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	3	-	-	-	-	1	1	-	-
CO2	1	-	-	-	-	-	2	1	-	-	-	1	1	-	-
CO3	1	-	-	-	-	-	2	1	-	-	-	1	1	-	-
CO4	1	-	-	-	-	1	2	1	-	-	-	1	1	-	-
CO5	1	-	-	-	-	1	2	1	-	-	-	1	2	-	-

UNIT- I

Environmental Studies: Definition, Scope and importance, need for public awareness.

Natural resources: Use and over utilization of Natural Resources - Water resources, Food resources, Forest resources, Mineral resources, Energy resources, Land resources.

UNIT- II

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, role of producers, consumers and decomposers, energy flow in an ecosystem, food chains, food webs, ecological pyramids, Nutrient cycling, Bio-geo chemical cycles, Terrestrial and Aquatic ecosystems.

Head Dept. of IT
CBIT, Hyderabad

UNIT-III

Biodiversity: Genetic, species and ecosystem biodiversity, Bio-geographical classification of India, India as a Mega diversity nation. Values of biodiversity, hot-spots of biodiversity, threats to biodiversity, endangered and endemic species of India, methods of conservation of biodiversity.

UNIT- IV

Environmental Pollution: Cause, effects and control measures of air pollution, water pollution, marine pollution, soil pollution, noise pollution and Solid waste management, nuclear hazards

Environmental Legislations: Environment protection Act, Air, Water, Forest & Wild life Acts, issues involved in enforcement of environmental legislation, responsibilities of state and central pollution control boards

UNIT- V

Social issues and the environment: Water conservation methods: Rain water harvesting and watershed management, Environmental ethics, Sustainable development and Climate change: Global warming, Ozone layer depletion, forest fires, and Contemporary issues.

Text Books:

1. Y. Anjaneyulu, “Introduction to Environmental Science”, B S Publications, 2004.
2. Suresh K. Dhameja, “Environmental Studies”, S. K. Kataria& Sons, 2009.

Suggested Reading:

1. C. S. Rao,” Environmental Pollution Control Engineering”, Wiley, 1991.
2. S. S. Dara, “A Text Book of Environmental Chemistry &Pollution Control”, S. Chand Limited, 2006

Head Dept. of IT
CBIT, Hyderabad

20ITC16 **SOFTWARE ENGINEERINGLAB**

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. Describe use case models that capture requirements of a software system.
2. Illustrate Dynamic models of a software system.
3. Build class diagrams that model a software system.
4. Acquaint with Activity and swimlane models.
5. Familiarize with analysis and design models.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Interpret user requirements using the UML notation.
2. Illustrate Dynamic models of a software system.
3. Analyze and develop class diagrams that model a software system.
4. Develop Activity and swimlane models.
5. Outline analysis and design models.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	1	-	-	1	1	-	-	1	-	1	-
CO2	2	1	1	-	1	-	-	1	-	-	-	1	-	-	-
CO3	1	1	1	-	-	2	-	-	-	-	2	1	1	-	2
CO4	3	1	-	-	-	-	-	1	-	-	-	2	2	-	-
CO5	2	1	-	-	-	2	1	-	1	-	2	1	-	-	2

List of Programs

1. Construct Use case diagrams for the following
    a. Diagram editor.
    b. Library information system.
    c. Banking system.
2. Construct Sequence diagrams for the following.
    a. Mobile phone.
    b. Use case student register for a course.
    c. Diagram editor.
3. Construct Collaboration diagrams for the following
    a. Use case librarian issues books to student.
    b. Mobile phone.
    c. Diagram editor.
4. Construct class diagrams for the following
    a. Diagram editor.
    b. Library information system.

Head Dept. of IT
CBIT, Hyderabad

c. Banking system
5. Construct Activity diagrams for the following.
    a. ATM transaction.
    b. Ticket machine.
    c. Sales order processing.
6. Construct Swim lane diagrams for the following.
    a. Account.
    b. CD player.
    c. ATM machine.
7. Case Studies**:**
    Prepare SRS, develop Analysis and design models for
    a. Passport automation system
    b. Credit card processing
    c. BPO management system
    d. E-book management system
    e. Recruitment system
8. Study of selenium web testing tool.
    a. Selenium IDE
    b. Selenium RC
9. Creating test cases for web pages using Selenium IDE.
    a. Recording and adding commands in a test
    b. Saving the recorded test
    c. Executing the recorded test
10. Creating test cases for GUI based desktop application.

Text Books:

1. Grady Booch, RobertA. Maksimchuk, “Object - Oriented Analysis and Design with Applications”, Addision-Wesley, 3 rd Edition, ISBN No: 9780201895513, 2007.
2. Martina Seidl , Marion Scholz , Christian Huemer, GertiKappel ”UML @ Classroom: An Introduction to Object-Oriented Modeling”, Springer; 2015th edition, ISBN-10: 3319127411, (March 9, 2015)

Suggested Reading:

1. Martin Fowler, Kendall Scott, “UML Distilled**:** A Brief Guide to the Standard Object Modeling Language” Addison Wesley, 4^{th} Edition, 2011.
2. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli,“Fundamentals of Software Engineering”, PHI,2^{nd} Edition.
3. Unmesh Gundecha , Carl Cocchiaro ,” Learn Selenium: Build data-driven test frameworks for mobile and web applications with Selenium Web Driver 3”, ISBN : 183898304X, Packt Publishing (July 18, 2019)

Web Resources:

1. SEweb - Software Engineering Education Home Page:http://tuvalu.cs.flinders.edu.au/seweb/se-ed/
2. IBM Rationalhttp://www-306.ibm.com/software/rational/uml/
3. Practical UML - A Hands-On Introduction for Developers
   http://www.togethersoft.com/services/practical_guides/umlonlinecourse
4. https://www.udemy.com/course/selenium-automation-testing-for-beginners/

Head Dept. of IT
CBIT, Hyderabad

20ITC17 DESIGN AND ANALYSIS OF ALGORITHMS LAB

Instruction	2	Hours per Week
Duration of SEE	3	Hours
SEE	50	Marks
CIE	50	Marks
Credits	1	

Course Objectives:

1. To introduce Divide and Conquer algorithmic strategy.
2. To familiarize Greedy Algorithms.
3. To introduce Dynamic programming algorithms.
4. To gain knowledge of connected and biconnected components.
5. To introduce Backtracking technique.

Course Outcomes:

Upon completing this course, students will be able to:

1. Implement Divide and Conquer Algorithms.
2. Build solutions using Greedy technique.
3. Apply Dynamic programming algorithms to solve problems.
4. Implement connected and biconnected components algorithms.
5. Design solutions using Backtracking technique.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3	3
CO2	3	3	2	2	1	-	-	-	-	-	-	2	2	3	3
CO3	3	3	2	2	1	-	-	-	-	-	2	2	2	-	3
CO4	3	3	2	2	1	-	-	-	-	-	-	2	2	-	3
CO5	3	3	2	2	1	-	-	-	-	-	-	2	2	3	3

List of Programs

1. Implement Binary Search Tree Operations.
2. Find Maximum and Minimum elements from a given list of elements using Divide and Conquer technique.
3. Implement Merge sort algorithm for sorting a list of integers in ascending order.
4. Implement greedy algorithm for job sequencing with deadlines.
5. Implement Prim's algorithm to generate minimum cost spanning tree.
6. Implement Kruskal's algorithm to generate minimum cost spanning tree.
7. Implement Dijkstra's algorithm for the Single source shortest path problem.
8. Implement Dynamic Programming algorithm for the 0/1 Knapsack problem.
9. Implement Dynamic Programming algorithm for the Optimal Binary Search Tree Problem.
10. Check whether given graph having connected components or not.
11. To find articulation points of a given graph..
12. Implement backtracking algorithm for the N-queens problem.
13. Implement backtracking algorithm for the Hamiltonian Cycle problem.
14. Implement backtracking algorithm for the Graph Coloring problem.
15. Implement Least Cost Branch and Bound for the 0/1 Knapsack problem

Head Dept. of IT
CBIT, Hyderabad

Note: All the programs can be implemented using Java Programming.

Text Books:

1. Ellis Horowitz, SartajSahani, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithm", 2^{nd} Edition, Universities Press, 2011.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 2^{nd} Edition, Prentice Hall of India Private Limited, 2006.

Suggested Reading:

1. Levitin A, "Introduction to the Design And Analysis of Algorithms", Pearson Education, 2008.
2. Goodrich M.T.,RTomassia, "Algorithm Design foundations Analysis and Internet Examples", John Wiley and Sons, 2006.
3. Base Sara, Allen Van Gelder, "Computer Algorithms Introduction to Design and Analysis", Pearson, 3^{rd} Edition, 1999.

Web Resources:

1. http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html
2. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms
3. http://nptel.ac.in/courses/ 106101060
4. http://www.facweb.iitkgp.ernet.in/~sourav/daa.html

Head Dept. of IT
CBIT, Hyderabad

20ADC03 **ARTIFICIAL INTELLIGENCE & MACHINE LEARNING TOOLS, TECHNIQUES AND APPLICATIONS**

Instruction	2 Hours per week
CIE	50 Marks
Credits	1

Course Objectives:

1. To introduce fundamental concepts in AI
2. To demonstrate simple AI applications using Natural Language Processing, Audio engineering & Speech
3. To demonstrate simple AI applications using Computer Vision, pattern recognition and machine learning.
4. To present various modeling and formulation techniques to solve problems using AI techniques.
5. To introduce state-of-art AI tools and techniques to solve problems faced by Engineers in design and analysis.

Course Outcomes:

Upon completing this course, students will be able to:

1. Understand the importance of AI.
2. Understand concepts of Machine Learning algorithms and their limitations.
3. Develop Chatbots based on the requirements.
4. Analyse complex problems involving image processing, such as quality control, visual surveillance, multimodal human-machine interfaces, and image compression.
5. Understand the application of Reinforcement Learning.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	1	1	-	2	-	2	-	3	-
CO2	-	2	-	1	-	-	1	1	-	2	-	2	-	3	-
CO3	1	3	2	2	3	-	1	1	-	1	-	2	3	3	3
CO4	3	3	2	3	3	-	1	1	-	1	-	3	3	3	3
CO5	1	1	1	1	-	-	1	1	-	2	-	2	-	-	-

List of Programs

1. **Overview of AI, AI project lifecycle**
   a. Design/Construct the workflow of a general AI project using draw.io

2. **Teachable Machine** - To introduce Machine Learning Models, Computer Vision, Natural Language Processing
   a. Train a Machine Learning model to recognise a Person or Object including gestures
   b. Train a Machine Learning model to recognise various sound bites
   c. Train a Machine Learning model to recognise speech

3. **AI with App Inventor** - To introduce Image Classification, Audio Classification, Facial Recognition, Reinforcement Learning(Markov Models)
   a. Develop an app to recognise objects using Image Classification
   b. Train a Machine Learning model to identify different facial expressions using webcam
   c. Develop an Expression Match app using the trained ML model for facial expressions
   d. Develop a Voice Authentication app that uses a trained audio model of the user using audio classification to recognise the user's voice to authenticate.
   e. Develop a Rock-Paper-Scissors game that uses Reinforcement Learning (Markov Models) to learn from the patterns in the user's game choices

Head Dept. of IT
CBIT, Hyderabad

4. **Amazon Lex** - To introduce Automatic Speech Recognition(Speech to Text), Natural Language Understanding(intent of text), Conversational AI agents
    a. Develop a conversational chatbot to automatically recognise speech, understand the intent of the user and generate a response accordingly using Amazon Lex

5. **Wolfram Technology Framework** - To introduce Supervised Learning(Classification, Prediction, Sequence Prediction), Unsupervised Learning(Feature Extraction, Clustering), Neural Networks, Model Deployment
    a. Design a program using the Wolfram Language to Classify Data(Numbers, Images, Colors) using automatic model selection.
    b. Design a program using the Wolfram Language to Predict the price of a house from a housing prices dataset using Regression.
    c. Design a program using the Wolfram Language to demonstrate Vector Encoding based Feature Extraction and Clustering for a dog image dataset.
    d. Construct a neural network from an image dataset and explore the hidden layers along with their outputs using the Wolfram Language

Web Resources:

1. https://teachablemachine.withgoogle.com/v1/
2. https://appinventor.mit.edu/explore/ai-with-mit-app-inventor
3. https://aws.amazon.com/lex/
4. https://www.wolfram.com/wolfram-u/machine-learning-zero-to-AI-60-minutes/
5. https://www.coursera.org/learn/ai-for-everyone

Head Dept. of IT
CBIT, Hyderabad

20ITC18 **Mini Project –II**

Instruction	2 Hours per week
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:
1. To enable students learning by doing.
2. To develop capability to analyse and solve real world problems.
3. To inculcate innovative ideas of the students.
4. To impart team building and management skills among students.
5. To instill writing and presentation skills for completing the project.

Course Outcomes:
Upon completing this course, students will be able to:
1. Interpret Literature with the purpose of formulating a project proposal.
2. Plan, Analyse, Design and implement a project using SDLC model.
3. Find the solution of identified problem with the help of modern Technology and give priority to real time scenarios.
4. Plan to work as a team and to focus on getting a working project done and submit a report within a stipulated period of time.
5. Prepare and submit the Report and deliver presentation before the departmental Committee.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	3	2	1	2	3	3	2	3	3
CO2	3	3	3	3	3	3	3	2	1	2	3	3	3	3	3
CO3	3	3	3	3	3	3	3	2	-	2	3	3	3	3	3
CO4	2	2	2	3	3	3	3	2	3	3	2	3	2	3	3
CO5	1	2	1	2	3	3	-	-	2	3	-	-	-	3	-

The Students are required to choose a topic for mini project related to the courses of the current semester or previous semester. The student has to implement and present the project as per the given schedule. During the implementation of the project, Personnel Software Process (PSP) has to be followed. Report of the project work has to be submitted for evaluation.

Schedule

S No	Description	Duration
1.	Problem Identification / Selection	2 weeks
2.	Preparation of Abstract	1 week
3.	Design, Implementation and Testing of the Project	7 weeks
4.	Documentation and Project Presentation	4 weeks

Head Dept. of IT
CBIT, Hyderabad

Guidelines for the Award of marks

S No	Description	Max. Marks
1.	Weekly Assessment	20
2.	PPT Preparation	5
3.	Presentation	10
4.	Question and Answers	5
5.	Report Preparation	10

Final Mini Project demonstration and PPT presentation is to be evaluated for the entire class together by all the faculty handling Mini Project for that class.

Head Dept. of IT
CBIT, Hyderabad

18IT C15 **OPERATING SYSTEMS**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To familiarize students with various services provided by an operating system.
2. To introduce the concepts of process, process synchronization and process scheduling.
3. To deal with different approaches of memory management.
4. To facilitate understanding of the structure and organization of the file system.
5. To provide understanding of Protection and security aspects of operating systems.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Demonstrate operating system services, inter process communication and multithreaded Programming.
2. Apply suitable process scheduling, deadlocks handling algorithms and solve process-synchronization.
3. Make use of advanced techniques such as paging, segmentation and virtual memory for memory management.
4. Illustrate file system interfaces and its implementation.
5. Identify the Operating System Security problems and Threats

UNIT–I

Introduction: Definition of Operating System, Computer-System Organization, Computer-System Architecture, Operating-System Structure, Operating-System Operations, Process Management, Memory Management, Storage Management, Protection and Security, Computing Environments, Open-Source Operating Systems.

Operating System Structures: Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating-System Structure, System Boot.

Process: Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication

Threads: Overview, Multicore Programming, Multithreading Models, Threading Issues.

UNIT–II

Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling.

Synchronization: Background, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors.

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

UNIT–III

Memory Management Straegies: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table.

Virtual Memory Management: Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory.

UNIT–IV

File-System: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing Protection.

Implementing File Systems: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance.

Mass-Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap-Space Management.

Head Dept. of IT
CBIT, Hyderabad

UNIT–V

System Protection: Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of the Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems
System Security: The Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool, User Authentication.

Text Book:

1. Abraham Silberschatz, Peter Galvin, Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Pvt Ltd, 2016.

Suggested Reading:

1. A.Tanenbaum, "Modern Operation Systems", 3rd Edition, Pearson Education, 2008.
2. William Stallings, "Operating Systems", 5th Edition, Pearson Education, 2005.
3. Ida M.Flynn, "Understanding Operating Systems", 6th Edition, Cengage, 2011.
4. D.M.Dhamdhere,"Operating systems a concept based approach", 2nd Edition, McGraw-Hill, 2007.

Web Resources:

1. http://nptel.ac.in/downloads/106108101/
2. http://www2.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/
3. http://www.cs.kent.edu/~farrell/osf03/oldnotes/

Head Dept. of IT
CBIT, Hyderabad

18IT C16 **THEORY OF AUTOMATA**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To study abstract computing models namely Finite Automata, Pushdown Automata, and Turning Machines.
2. To introduce various grammars, formal languages and their relationships.
3. To impart the relation between various grammars and recognizers for different formal languages.
4. To aquiant with mathematical methods to prove properties of languages, grammars and automata.
5. To familiarize with decidability and undecidability of computational problems.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Build Deterministic, Non deterministic Finite automata for Languages and show the acceptance of strings using Formal Machines.
2. Develop regular expressions and their equivalent finite automata for different languages.
3. Infer Context-free grammars for certain languages and Test for Closure Properties and Decision Properties of CFL's.
4. Construct pushdown automata for languages and Analyze Equivalence of PDA's, CFG's.
5. Identify Recursively Enumerable Languages, Undecidable problems using Turing Machines and Model Turing Machines for simple Computational Problems.

UNIT-I

Automata: Introduction to Finite Automata, the Central Concepts of Automata Theory: Alphabets, Strings and Languages.

Finite Automata: An Informal Picture Of Finite Automata: The Ground Rules, the Protocol, Enabling the Automata to Ignore Actions, the Entire System as an Automaton. Deterministic Finite Automata: Definition of a DFA, Simpler Notations for DFA's, Extending the Transition Function to Strings, The Language of a DFA, Nondeterministic Finite Automata: Definition of NFA, The Extended Transition Function, The Language of an NFA, Equivalence of NFA and DFA, An Application: Text Search, Finite Automata with Epsilon-Transitions: Use of €-transitions, The formal notation for an €- NFA, €-closure, Extended Transitions and Languages for €-NFA's, Eliminating €-transitions.

UNIT-II

Regular Expression and languages: Regular Expressions: The Operators of Regular Expressions, Building Regular Expressions. Finite Automata and Regular Expression: From DFAs to Regular Expressions, Converting DFA's to Regular Expressions by Eliminating States, Converting Regular Expressions to Automata, Applications of Regular Expressions, Algebraic Laws for Regular Expressions.

Properties of Regular Languages: Proving Languages not to be Regular: The pumping lemma for Regular Languages, Applications of Pumping Lemma, Closure Properties of Regular Languages, Decision Properties of Regular Languages: Testing Emptiness of Regular Languages, Testing Membership in a Regular Language. Equivalence and Minimization of Automata: Testing Equivalence of States, Testing Equivalence of Regular Languages, Minimization of DFA's.

UNIT-III

Context Free Grammars and Languages: Context-Free Grammars: Definition of Context Free Grammars, Derivations using a Grammar, Leftmost and Rightmost Derivation, The language of a Grammar, Parse Trees: Constructing Parse Trees, The Yield of a Parse Tree, Applications of CFGs, Ambiguity in Grammars and Languages: Ambiguous Grammars, Removing Ambiguity From Grammars, Leftmost Derivations as way to Express Ambiguity, Inherent Ambiguity.

Properties of Context Free Languages: Normal Forms for Context-Free Grammars: Eliminating Useless Symbols, Computing the Generating and Reachable Symbols, Eliminating Productions, Eliminating Unit

Head Dept. of IT
CBIT, Hyderabad

Productions, Chomsky Normal Form, Pumping Lemma for CFL's: Statement of the Pumping Lemma, Applications of Pumping Lemma for CFL's, Closure Properties of CFL's, Decision Properties of CFL's: Testing Emptiness of CFL's, Testing Membership in a CFL's.

UNIT-IV

Pushdown Automata: Definition of pushdown automaton: The Formal Definition of PDA, Graphical Notation for PDA's, Instantaneous Description of a PDA, The Language of a PDA: Acceptance by Final State, Acceptance by Empty Stack, From Empty Stack to Final State, From Final State to Empty Stack, Equivalence of PDA's and CFG's: From Grammars to PDA's, From PDA's to Grammars, Deterministic Pushdown Automata: Definition, Regular Languages and Deterministic PDA's.

UNIT-V

Introduction to Turing Machines: Problems that Computer Cannot Solve: The Turing Machine: Notation for the TM, Instantaneous Descriptions for TM's, Transitions Diagrams, The Language of a TM, Turing Machines and Halting, Programming Techniques for Turing Machines: Storage in the State, Multiple Tracks, Subroutines.
Extensions to the Basic Turing machine, Restricted Turing machines, Turing Machine and Computers: Simulating a Computer by a TM.

Undecidability: A Language That Is Not Recursively Enumerable: Enumerating the Binary Strings, Codes for Turing Machines, The Diagonalization Language, An Undecidable problem that is RE: Recursive Languages, Compliments of Recursive and RE languages, The Universal Languages, Undecidablity of the Universal Language, Undecidable problems about Turing Machines: Reductions, TM's That Accept The Empty Language, Rice's Theorem and Properties of RE languages, Post's Correspondence Problem: Definition of PCP, The Modified PCP, Other Undecidable Problems.

Text Book:

1. John E. Hopcroft, Rajeev Motwani, Jeffery D Ullman, "Introduction to Automata Theory Languages and Computation", 3rd Edition, Pearson Education, 2007.

Suggested Reading:

1. John C Martin. "Introduction to Language and Theory of Computation", 3rd Edition, TMH, 2003.
2. Daniel Cohen, "Introduction to Computer Theory", 2nd Edition, Wiley Publications, 2007.
3. Mishra K., Chandrasekaran N., "Theory of Computer Science (Automata, Languages and Computation)", 3rd Edition, Prentice Hall of India 2008.
4. ShyamalendraKandar, "Introduction to Automata Theory, Formal Languages and Computation", Pearson, 2013.

Web Resources:

1. http://nptel.ac.in/courses/106106049/
2. http://online.stanford.edu/course/automata-theory

Head Dept. of IT
CBIT, Hyderabad

18IT C17 **COMPUTER NETWORKS**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To present an overview of computer networking concepts and give an insight into the working principles of popular Internet Applications WWW, HTTP, Electronic Mail and Domain Name System.
2. To facilitate state-of-the-art knowledge on Network Layer issues including Routing and Addressing.
3. To introduce IP based transport protocols TCP and UDP.
4. To familiarize an understanding of various data link control protocols.
5. To provide main issues related to network security and relevant cryptographic techniques.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Describe the components, reference models, services and performance measures of Computer Networks and operating principles of WWW, HTTP, FTP, Electronic Mail and Domain Name System.
2. Identify transport layer services and infer UDP and TCP protocols.
3. Propose appropriate routing algorithm for Data routing.
4. Illustrate data link layer protocols for error detection, correction, channel partitioning and addressing.
5. Summarize various network security threats and cryptographic algorithms.

UNIT-I
Computer Networks and the Internet: Internet-A Nuts-and-Bolts Description, A Services Description, Protocol, The Network Edge - Access Networks, Physical Media, The Network Core, Packet Switching, Circuit Switching, A Network of Networks, Delay, Loss, and Throughput in Packet-Switched Networks- Overview of Delay in Packet-Switched Networks, Queuing Delay and Packet Loss, End-to-End Delay, Throughput in Computer Networks, Protocol Layers and Their Service Models-Layered Architecture, Encapsulation
Application Layer: Principles of Network Applications- Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the Internet, Application-Layer Protocols, The Web and HTTP - Overview of HTTP, Non-Persistent and Persistent Connections, HTTP Message Format, User-Server Interaction: Cookies, Web Caching, The Conditional GET, File Transfer- FTP- SMTP, Comparison with HTTP, Mail Message Format, Mail Access Protocols Electronic Mail in the Internet DNS The Internet's Directory Service -Services Provided by DNS, Overview of How DNS Works, DNS Records and Messages

UNIT-II
Transport Layer- Introduction and Transport-Layer Services- Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing, Connectionless Transport: UDP-UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer- Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N (GBN), Selective Repeat (SR), Connection-Oriented Transport: TCP- The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control- The Causes and the Costs of Congestion, Approaches to Congestion Control, Network-Assisted Congestion-Control Example: ATM ABR Congestion Control

UNIT-III
Network Layer: Introduction- Forwarding and Routing Network Service Models Virtual Circuit and Datagram Networks-Virtual-Circuit Networks, Datagram Networks, Inside a Router- Input Processing, Switching, Output Processing, Queuing, The Internet Protocol (IP)-Forwarding and Addressing in the Internet, Datagram Format, IPv4 Addressing, Internet Control Message Protocol (ICMP), IPv6, Routing Algorithms, The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Hierarchical Routing, Routing in the Internet- Intra-AS Routing in the Internet: RIP, Intra-AS Routing in the Internet: OSPF, Inter-AS Routing: BGP, Broadcast and Multicast Routing- Broadcast Routing Algorithms, Multicast

UNIT-IV

The Link Layer: Links, Access Networks, and LANs, Introduction to the Link Layer - The Services Provided by the Link Layer, Link Layer Implementation Error-Detection and -Correction Techniques- Parity Checks, Checksumming Methods, Cyclic Redundancy Check (CRC), Multiple Access Links and Protocols- Channel Partitioning Protocols, Random Access Protocols Taking-Turns Protocols, Switched Local Area Networks, Link-Layer Addressing and ARP, Ethernet, Link-Layer Switches, Virtual Local Area Networks (VLANs), Data Center Networking

UNIT-V

Security in Computer Networks: Network Security, Principles of Cryptography-Symmetric Key Cryptography, Public Key Encryption, Message Integrity and Digital Signatures-Cryptographic Hash Functions, Message Authentication Code, Digital Signatures, End-Point Authentication-Authentication Protocols, Securing E-Mail- Secure E-Mail, PGP, Network-Layer Security- IPsec and Virtual Private Networks (VPNs)

Text Book:

1. James F. Kurose, Keith W. Ross, "Computer Networking – A Top-Down Approach Featuring the Internet", 6th Edition, Pearson Education, 2013.

Suggested Reading:

1. Andrew S. Tanenbaum and David J. Wetherall, "Computer Networks", 5th Edition, Prentice Hall, 2013.
2. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", 5th Edition, Morgan Kaufmann Publishers, 2011.
3. Behrouz A. Forouzan, "Data communication and Networking", 4th Edition, Tata McGraw – Hill, 2011.
4. Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, 2010.

Web Resources:

1. https://nptel.ac.in/courses/106105081/
2. http://www.redbooks.ibm.com/abstracts/gg243376.html
3. http://www.ietf.org/rfc.html

Head Dept. of IT
CBIT, Hyderabad

18IT C18 **SOFTWARE ENGINEERING**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To describe various software life cycle models and Agile software development concepts.
2. To introduce the Behavioural modeling concepts in UML.
3. To define the structural modeling concepts in UML.
4. To familiarize with Software Testing Techniques and tools.
5. To capacitate the students with Risk management and Product metrics concepts.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Describe the concepts of Software Engineering and build the Requirements model.
2. Develop basic and advanced behavioral models using the concepts of Unified Modelling Language.
3. Design various structural models such as Class, Objects and Packages for real world scenarios.
4. Acquire thorough knowledge of software testing strategies and testing tools.
5. Estimate the software productivity using product metrics and acquire knowledge of software risk Management.

UNIT-I
Software and Software Engineering: The Nature of Software, Software Engineering. The Software Process, Software Engineering Practice. **A Generic view of Process :** Software Engineering -A Layered Technology, A Process frame work, Process Models-Waterfall model, spiral model , The Unified Process, Product and Process, Process Assessment and Improvement, The CMMI, Introduction to Agile development-Extreme programming.
Understanding Requirements: Requirements Engineering, Establishing the Groundwork,Eliciting Requirements, Building the Requirements Model, Negotiating Requirements, Validating Requirements. **Requirements Modeling:** Requirements Analysis, Scenario-Based Modeling, Problem Analysis, Software Requirement and specifications.

UNIT-II
UML Introduction: Model, Introducing the UML, Elements of UML-Things Relationships and Diagrams.
Basic Behavioral Modeling: Interactions, Use Cases, Use Case Diagrams, Interaction diagrams-Sequence diagrams-components of Sequence diagrams, Collaboration diagrams-Components of Collaboration diagrams, Activity diagrams-components of activity diagrams, Swimlane diagrams, Case studies on Use Case diagrams, Interaction diagrams.

UNIT-III
Basic Structural Modeling: Classes, Relationships, Class Diagrams, Advanced Structural Modeling: Advanced Classes, Advanced Relationships, Interfaces, Components, Collaborations and Deployment diagrams, Case studies on class diagrams.
Quality Concepts: Software Quality, Achieving Software Quality, Software Quality Assurance: Background Issues, Elements of Software Quality Assurance, SQA Tasks, The ISO 9000 Quality Standards.

UNIT-IV
Software Testing Strategies: A Strategic Approach to Software Testing, Strategic Issues, Validation Testing, System Testing. Testing Tools–Rational functional tester, Selenium software testing tool.
Testing Conventional Applications: Software Testing Fundamentals, White-Box Testing, Basis Path Testing, Black–Box Testing, Alpha testing, Beta testing.

UNIT-V
Product Metrics: A Framework for Product Metrics, Size Metrics like LOC, Function points.
Risk Management: Software Risks, Reactive versus Proactive Risk Strategies, Risk Mitigation, Monitoring, and Management, The RMMM Plan.

Head Dept. of IT
CBIT, Hyderabad

Text Books:

1. Roger S.Pressman, “Software Engineering: A Practitioners Approach”, 7th Edition, McGraw Hill, 2017.
2. Grady Booch, James Rumbaugh, Ivor Jacobson, “The Unified Modeling Language-User Guide (Covering UML 2.0)”, 3rd Edition, Pearson Education, India, 2010.
3. Pankaj Jalote “An Integrated Approach to Software Engineering”, 3rd Edition, Narosa Publishing house, 2008.

Suggested Reading:

1. Martin Fowler, Kendall Scott “UML Distilled**:** A Brief Guide to the Standard Object Modeling Language” Addison Wesley, 4th Edition, 2011.
2. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, “Fundamentals of Software Engineering”, PHI, 2nd Edition.

Web Resources:

1. http://tuvalu.cs.flinders.edu.au/seweb/se-ed/
2. IBM Rational http://www-306.ibm.com/software/rational/uml/
3. http://www.togethersoft.com/services/practical_guides/umlonlinecourse/

Head Dept. of IT
CBIT, Hyderabad

18IT E01 **DATA WAREHOUSING AND DATA MINING**

(Core Elective–1)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To introduce the concepts of Data Warehouse and Data Mining.
2. To familiarize different kinds of data and various preprocessing techniques.
3. To present different frequent pattern discovery methods.
4. To describe various classification and clustering techniques.
5. To facilitate the learning of outlier analysis.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the basic requirements of data mining and apply pre-process techniques.
2. Build Multidimensional data model and perform OLAP operations, generate Association rules from data.
3. Build and evaluate models for Classification and Prediction.
4. Evaluate the advanced classification and clustering techniques.
5. Understand outlier detection and real time applications of Data mining.

UNIT-I

Introduction: Data mining, Kinds of data, Kinds of pattern, Major issues in data mining. **Getting to know your data:** Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Measuring Data Similarity and Dissimilarity. **Data Preprocessing:** An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

UNIT-II

Data Warehousing and Online Analytical Processing: Data Warehouse: Basic Concepts, Data Warehouse Modeling: Data Cube and OLAP, Data Warehouse Design and Usage: A Business Analysis Framework for Data Warehouse Design, Data Warehouse Design Process, Data Warehouse Usage for Information Processing, Data Warehouse Implementation. **Mining Frequent Patterns, Associations and correlations:** Basic Concepts, Frequent Item Set Mining Methods, Interesting patterns, Pattern Evaluation Methods. Advanced Pattern Mining: Pattern Mining in Multilevel and Multidimensional Space.

UNIT-III

Classification: Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy: Introducing Ensemble Methods, Bagging, Boosting, Random Forests, Improving Classification Accuracy of Class-Imbalanced Data.

UNIT-IV

Classification: Advanced Methods: Bayesian Belief Networks, Classification by Back propagation, Support Vector Machines, Lazy Learners (or Learning from Your Neighbors), Other Classification Methods.
Cluster Analysis: Basic Concepts and Methods: Cluster Analysis, Partitioning Methods, Hierarchical Methods: Agglomerative versus Divisive Hierarchical Clustering, Distance Measures in Algorithmic Methods, DBSCAN, Evaluation of Clustering, Clustering graph and network data.

UNIT-V

Outlier Detection: Outliers and Outlier Analysis, Outlier Detection Methods, Statistical Approaches, Proximity-Based Approaches **Data Mining Trends and Research Frontiers:** Mining Complex Data Types: Mining Sequence Data: Mining Other Kinds of Data, Data Mining Applications, Data Mining and Society, Data Mining Trends.

Head Dept. of IT
CBIT, Hyderabad

Text Book:

1. Han J, Kamber M, Jian P "Data Mining: Concepts and Techniques", 3rd Edition, Elsevier, 2012.

Suggested Reading:

1. Pang-Ning Tan, Michael Steinback, Vipin Kumar, "Introduction to Data Mining", Pearson Education, 2008.
2. M. Humphires, M.Hawkins, M.Dy,"Data Warehousing: Architecture and Implementation", Pearson Education, 2009.
3. Anahory, Murray, "Data Warehousing in the Real World", Pearson Education, 2008.
4. Kargupta, Joshi, etc., "Data Mining: Next Generation Challenges and Future Directions", Prentice Hall of India Pvt. Ltd, 2007.

Web Resources:

1. https://hanj.cs.illinois.edu/bk3/
2. https://www.kdnuggets.com/
3. http://archive.ics.uci.edu/ml/index.php

Head Dept. of IT
CBIT, Hyderabad

18IT E04 **UNIX AND SHELL PROGRAMMING**

(Core Elective-1)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To familiarize students with the UNIX environment and basic UNIX utilities.
2. To introduce File systems and File structures.
3. To impart skills required for shell scripting and process handling.
4. To develop skills required to formulate regular expressions.
5. To familiarize students with the routine system administrative features and tools.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Describe the functional architecture, features and utilities of UNIX OS
2. Demonstrate various File handling operations
3. Understand the basic of the shell scripting and process handling mechanism using commands
4. Build regular expressions for pattern matching to design a task specific filter
5. Write application specific shell program and perform system administration

UNIT-I

Introduction to Unix: The UNIX Operating System, The UNIX Architecture, Features of UNIX, Internal and External Commands, Command Structure, **General-Purpose Utilities:**cal, date, echo, printf, bc, script, mailx, passwd, who, uname, tty, sty. **The vi editor:** vi Basics, Input Mode, Saving Text and Quitting, Navigation, Editing Text, Undoing Last Editing Instructions, Repeating the Last Command, Searching for a Pattern, Substitution.

UNIT-II

Handling Files: The File System, Parent Child Relationship, The HOME variable, pwd,cd, mkdir, rmdir, Absolute Pathnames, Relative Pathnames, The UNIX File System cat, cp, rm, mv, more, file, ls, wc, cmp, comm, diff. **Compressing and Archiving files:**gzip and gunzip- Compressing and Decompressing files, tar-The Archival program, zip and unzip- Compressing and Archiving together.

File Attributes: ls options -l, -d,-lh,-la, File Ownership, File Permissions, chmod-Changing File permissions, Directory Permissions, Changing File ownership.

UNIT-III

The Shell: The Shells's interpretive Cycle, Shell Offerings, Pattern Matching, Escaping and quoting, Redirection, /dev/null and /dev/tty, Pipes, tee- Creating a tee, Command Substitution, Shell Variables.

The Process: Process Basics, ps- Process Status, System Processes (-e or –a), Mechanism of Process creation, Internal and External Commands, Process states and Zombies, Running jobs in Background, nice-Job Execution with low priority, Killing Processes with signals, Job Control, at and batch-Execute later, cron- Running jobs periodically, time-Timing Processes.

UNIT-IV

Simple Filters: pr-Paginating Files, head- Displaying the beginning of a File, tail-Displaying the end of a File, cut- Slitting a File vertically, paste-Pasting Files, sort-Ordering a File, uniq- Locate Repeated and Non-repeated Lines, tr- Translating Characters.

Filters using Regular Expressions: grep, Basic Regular Expressions, Extended Regular expressions, egrep, sed, Line Addressing, Using multiple instructions, Context Addressing, Writing Selected lines to a File, Text Editing, Substitution.

Head Dept. of IT
CBIT, Hyderabad

UNIT-V

Shell Programming: Shell scripts, read, Using Command Line Arguments, exit, The logical operators && and ||, Conditional execution- if, Using test and [ ] to evaluate expressions, case, expr, while, for, set and shift, trap, Debugging shell scripts with set–x.

System Administration: root, The administrator’s privileges, Maintaining Security, User Management, Startup and Shutdown, Managing Disk Space, Device Files.

Text Book:

1. Sumitabha Das, “Unix Concepts and Applications”, 4^{th} Edition, TMH, 2006.

Suggested Reading:

1. Behrouz A. Forouzan, Richard F. Gilbery, “Unix and Shell Programming”, 1^{st} Edition, Cengage Learning India, 2003.
2. Graham Glass, King Ables, “Unix for programmers and users”, 3^{rd} Edition, Pearson Education, 2009.
3. YashwanthKanitkar, “Unix Shell programming”, 1^{st} Edition, BPB Publishers, 2010.
4. M.G. Venkateshmurthy, “Introduction to Unix and Shell Programming”, Pearson Education, 2005.

Web Resources:

1. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=PracticalUnix
2. https://www.shellscript.sh/
3. www.bash.academy/
4. http://linuxcommand.org/

Head Dept. of IT
CBIT, Hyderabad

18IT E05 **PREDICTIVE ANALYTICS WITH 'R'**

(Core Elective-2)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To introduce Predictive Modeling.
2. To familiarize Regression and Classification Techniques.
3. To impart knowledge on the concepts of Neural Networks and various model Evaluation Techniques.
4. To introduce Topic Modeling.
5. To explore various case studies.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Perform predictive modelling and evaluate the performance
2. Understand regression techniques and Support Vector Machines
3. Evaluate different classifiers and build an efficient networking model
4. Analyze various ensemble methods, probabilistic Graphic models and understand topic modeling
5. Analyze time series models on real world data

Gearing Up for Predictive Modeling: Models**, Types of models :** Supervised, unsupervised, semi-supervised, and reinforcement learning models, Parametric and nonparametric models, Regression and classification models, Real-time and batch machine learning models, **The process of Predictive Modeling:** Defining the model's objective, Collecting the data, Picking a model, Preprocessing the data, Exploratory data analysis, Feature transformations, Encoding categorical features, Missing data, Outliers, Removing problematic features, Feature engineering and dimensionality reduction, Training and assessing the model, Repeating with different models and final model selection, Deploying the model, **Performance metrics:** Assessing regression models, Assessing classification models, Assessing binary classification models.

UNIT-II

Linear Regression: Introduction to linear regression, Simple linear regression, Multiple linear regression, Assessing linear regression models, Problems with linear regression, Feature selection, Regularization, Ridge regression**.**

Logistic Regression: Classifying with linear regression, Assessing logistic regression models, Regularization with the lasso, Classification metrics, Extensions of the binary and Multinomial logistic classifier **Support Vector Machines:** Maximal margin classification, Support vector classification, Inner products**,** Kernels and support vector machines, Cross-validation.

UNIT-III

Neural Networks: Stochastic gradient descent**:** Gradient descent and local minima, The perceptron algorithm, Linear separation, The logistic neuron, **Multilayer perceptron networks:** Training multilayer perceptron networks.

Tree-based Methods: The intuition for tree models, Algorithms for training decision trees- Classification and regression trees, CART regression trees, Tree pruning, Missing data, Regression model trees CART classification trees, C5.0, Predicting complex skill learning, Variable importance in tree models,

UNIT-IV

Ensemble Methods: Bagging - Margins and out-of-bag observations, Predicting heart disease with bagging, Limitations of bagging, **Boosting –** AdaBoost, Limitations of boosting, **Random forests-** The importance of variables in random forests,

Probabilistic Graphical Models: A little graph theory, Bayes' Theorem, Conditional independence, Bayesian networks, The Naïve Bayes classifier. Hidden Markov models- Predicting letter patterns in English words.

Head Dept. of IT
CBIT, Hyderabad

Topic Modeling: An overview of topic modeling, Latent Dirichlet Allocation, The Dirichlet distribution, The generative process, Fitting an LDA model, Modeling the topics of online news stories, Model stability, Finding the number of topics, Topic distributions, Word distributions, LDA extensions

UNIT-V

Time Series Analysis: Fundamental concepts of time series, Time series summary functions, Some fundamental time series - White noise, Fitting a white noise time series, Random walk - Fitting a random walk, **Stationarity:** Stationary time series models, Moving average models, Autoregressive models - Autoregressive moving average models, **Non-stationary time series models:** Autoregressive integrated moving average models, Autoregressive conditional heteroscedasticity models, Generalized autoregressive heteroscedasticity models. Predicting foreign exchange rates, Other time series models. **Recommendation Systems:** Rating matrix, Measuring user similarity, Collaborative filtering, User-based collaborative filtering, Item-based collaborative filtering, Singular value decomposition, Other approaches to recommendation.

Text Books:

1. Rui Miguel Forte, "Mastering Predictive Analytics with R", Packt Publishing Ltd, 2015.
2. Roger D. Peng,"R Programming for Data Science", Lean Publishing, 2015.

Suggested Reading:

1. Lantz Brett, "Machine Learning with R", 2nd Edition, Packt Publishing Limited.
2. Sunila Gollapudi, "Practical Machine Learning", Packt Publishing Ltd.
3. Ethem Alpaydin, "Introduction to Machine Learning", 2nd Edition, PHI, 2013.

Web Resources:

1. https://data-flair.training/blogs/r-predictive-and-descriptive-analytics/
2. https://www.littlemissdata.com/blog/predictive-analytics-tutorial-part-1
3. http://uc-r.github.io/mars

Head Dept. of IT
CBIT, Hyderabad

18IT E06 **WEB TECHNOLOGIES**

(Core Elective - 2)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To provide knowledge about web pages design and development.
2. To discuss the importance of XML and Web Services.
3. To impart knowledge on Java Servlets and JSP to build dynamic web pages.
4. To familiarize state of art frameworks.
5. To acquaint with Django framework that helps you to build a RESTful API.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Create web pages with good aesthetic sense of design using HTML, XHTML, CSS, JavaScript, DOM and JQuery.
2. Write well-formed and valid XML document and schema.
3. Implement java based dynamic web applications using Servlets, JSP and JDBC.
4. Build complex websites using MVC based STRUTS Framework.
5. Design and Develop full-stack web sites based on content stored in an RDBMS.

UNIT-I

Introduction: Web Fundamentals, **HTML 5.0:** basic tags, Images, Tables, Lists, Iframes, Forms, Layout, Graphics, span and div tags.

Introduction to Cascading Style Sheets: Types of CSS**,** CSS Selectors, CSS BOX Model, CSS Positioning, and CSS floating.

JQuery: Basics of JavaScript, JQuery syntax, Selectors, Events, JSON Fundamentals.

UNIT-II

Introduction to XML: The Syntax of XML, XML Document Structure, Document Type Definitions, Name Space, XML Schemas, Displaying XML Documents with CSS, XSLT Style Sheets and XML Processors.

Web Services: Web Service Architecture, structure and contents of SOAP message, structure of WSDL, Information in UDDI Registry, UDDI Registry API.

UNIT-III

Java Servlets: Overview of Java Servlet API, Servlet Implementation, Servlet Configuration, Servlet Exceptions, Servlet Life cycle, Request and Response methods, Approaches to Session tracking, Servlet Context, Servlet Collaboration.

JSP Basics: Introduction to JSP, Directives, Scripting Elements, Standard Actions.

Databases: Connect servlet to MySQL, Connect JSP to MySQL.

UNIT-IV

Struts framework: MVC Design pattern, Introduction to the modern web application framework, Architecture and flow of execution, working with actions and interceptors, Building the view with Tags and Results in detail, OGNL and type conversion, exploring the validation framework, writing the custom validator and Struts application development.

UNIT-V

Django: Introduction, Django Framework Design Principles, Django Urls and Views, Django Templates Django Application Management, Django Form Structure and Workflow, Django Form Processing: Initialization, Field Access, Validation, and Error Handling Django Form Field Types: Widgets, Options, and Validations, Django Model Data Types, Django Model Database Tasks, Django Models and Multiple Databases CRUD Single Records in Django Models REST Services with Django.

Head Dept. of IT
CBIT, Hyderabad

Text Books:

1. Robert W.Sebesta, “Programming with World Wide Web”, 8th Edition, Pearson Education, 2014.
2. Subramanyam Allamraju, “Professional Java Server programming”, J2EE 1.3 Edition, CeditBuest, Apress Publications, 2007.
3. Donald Brown, Chad Michael Davis, Scott Stanlick, “Struts 2 in Action”, Manning Publications, 2008.
4. Daniel Rubio, “Beginning Django Web Application Development and Deployment with Python”, 1st Edition, Apress 2017.

Suggested Reading:

1. Gustavo Alonso, “Web Services: Concepts, Architectures and Applications”, Springer, 2010.

Web Resources:

1. https://msdn.microsoft.com/en-us/library/office/ aa218647(v=office.11).aspx
2. https://www.w3schools.Com

Head Dept. of IT
CBIT, Hyderabad

18IT C19 OPERATING SYSTEMS AND COMPUTER NETWORKS LAB

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:
1. To familiarize with various system calls of LINUX and network commands.
2. To introduce Inter process communication Methods and CPU scheduling algorithms.
3. To facilitate knowledge required to handle deadlocks and use semaphores.
4. To presenr Client/Server applications based on TCP and UDP using Java Socket API.
5. To provide knowledge required to implement error detection, network routing algorithms and encryption algorithms.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Demonstrate starting of a new process, replacing a process and execute basic System Calls.
2. Implement Inter-process communication and CPU scheduling Algorithms.
3. Apply the appropriate method to handle deadlocks and synchronize processes to solve critical section problems.
4. Show client-server communication using TCP and UDP.
5. Examine Error detection using CRC, encryption and routing algorithms.

List of Programs

Operating System Programs:
1. a) Demonstrate the system calls. a) fork b) execvp c) stat d) setenv & getenv
   b) Basic networking Commands: - ping, tracert, netstat, ipconfig, traceroute
2. Implement Inter process communication between a server and multiple clients
3. Implement CPU scheduling algorithms
4. Implement Banker's algorithm for Deadlock Avoidance.
5. Implement Producer-Consumer Problem using semaphores.

Computer Network Programs:

6. Implementation of TCP (Server and client) and UDP (Server and client)
7. Capture and analyze IP packets by executing trace route.
8. Implement Dijkstra's and Distance Vector routing algorithms
9. Implement CRC Error detection technique.
10. Implement RSA asymmetric Encryption Algorithm.

Text Books:

1. W. Richard Stevens, "Unix Network Programming", Volume 2, 2nd Edition, Pearson Education, 2015.
2. James F. Kurose, Keith W. Ross, "Computer Networking – A Top-Down Approach Featuring the Internet", 6th Edition, Pearson Education, 2013.

Suggested Reading:

1. A.Tanenbaum, "Modern Operation Systems", 3rd Edition, Pearson Education, 2008.
2. Silberschatz, Galvin, and Gagne," Operating System Concepts", 8th Edition,Wiley Publication.
3. Andrew S. Tanenbaum and David J. Wetherall, "Computer Networks", 5th Edition, Prentice Hall, 2013.

Web Resources:
1. https://www.cse.iitb.ac.in/~mythili/teaching/cs347_autumn2016/index.html
2. https://www.nsnam.org/docs/tutorial/html/

Head Dept. of IT
CBIT, Hyderabad

18IT C20 **SOFTWARE ENGINEERING LAB**

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:

1. To discuss use case models that capture requirements of a software system.
2. To illustrate dynamic models of a software system.
3. To build class diagrams that models a software system.
4. To acquaint with activity and swimlane models.
5. To familiarize with analysis and design models.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Interpret user requirements using the UML notation.
2. Illustrate Dynamic models of a software system.
3. Design class diagrams that model a software system.
4. Develop Activity and swim lane models.
5. Implement Analysis and Design models for various real world scenarios.

List of Experiments

1. Construct Use case diagrams for the following
   a. Diagram editor.
   b. Library information system.
   c. Banking system.
2. Construct Sequence diagrams for the following.
   a. Mobile phone.
   b. Use case student register for a course.
   c. Diagram editor.
3. Construct Collaboration diagrams for the following
   a. Use case librarian issues books to student.
   b. Mobile phone.
   c. Diagram editor.
4. Construct Activity diagrams for the following
   a. ATM transaction.
   b. Ticket machine.
   c. Sales order processing.
5. Construct Swim lane diagrams for the following
   a. Account.
   b. CD player.
   c. ATM machine.

Case Studies:

Develop analysis and design models for

6. Passport automation system
7. Credit card processing
8. BPO management system
9. E-book management system
10. Recruitment system

Head Dept. of IT
CBIT, Hyderabad

Text Books:

1. G. Booch, J. Rumbaugh, and I. Jacobson, “The Unified Modeling Language User Guide”, Addison-Wesley, 1^{st} Edition, 1998. (Chapters 17 to 27).
2. Grady Booch, RobertA.Maksimchuk, “Object - Oriented Analysis and Design with Applications”, Addision-Wesley, 3^{rd} Edition, 2007. (Chapters 8 to 12).

Suggested Reading:

1. Martin Fowler, Kendall Scott, “UML Distilled**:** A Brief Guide to the Standard Object Modeling Language” Addison Wesley, 4^{th} Edition, 2011.
2. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, “Fundamentals of Software Engineering”, PHI, 2^{nd} Edition.

Web Resources:

1. SEweb - Software Engineering Education Home Page: http://tuvalu.cs.flinders.edu.au/seweb/se-ed/
2. IBM Rational http://www-306.ibm.com/software/rational/uml/
3. Practical UML - A Hands-On Introduction for Developers
   http://www.togethersoft.com/services/practical_guides/umlonlinecourse

Head Dept. of IT
CBIT, Hyderabad

18IT C21 **MINI PROJECT – III**

Instruction	2 Hours per week
Duration of Semester End Examination	-
Semester End Examination	-
CIE	50 Marks
Credits	1

Course Objectives:

1. To enable students to learn by doing.
2. To develop capability to analyse and solve real world problems.
3. To develop innovative ideas among the students

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Interpret Literature with the purpose of Formulating a project proposal.
2. Planning, analyzing, Designing and implement a software project using SDLC model.
3. Find the solution of identified problem with the help of modern Technology and give priority to real time scenarios.
4. Plan to work as a team and to focus on getting a working project done and submit a report with in a stipulated period of time.
5. Final Seminar, as oral Presentation before departmental Committee.

The Students are required to implement a project from opted subject in the core elective-2. During the implementation of the project, Personnel Software Process (PSP) has to be followed.

Report of the project work is to be submitted at the end of the Semester for evaluation.

Schedule

S.No	Programming concepts are to be taught related to the courses choosen from core elective – 2	4 weeks
1.	Problem Identification / Selection	2 weeks
2.	Preparation of Abstract	1 week
3.	Design, Implementation & Testing of the Project	5 weeks
4.	Documentation & Project Presentation	2 weeks

Guidelines for the Award of marks

S.No.	Description	Max. Marks
1.	Weekly Assesment	20
2.	PPT Preparation	05
3.	Presentation	10
4.	Question and Answers	05
5.	Report Preparation	10

Final Mini Project demonstration and PPT presentation is to be evaluated for the entire class together by all the faculty handling Mini Project for that class.

Head Dept. of IT
CBIT, Hyderabad

18IT C22 **ARTIFICIAL INTELLIGENCE**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Learn problem solving through search techniques.
2. Familiarize with knowledge representation and logical reasoning techniques in AI.
3. Learn probabilistic reasoning models on uncertain data.
4. Acquaint with supervised and reinforcement learning.
5. Learn syntax and semantic analysis of the natural language.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the basics of AI and analyze various Exhaustive and Heuristic Search Techniques.
2. Apply logical concepts and representation techniques to infer knowledge.
3. Understand quantification of uncertainty and evaluate data using probabilistic reasoning models.
4. Apply the techniques of supervised and reinforcement learning on data.
5. Process Natural Language and perform syntax & semantic analysis.

UNIT-I

Introduction: The Foundations of AI, History of AI. Intelligent agents – Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

Solving problems by searching: Problem Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed Search Strategies, Heuristic Functions.

Adversarial search: Games, Optimal decisions in games, Alpha-Beta Pruning. Constraint Satisfaction Problems- Defining constraint satisfaction Problems.

UNIT-II

Logic Concepts and Logic Programming: Introduction, Propositional Calculus, Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Tableau System in Propositional Logic, Resolution Refutation in Propositional Logic, Predicate Logic, Logic Programming.

Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

UNIT-III

Quantifying Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and its Use.

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Exact Inference in Bayesian Networks. **Probabilistic Reasoning over Time:** Time and Uncertainty, Inference in Temporal Models, Hidden Markov Models, Kalman Filters.

UNIT-IV

Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, The Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks, Nonparametric Models, Support Vector Machines.

Learning Probabilistic Models: Statistical Learning, Learning with Complete Data.

Learning with Hidden Variables: The EM Algorithm

Reinforcement Learning: Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning-Q learning

Head Dept. of IT
CBIT, Hyderabad

UNIT–V

Natural Language Processing: Language Models, Text Classification, Information Retrieval, Information Extraction.

Natural Language for Communication: Phrase Structure Grammars, Syntactic Analysis, Augmented Grammars and Semantic Interpretation.

Text Books:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach" , Prentice Hall, 3rd Edition.
2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011.

Suggested Reading:

1. Nilsson, N., “Artificial Intelligence: A New Synthesis”, San Francisco, Morgan Kaufmann, 1998.
2. Rich, Knight, Nair: “Artificial intelligence”, Tata McGraw Hill, Third Edition, 2009.
3. Tom M. Mitchell, “Machine Learning”, McGraw Hill, 1997.
4. Kulkarni, Parag, Joshi, Prachi ,”Artificial Intelligence : Building Intelligent Systems”, PHI, 2015.
5. Peter Jackson, “Introduction to Expert Systems”, Third Edition, Pearson Addison Wesley, 1998.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc19_cs19/
2. https://www.coursera.org/learn/ai-for-everyone

Head Dept. of IT
CBIT, Hyderabad

18IT C23 **INFORMATION SECURITY**

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	20 Marks
Credits	2

Course Objectives:
1. To provide basic concepts of Information security and threats its associated attacks.
2. To explore the role of risk management and security technology like firewalls and Intrusion systems.
3. To familiarize with the concepts Cryptographic algorithms and Transport level Security.
4. To acquire knowledge of Electronic mail,IP Security and User Authentication.
5. To introduce how security policy affects the ongoing technical and administrative evaluation.

Course Outcomes:
Upon successful completion of this course, student will be able to:
1. Describe the components of information security and identify threats, attacks that cause harm to organizational assets.
2. Examine the control measures to maintain the level of risk and make use of firewalls and intrusion detection systems to protect the networks.
3. Demonstrate cryptographic algorithms and implement secure communications between web browser and a web server.
4. Inspect on three functional areas like authentication, confidentiality and key management.
5. Compare information security technical and non-technical aspects and aware of employment policies and practices.

UNIT-I
Introduction to Information Security: History of Information Security, What Is Security, CNSS security model, Components of an Information System, Balancing Information Security and Access, Approaches to Information Security Implementation, Security in the Systems Life Cycle, Security Professionals and the Organization.

Need for Security: Business needs, Threats and Attacks, Compromises to Intellectual Property, Deviations in Quality of Service, Espionage or Trespass, Forces of Nature, Human Error or Failure, Information Extortion, Sabotage or Vandalism, Software Attacks, Technical Hardware Failure or Errors, Technical Software Failure or Errors, Technological Obsolescence, Theft.

UNIT-II
Risk management: An Overview of Risk Management, Risk Identification, Risk assessment, Risk Control, Quantatitive versus Qualitative Risk Management Practices, Recommended Risk Control Practices.
Security Technology: Introduction,Access Control, Firewalls, Intrusion detection and prevention systems, Honeypots,Honeynets, Padded Cell Systems, Scanning and Analysis Tools.

UNIT-III
Cryptography: Introduction, Foundations of Cryptology, Cipher methods, cryptographic Algorithms, Cryptographic Tools, Protocols for Secure Communications.
Transport Level Security: Web Security Considerations, Secure Socket Layer and Transport Layer Security, HTTTPS, Secure Shell.

UNIT-IV
Electronic Mail Security: Pretty Good Privacy, S/MIME, DomainKeys Identified Mail.

IPSecurity: IPSecurity Overview, IPSecurity Policy, Encapsulating Security Payload, Combining Security Associations, Internet key exchange.

User Authentication: kerberos, Federated Identity Management.

Head Dept. of IT
CBIT, Hyderabad

UNIT-V

Implementing Information Security: Introduction, Information Security Project Management, Technical Aspects of Implementation, Non technical Aspects of Implementation, Information Systems Security Certification and Accreditation.

Security and Personnel: Introduction ,Positioning and Staffing Security Function, Employment Policies and Practices, Security Considerations for Temporary Employees, Consultants and Other Workers, Internal Control Strategies, Privacy and the Security of Personnel Data.

Information security Maintenance: Introduction, Security Management Maintenance Models, Digital Forensics.

Text Books:

1. Michael E. Whitman, Hebert J Mattord, “Principles of Information Security”, 5^{th} Edition, Cengage Learning, 2014.
2. Thomas R Peltier, Justing Peltier, JohnBlackley, “Information Security Fundamentals”, Auerbacj Publications, 2010.
3. William Stallings “Cryptography and Network Security Principles and Practice”, 6^{th} Edition, Pearson, 2014.

Suggested Reading:

1. Dr.V.K.Jain,”Cryptography and Network Security”, 1^{st} Edition, Khanna Book publishing, 2013.
2. Marks Merkow, Jim Breithaupt, “Information Security: Principle and Practices”, 2^{nd} Edition, Pearson Education, 2014.

Web Resources:

1. https://www.sans.org/security-resources/
2. https://nptel.ac.in/courses/106106129/

Head Dept. of IT
CBIT, Hyderabad

18IT E09 **SOCIAL MEDIA ANALYTICS**

(Core Elective - 3)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To introduce Social Media Mining, Graph Essentials and Network Models.
2. To familiarize various algorithms for the study of Communities.
3. Impart knowledge about Mining, Influence and Homophily.
4. To familiarize Recommendation Systems and Behavioral Analytics.
5. To explore various Prediction Systems.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Describe graph essentials and various network measures and models.
2. Understand community behavior and information diffusion in social media.
3. Comprehend data mining algorithms and measure influence and homophily.
4. Understand the challenges and evaluate the recommendation systems.
5. Apply prediction algorithms for real world problems.

UNIT-I

Introduction: Social Media Mining, New Challenges for Mining.

Graph Essentials: Graph Basics, Graph Representation, Types of Graphs, Connectivity in Graphs, Special Graphs, Graph Algorithms.

Network Measures: Centrality, Transitivity and Reciprocity, Balance and Status, Similarity, Network Models: Properties of Real-World Networks, Random Graphs, Small-World Model, Preferential Attachment Model.

UNIT-II

Community Analysis: Community Detection, Community Evolution, Community Evaluation, Information. **Diffusion in Social Media:** Herd Behaviour, Information Cascades, Diffusion of Innovations, Epidemics.

UNIT-III

Data Mining Essentials: Data, Data Preprocessing, Data Mining Algorithms, Supervised Learning, Unsupervised Learning.

Influence and Homophily: Measuring Assortativity, Influence, Homophily, Distinguishing Influence and Homophily.

UNIT-IV

Recommendation in Social Media: Challenges, Classical Recommendation Algorithms, Recommendation Using Social Context, Evaluating Recommendations.

Behavior Analytics: Individual Behavior, Collective Behavior.

UNIT-V

Prediction: Predicting the future, Prediction of learning, Predicting elections, Predicting Box offices, Predicting Stock market, Closing predictions.

Text Books:

1. Zafarani R., Abbasi M.A., Liu H, "Social Media Mining: An Introduction", Cambridge University Press, 2014.
2. Lutz Finger, Soumitra Dutta, "Ask, Measure, Learn: Using Social Media Analytics to Understand and Influence Customer Behavior", O'Reilly Media, 2014.

Head Dept. of IT
CBIT, Hyderabad

Suggested Reading:

1. David Easley and Jon Kleinberg, “Networks, Crowds and Markets”, Cambridge University Press, 2010
2. Bing Liu, “Sentiment Analysis: mining opinions, sentiments, and emotions”, Cambridge University Press, 2015.
3. Matthew A. Russell, “Mining the Social Web: Analyzing Data from Facebook, Twitter, LinkedIn, and Other Social Media Sites”, O'Reilly Media 2011.

Web Resources:

1. http://www.kdd.org/kdd2015/tutorial.html
2. http://thinktostart.com/category/social-media/
3. http://blogs.iit.edu/iit_web/social-media-2/social-media-whats-your-strategy/4

Head Dept. of IT
CBIT, Hyderabad

18IT E10 **VIRTUAL REALITY**
(Core Elective – 3)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To familiarize the students with the fundamentals of Virtual Reality.
2. To impart the knowledge of 2D and 3D orientation for understanding the behavior of VR system with the environment.
3. To introduce the dynamics of the objects.
4. To deal with the factors involved to create virtual environment.
5. To introduce the applications of Virtual Reality Systems.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Explain the basic concepts of Virtual Reality and 3D Computer Graphics.
2. Demonstrate geometric modeling, transformations and model of interaction of the virtual environment with the system.
3. Apply the dynamics of Virtual Environment and Physical simulation for real time applications.
4. Evaluate the human factors involved in Virtual Hardware and Virtual Software.
5. Develop a Virtual Reality application.

UNIT-I
Introduction to Virtual Reality: Virtual Reality and Virtual Environment: Introduction, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark.
3D Computer Graphics: Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, 3D clipping, Colour theory, Simple 3D modelling, Illumination models, Reflection models, Shading algorithms, Radiosity, Hidden Surface Removal, Realism-Stereographic image.

UNIT-II
Geometric Modelling: Geometric Modelling: Introduction, From 2D to 3D, 3D space curves, 3D boundary representation.
Geometrical Transformations: Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection.
Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems.

UNIT-III
Virtual Environment: Animating the Virtual Environment: Introduction. The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object inbetweening, free from deformation, particle system.
Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.

UNIT-IV
VR Hardware and Software: Human factors: Introduction, the eye, the car, the somatic senses.
VR Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware. Integrated VR systems.
VR Software: Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML

Head Dept. of IT
CBIT, Hyderabad

18IT E12 **MOBILE COMMERCE**

(Core Elective – 3)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To introduce fundamentals of E-Commerce.
2. To examine strategies used by businesses used to improve purchasing, logistics, and other supporting activities.
3. To impart knowledge on technical infrastructure and security needed for M-Commerce.
4. To facilitate different e-payment options.
5. To acquaint with various security issues in E-Commerce.

Course Outcomes:

After successful completion of the course, student will be able to:

1. Understand electronic commerce and the stakeholders and their capabilities and limitations in the strategic convergence of technology and business.
2. Assess e-commerce strategies and applications, including online marketing, e-government, e-learning and global e-commerce.
3. Describe the concepts of M-Commerce and its applications.
4. Categorize advantages and disadvantages of different online payment options and choose an appropriate E-commerce Solution.
5. Identify the importance of security, privacy, and ethical issues as they relate to E-Commerce.

UNIT-I

Introduction: Definition, Objectives, Advantages and disadvantages, Forces driving E-Commerce, Traditional commerce Vs. E-Commerce, E-Commerce opportunities for industries, Growth of E-Commerce. E-Commerce Models: Business to consumer, Business to Business, Consumer to Consumer, other models – Brokerage Model, Aggregator Model, Info-mediary Model, Community Model and value chain Model.

UNIT-II

Introduction: The Fundamental Functional Platform of M-Commerce – Applications - The Value Chain Supporting M-Commerce Transactions. Services and Applications in Horizontal and Vertical Markets: Personal Organizers-Location Based Services and Applications - M-Commerce Portals- Communication and Messaging-M-Commerce Data Synchronization - Education-Gaming Services.

UNIT-III

A Framework for the study of Mobile Commerce, NTT DoCoMo's I-Mode, Wireless Devices For Mobile Commerce, Towards A Classification Framework For Mobile Location Based Services, Wireless Personal And Local Area Networks, The Impact Of Technology Advances On Strategy Formulation In Mobile Communications Networks.

UNIT -IV

Electronic Payment Systems: Special features required in payment systems, Types of E-payment systems, E-Cash, E-cheque, credit card, Smart Card, Electronic Purses.

E-Marketing, E-Customer Relationship Management, E-Supply Chain Management.

UNIT-V

Security Issues in E-Commerce: Security risk of E-Commerce, Types of threats, Security tools and risk management approach, Cyber laws, Business Ethics, IT Acts.

Head Dept. of IT
CBIT, Hyderabad

Text Books:

1. Ravi Kalakota & A.B. Winston, “Frontiers of Electronic Commerce”, 1^{st} Edition, Pearson Education, 2005.
2. E.BrianMennecke, J.TroyStrader, “Mobile Commerce: Technology, Theory and Applications”, Idea Group Inc., IRM press, 2003.

Suggested Reading:

1. Bharat Bhaskar, “Electronic Commerce – Framework Technologies and Applications”, 3^{rd} Edition, Tata McGraw Hill, 2008.
2. Paul May, “Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business” Cambridge University Press March 2001.
3. Dr.Pandey, Saurabh Shukla, “E-commerce and Mobile commerce Technologies”, Sultan chand, 2011.

Web Resources:

1. Mobile Commerce World (www.mobilecommerceworld.com) Industry news.
2. Clarke, R. (1998) Electronic Data Interchange (EDI): An Introduction.
   www.anu.edu.au/ people/Roger.Clarke/EC/EDIIntro.htm
3. The worldwide Mobile Marketing Association (www.mmaglobal.com) has case studies and statistics of adoption.

Head Dept. of IT
CBIT, Hyderabad

18IT E13 **DATA SCIENCE WITH PYTHON**

(Core Elective – 4)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To facilitate learning fundamentals of Numpy, Pandas and various file formats.
2. To familiarise with data pre-processing operations.
3. To introduce time series data and inferential statistics.
4. To acquire knowledge about visualisation and prediction.
5. To explore various case studies.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the usage of Numpy, Pandas libraries and various file formats.
2. Apply data pre-processing and visualization techniques on the data.
3. Perform time series data analysis and apply inferential statistics.
4. Visualize the data and apply prediction techniques.
5. Understand Collaborative filtering, clustering and ensemble models.

UNIT-I

NumPy Basics: Arrays and Vectorized Computation, Getting Started with pandas, Data Loading, Storage, and File Formats.

UNIT-II

Data Cleaning and Preparation, Data Wrangling: Join, Combine, and Reshape, Plotting and Visualization, Data Aggregation and Group Operations.

UNIT-III

Time Series, Advanced Pandas, Introduction to Modeling Libraries in Python, Data Analysis Examples, Inferential Statistics.

UNIT-IV

Finding a Needle in a Haystack, Making Sense of Data through Advanced Visualization, Performing Predictions with a Linear Regression, Estimating the Likelihood of Events.

UNIT-V

Generating Recommendations with Collaborative Filtering, Pushing Boundaries with Ensemble Models, Applying Segmentation with k-means Clustering, Analyzing Unstructured Data with Text Mining.

Text Books:

1. William McKinney, "Python for Data Analysis Data Wrangling with Pandas, NumPy and IPython", 2nd Edition, O'Reilly Media, 2017.
2. Samir Madhavan, "Mastering Python for Data Science", Packt Publishing, 2015.

Suggested Reading:

1. Joel Grus, "Data Science from Scratch", O'Reilly Media, 2015.
2. John V. Guttag, "Introduction to Computation and Programming Using Python– with Application to Understanding Data", The MIT Press, 2nd Edition, 2016.
3. Alberto Boschetti, Luca Massaron, "Python Data Science Essentials: A practitioner's guide covering essential data science principles, tools, and techniques", 3rd Edition, 2018.

Head Dept. of IT
CBIT, Hyderabad

Web Resources:

1. https://www.analyticsvidhya.com/
2. https://www.kaggle.com
3. https://www.dataschool.io/

Head Dept. of IT
CBIT, Hyderabad

18IT E16

CYBER SECURITY
(Core Elective – 4)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To present basic concepts of Cybercrime and Cyberattacks.
2. To introduce security challenges presented by mobile devices.
3. To impart knowledge on Tools and Methods used in Cybercrime.
4. To present fundamentals concepts in Cyber Forensics.
5. To familiarize about regulatory framework for Cybersecurity.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Describe legal and global perspectives of Cybercrimes and inspect how criminals plan the attacks.
2. Identify attacks, security policies and credit card frauds in mobile and wireless computing Era.
3. Examine phishing techniques, keyloggers, spywares, password cracking methods and types of thefts used in cybercrimes.
4. Demonstrate the need for computer forensics, relevance of OSI layer model and implications for evidential aspects.
5. Evaluate the cost of cybercrimes, web threats, IPR issues, organizational guidelines for Internet usage and safe computing.

UNIT-I
Introduction to Cybercrime: Definition and origins of the word, Cybercrime and Information security, who are cybercriminals, Classification of Cybercrimes, Legal Perspectives, Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era.
Cyberoffenses: Introduction, How Criminals plan the attacks, Social Engineering, CyberStalking, Cybercafe and Cybercrimes, Botnets, Attack vector, Cloud computing.

UNIT-II
Cybercrime Mobile and Wireless Devices:Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry settings for Mobile Devices, Authentication Service Security, Attack on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations,Organizational Measures for Handling Mobile Devices-Related Security Issues, Organizational security policies and measures in Mobile Computing Era, Laptops.

UNIT-III
Tools and Methods Used in Cybercrime: Introduction, Proxy servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms,Trojan Horses and Backdoors, Steganography, DoS and DDos Attacks, SQL Injection, Buffer Overflow, Attacks on wireless Networks.
Phishing and Identity Theft: Introduction, Phishing, Identity Theft.

UNIT-IV
Understanding Computer Forensics: Introduction, Historical Background of Cyberforensics, Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of E-mail, Digital Forensics Life cycle, Chain of Custody Concept, Network Forensics, Approaches a computer Forensics Investigation, Computer Forensics and Steganography, Relevance of the OSI 7 Layer model to computer Forensics, Forensics and social Networking Sites, Computer Forensics from Compliance perspective, Chanllenges in Computer Forensics, Special tools and Techniques, Forensics Auditing, Antiforensics.

Head Dept. of IT
CBIT, Hyderabad

UNIT-V

Cybersecurity Organizational Implications: Introduction, Cost of Cybercrimes and IPR Issues, Web Threats for Organizations, Security and Privacy Implications from Cloud Computing, Social Media Marketing, Social Computing and the Associated challenges for Organizations, Protecting People’s Privacy in the Organization, Organizational Guidelines for Internet Usage, Safe Computing Guidelines and Computer Usage Policy, Incident Handling, Forensics Best practices for Organizations.

Text Books:

1. Nina Godbole, Sunit Belapure, ”Cyber Security understanding Cyber Crimes, Computer forensics and Legal Perspectives”, Wiley India Pvt.Ltd., 2013.
2. Harsh Bothra, “Hacking Be A Hacker with Ethics”, Khanna Publishers 2017.

Suggested Reading:

1. William Stallings “Cryptography and Network Security Principles and Practice, 6th Edition, Pearson 2014.
2. Dr.V.K.Jain,”Cryptography and Network Security”, 1st Edition, Khanna Book publishing New Delhi 2013.
3. Nina Godbole,”Information Systems Security Security Management, Metrics, Frameworks and Best Practices”, Wiley, 2nd Edition, 2012.

Web Resources:

1. https://www.nist.gov/
2. https://www.sans.org/
3. https://www.udemy.com/the-complete-cyber-security-course-end-point-protection/

Head Dept. of IT
CBIT, Hyderabad

18MB C01 **ENGINEERING ECONOMICS AND ACCOUNTANCY**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
The Objectives of the course are:

1. To demonstrate the importance of Managerial Economics in Decision Making.
2. To explain the concept of Accountancy and provide basic knowledge on preparation of Final accounts.
3. To understand the importance of Project Evaluation in achieving a firm's Objective.

Course Outcomes:
Upon successful completion of this course, students will be able to:

1. Apply fundamental knowledge of Managerial economics concepts and tools.
2. Analyze various aspects of Demand Analysis, Supply and Demand Forecasting.
3. Understand production and cost relationships to make best use of resources available.
4. Apply accountancy concepts and conventions and preparation of final accounts.
5. Evaluate Capital and Capital Budgeting decision based on any technique.

Unit-I
Introduction to Managerial Economics: Introduction to Economics and its evolution - Managerial Economics - its Nature and Scope, Importance; Relationship with other Subjects. Its usefulness to Engineers; Basic concepts of Managerial economics - Incremental, Time perspective, Discounting Principle, Opportunity Cost, Equimarginal Principle, Contribution, Negotiation Principle.

Unit-II
Demand and Supply Analysis: Demand Analysis - Concept of Demand, Determinants, Law of demand - Assumptions and Exceptions; Elasticity of demand - Price, Income and Cross elasticity - simple numerical problems; Concept of Supply - Determinants of Supply, Law of Supply; Demand Forecasting - Methods.

Unit-III
Production and Cost Analysis: Theory of Production - Production function - Isoquants and Isocosts, MRTS, Input-Output Relations; Laws of returns; Internal and External Economies of Scale.
Cost Analysis: Cost concepts – Types of Costs, Cost-Output Relationship – Short Run and Long Run; Market structures – Types of Competition, Features, Price Output Determination under Perfect Competition, Monopoly and Monopolistic Competition; Break-even Analysis – Concepts, Assumptions, Limitations, Numerical problems.

Unit-IV
Accountancy: Book-keeping, Principles and Significance of Double Entry Book Keeping, Accounting Concepts and Conventions, Accounting Cycle, Journalization, Subsidiary books, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments. Ratio Analysis.

Unit-V
Capital and Capital Budgeting: Capital and its Significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Capital Budgeting, Methods: Traditional and Discounted Cash Flow Methods - Numerical problems.

Text Books:

1. MehtaP.L.,"Managerial Economics: Analysis, Problems and Cases", Sultan Chand & Son's Educational publishers, 2016.
2. Maheswari S.N. "Introduction to Accountancy", Vikas Publishing House, 11th Edition, 2013.
3. PandayI.M. "Financial Management", 11th edition, VikasPublishing House, 2015.

Head Dept. of IT
CBIT, Hyderabad

Suggested Reading:

1. Varshney and KL Maheswari, Managerial Economics, Sultan Chand, 2014.
2. M.Kasi Reddy and S.Saraswathi, Managerial Economics and Financial Accounting, Prentice Hall of India Pvt Ltd, 2007.
3. A.R.Aryasri, Managerial Economics and Financial Analysis, McGraw-Hill, 2013.

Head Dept. of IT
CBIT, Hyderabad

18EG O02 **GENDER SENSITIZATION**

(Open Elective – 1)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives

This course will introduce the students to:

1. Sensibility regarding issues of gender in contemporary India.
2. A critical perspective on the socialization of men and women.
3. Popular debates on the politics and economics of work while helping them reflect critically on gender violence.

Course Outcomes

Upon successful completion of this course, students will be able to:

1. Understand the difference between "Sex" and "Gender" and be able to explain socially constructed theories of identity.
2. Recognize shifting definitions of "Man" and "Women" in relation to evolving notions of "Masculinity" and "Femininity".
3. Appreciate women's contributions to society historically, culturally and politically.
4. Analyze the contemporary system of privilege and oppressions, with special attention to the ways gender intersects with race, class, sexuality, ethnicity, ability, religion, and nationality.
5. Demonstrate an understanding of personal life, the workplace, the community and active civic engagement through classroom learning.

UNIT – I

Understanding Gender:

Gender: Why Should We Study It? *(Towards a World of Equals: Unit -1)*

Socialization: Making Women, Making Men *(Towards a World of Equals: Unit -2)*

Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT – II

Gender And Biology:

Missing Women: Sex Selection and Its Consequences *(Towards a World of Equals: Unit -4)*

Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary *(Towards a World of Equals: Unit -10)*

Two or Many? Struggles with Discrimination.

UNIT – III

Gender and Labour:

Housework: the Invisible Labour *(Towards a World of Equals: Unit -3)*

"My Mother doesn't Work." "Share the Load."

Women's Work: Its Politics and Economics *(Towards a World of Equals: Unit -7)*

Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT-IV

Issues Of Violence

Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu"*.

Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.

Head Dept. of IT
CBIT, Hyderabad

Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)
Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT – V
Gender: Co - Existence
Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12)
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers.
Additional Reading: Rosa Parks-The Brave Heart.

Textbook:

1. A. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote,VasudhaNagaraj, AsmaRasheed, GoguShyamala, DeepaSreenivas and Susie Tharu "Towards a World of Equals: A Bilingual Textbook on Gender" published by Telugu Akademi, Hyderabad, Telangana State, 2015.

Suggested Reading:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. **"I Fought For My Life…and Won."**Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

Web Resources:

1. https://aifs.gov.au/publications/gender-equality-and-violence-against-women/introduction
2. https://theconversation.com/achieving-gender-equality-in-india

Note: Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

Head Dept. of IT
CBIT, Hyderabad

18EE M01 **INDIAN TRADITIONAL KNOWELDGE**

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
Credits	0

Course Objectives:
1. To get a knowledge in Indian Culture.
2. To Know Indian Languages and Literature and the fine arts in India.
3. To explore the Science and Scientists of Medieval and Modern India.

Course Outcomes:
After completion of this course, students will be able to:
1. Understand the culture, civilization, and heritage of Ancient, Medieval and Modern India.
2. Distinguish various Languages and Literature existing in India.
3. Discuss and Compare Philosophy and Religion in Indian since ancient times.
4. Explore various Fine arts in Indian History, and Illustrate the development of Science and Technology in India.
5. Describe the Indian Education System, and recognize the efforts of scientist to the development of India.

UNIT-I
Introduction to Culture: Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India.

UNIT-II
Indian Languages, Culture and Literature:
Indian Languages and Literature-I: the role of Sanskrit, significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India.
Indian Languages and Literature-II: Northern Indian languages & literature.

UNIT-III
Religion and Philosophy: Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only).

UNIT-IV
Fine arts in India (Art, Technology& Engineering): Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India.

UNIT-V
Education system in India: Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India.

Text Books:
1. Kapil Kapoor, Text and Interpretation: The India Tradition, ISBN: 81246033375, 2005.
2. Science in Samskrit, Samskrita Bharti Publisher, ISBN-13: 978-8187276333, 2007.
3. S. Narain, Examinations in ancient India, Arya Book Depot, 1993.
4. Satya Prakash, Founders of Sciences in Ancient India, Vijay Kumar Publisher, 1989.
5. M. Hiriyanna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, ISBN-13: 978 8120810990, 2014.

Suggested Reading:
1. Kapil Kapoor, Language, Linguistics and Literature: The Indian Perspective, ISBN-10: 8171880649, 1994.

2. Karan Singh, A Treasury of Indian Wisdom: An Anthology of Spiritual Learn, ISBN: 978-0143426158, 2016.

Head Dept. of IT
CBIT, Hyderabad

18IT C24 **ARTIFICIAL INTELLIGENCE LAB**

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:

1. To familiarize with search and game playing strategies.
2. To introduce logic programming concepts through Prolog.
3. To learn probabilistic reasoning on uncertain data.
4. To familiarize with supervised learning algorithms.
5. To introduce Natural Language Processing

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Build intelligent agent for search.
2. Implement logic programming.
3. Apply probabilistic reasoning on data.
4. Apply the techniques of supervised and reinforcement learning on data.
5. Perform NLP operations with and without NLTK.

List of Programs

1. Implementation of uninformed and informed search techniques.
2. Implementation of game search.
3. Installation of prolog and demonstration of basic operations.
4. Design of a Bayesian network from given data.
5. Demonstration of supervised learning algorithms.
6. Demonstration of reinforcement learning.
7. Design an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
8. Implementation of simple chatbot.
9. Demonstration of the following operations on text data.
   a. Removal of punctuations in the given string.
   b. Generation of string tokens.
10. Demonstration of the following operations using NLTK.
    a. Removal of stop words for a given passage from a text file.
    b. Stemming for a given sentence.
    c. POS tagging for a given sentence to classify text data.

Text Books:

1. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011.
2. Russell, Norvig, “Artificial intelligence - A Modern Approach”, Pearson Education, 3rd Edition, 2015.

Suggested Reading:

1. Rich, Knight, Nair: “Artificial intelligence”, Tata McGraw Hill, 3rd Edition, 2009.
2. Nicole Bauerle, Ulrich Rieder, “Markov Decision Process with Applications to Finance”, Springer, 2011.
3. Nilsson, N., “Artificial Intelligence: A New Synthesis”, Morgan Kaufmann, 1st Edition, 1998.

Web Resources:

1. https://ai.berkeley.edu/project_overview.html
2. http://aima.cs.berkeley.edu/

Head Dept. of IT
CBIT, Hyderabad

18IT C25 **INFORMATION SECURITY LAB**

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:
1. To provide basic cryptography techniques for securing the data.
2. To impart knowledge on symmetric and Asymmetric encryption techniques.
3. To facilitate understanding of digital signatures and key management.
4. To deal with the configuration and use of technologies designed to segregate the organization's systems from the insecure Network.
5. To familiarize with various security threats that modern organizations face.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Demonstrate encryption and decryption methods using substitution, transposition and product ciphers.
2. Develop the code using symmetric and asymmetric encryption algorithms like AES, Blowfish and Diffie Hellman key exchange.
3. Build the program to calculate the message digest of a text using Hash algorithms like MD5 and SHA1.
4. Construct the code using digital signature algorithm to solve data integrity problems.
5. Experiment with rootkits,wireshark,Nmap to troubleshoot network problems and to develop and test software.

List of Programs
1. Program to implement encryption and decryption using the following:
   a) Substitution cipher b) Transposition Cipher c) Product Cipher
2. Program to implement AES Algorithm.
3. Program to implement Blowfish algorithm.
4. Program to implement the Diffie-Hellman Key exchange algorithm.
5. Program to calculate the message digest of a text using the SHA-1 algorithm.
6. Program to calculate the message digest of a text using the MD5 algorithm.
7. Program to implement Digital Signature algorithm.
8. Demonstrate intrusion detection system using SNORT tool or any other sofware.
9. Installation of rootkits and study about the variety of options.
10. Implement Wireshark to capture the packets and interfaces.
11. Setup a honey pot and monitor the honeypot on network using KF sensor.
12. Demonstrate how to managing securing policies using tcpdump, dumpcap using Wireshark.
13. Demonstration of pentest tools using Nmap, Wireshark.

Text Books:
1. Michael Gregg, "Build Your Own Security Lab" ,Wiley Publishing, Inc.,2008.
2. Michael E.whitman, Herbert J.Mattord,Andrew Green ,"Hands on Information Security lab manual", Cengage Learning, Fourth edition, December 27, 2013.

Suggested Readings:
1. Alfred Basta, Wolf Halton, "Computer Security, concepts, issues and implementation", Cengage Learning India Pvt Ltd, 2008.
2. William Stallings, "Cryptography and Network Security principles and practice", 5th Edition, Pearson Education, Inc., publishing as Prentice Hall 2011.

Head Dept. of IT
CBIT, Hyderabad

Web Resources:

1. https://www.sans.org/security-resources/blogs
2. http://opensecuritytraining.info/HTID.html
3. http://cyber.gatech.edu/research
4. https://www.udemy.com/topic/penetration-testing/
5. https://nmap.org/
6. https://www.bornfortech.net/best-rootkit-remover/
7. https://www.snort.org/
8. https://www.wireshark.org/

Head Dept. of IT
CBIT, Hyderabad

18IT C26 **MINI PROJECT – IV**

Instruction	2 Hours per week
Duration of SEE	-
SEE	-
CIE	50 Marks
Credits	1

Course Objectives:

1. To enable students to learn by doing.
2. To develop capability to analyse and solve real world problems.
3. To develop innovative ideas among the students

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Interpret Literature with the purpose of formulating a project proposal.
2. Planning, analyzing, Designing and implement a software project using SDLC model.
3. Find the solution of identified problem with the help of modern Technology and give priority to real time scenarios.
4. Plan to work as a team and to focus on getting a working project done and submit a report with in a stipulated period of time.
5. Final Seminar, as oral Presentation before departmental Committee.

The Students are required to implement a project from opted subject in the core elective - 4. During the implementation of the project, Personnel Software Process (PSP) has to be followed. Report of the project work is to be submitted at the end of the Semester for evaluation.

Schedule

S.No	Programming concepts are to be taught related to the courses choosen from core elective – 4	4 weeks
1.	Problem Identification / Selection	2 weeks
2.	Preparation of Abstract	1 week
3.	Design, Implementation & Testing of the Project	5 weeks
4.	Documentation & Project Presentation	2 weeks

Guidelines for the Award of marks

S.No.	Description	Max. Marks
1.	Weekly Assesment	20
2.	PPT Preparation	05
3.	Presentation	10
4.	Question and Answers	05
5.	Report Preparation	10

Final Mini Project demonstration and PPT presentation is to be evaluated for the entire class together by all the faculty handling Mini Project for that class.

Head Dept. of IT
CBIT, Hyderabad

18IT C27 **BIG DATA ANALYTICS**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To introduce the importance of big data, role of Hadoop framework in analyzing large datasets.
2. To gain knowledge of writing mapper and reducer for a given problem.
3. To provide the concepts of NoSQL databases and the working mechanisms of MongoDB.
4. To familiarize writing queries in Pig and Hive to process big data.
5. To discuss the concept and writing applications using Spark.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand and analyze the processing of large datasets in Hadoop framework.
2. Apply MapReduce architecture to solve real world problems.
3. Understand NoSQL databases and create data models using MongoDB.
4. Develop scripts using Pig over large datasets and query using Hive.
5. Understand the fundamentals of the Scala programming and exercise Resilient Distributed Datasets (RDDs) for creating applications in Spark.

UNIT-I

Introduction to Big Data: Importance of Big Data, when to consider Big Data as a solution, Big Data use cases: IT for IT Log Analytics, The Fraud Detection Pattern, and Social Media Pattern.

The Hadoop Distributed Files system: The Design of HDFS, HDFS Concepts, Blocks, Name nodes and Data nodes, Block Caching, HDFS Federation, HDFS High Availability, The Command-Line Interface, Basic File system Operations, Hadoop File systems, Interfaces, The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the File System API, Writing Data, Directories, Querying the File system, Deleting Data, Data Flow, Anatomy of a File Read, Anatomy of a File Write.

UNIT-II

MapReduce: What is Map reduce, Architecture of map reduce.

How MapReduce Works: Anatomy of a MapReduce Job Run, Job Submission, Job Initialization, Task Assignment, Task Execution, Progress and Status Updates, Job Completion, Failures, Task Failure, Application Master Failure, Node Manager Failure, Resource Manager Failure, Shuffle and Sort, The Map Side, The Reduce Side, MapReduce Types and Formats: MapReduce Types, The Default MapReduce Job, Input Formats, Input Splits and Records, Text Input, Output Formats, Text Output, Developing a MapReduce Application.

UNIT-III

No SQL Databases: Review of traditional Databases, Need for NoSQL Databases, Columnar Databases, Failover and reliability principles, CAP Theorem, Differences between SQL and NoSQL databases, **Working mechanisms of Mongo DB:** Overview, Advantages, Environment, Data Modelling, Create Database, Drop Database, Create collection, Drop collection, Data types, Insert, Query, Update and Delete operations, Limiting and Sorting records, Indexing, Aggregation.

UNIT-IV

Pig: Installing and Running Pig, an Example, Generating Examples, Comparison with Databases, Pig Latin, User-Defined Functions, Data Processing Operators, Pig in Practice.

Hive: Installing Hive, The Hive Shell, An Example, Running Hive, Comparison with Traditional Databases, HiveQL, Tables, Querying Data, User-Defined Functions, Writing a User Defined Functions, Writing a User Defined Aggregate Function.

UNIT-V

Spark: Importance of Spark Framework, Components of the Spark unified stack, Batch and Real-Time Analytics with Apache Spark, Resilient Distributed Dataset (RDD), SCALA (Object Oriented and Functional

Head Dept. of IT
CBIT, Hyderabad

Programming) **Scala**: Scala Environment Set up, Downloading and installing Spark standalone, Functional Programming, Collections.

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", 4^{th} Edition, O'Reilly Media Inc, 2015.
2. Tanmay Deshpande, “Hadoop Real-World Solutions Cookbook”, 2^{nd} Edition, Packet Publishing 2016.

Suggested Reading:

1. Thilinagunarathne Hadoop MapReduce v2 Cookbook – 2^{nd} Edition, Packet Publishing, 2015.
2. Chuck Lam, Mark Davis, Ajit Gaddam, “Hadoop in Action”, Manning Publications Company, 2016.
3. Alan Gates, "Programming Pig", O'Reilly Media Inc, 2011.

Web Resources:

1. http://www.planetcassandra.org/what-is-nosql
2. http://www.iitr.ac.in/media/facspace/patelfec/16Bit/index.html
3. https://class.coursera.org/datasci-001/lecture
4. http://bigdatauniversity.com

Head Dept. of IT
CBIT, Hyderabad

18IT C28 **EMBEDDED SYSTEMS**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To introduce the architecture, instruction set of 8085 and Assembly language programming.
2. To facilitate with the understanding of the functionality and interfacing of various peripheral devices.
3. To provide basic concepts of embedded system development using 8051.
4. To deal with theoretical aspects of the design and development of an embedded system.
5. To familiarize with different debugging techniques, hardware and software tools.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Make use of the architecture, instruction set of 8085 and write Assembly language programs.
2. Examine the interface with peripheral devices like Keyboard and Display devices.
3. Inference the embedded systems and its applications using 8051 Microcontroller.
4. Interpret the design issues of Microcontroller based embedded systems.
5. Identify and test Embedded systems using Hardware tools like Multi meter, Logic Analyzer and Software tools like Emulator, Simulator etc.

UNIT-I
8085 Microprocessor Architecture: Introduction to Microprocessors, The 8085 MPU: The 8085 Microprocessor, Microprocessor Communication and Bus Timings, De-multiplexing the Bus AD7-AD0, Generating Control Signals, A Detailed Look at the 8085 MPU and its Architecture, Decoding and Executing an Instruction**.**
Programming the 8085: Introduction to 8085 instructions: Data Transfer Operations, Arithmetic Operation, Logic Operations, Branch Operations, Writing Assembly Language Programs, Debugging a Program. Programming techniques with Additional instructions: Programming Techniques-Looping, Counting and Indexing, Additional Data Transfer and 16-Bit Arithmetic Instructions, Arithmetic Operations Related to memory, Logic Operations: Rotate and Compare.

UNIT-II
Stacks and subroutines: Stack, Subroutine, Restart, Conditional CALL and RETURN instructions, Advanced Subroutine Concepts. **Interrupts:** The 8085 Interrupt, 8085 Vectored Interrupts: TRAP, RST 7.5, 6.5, AND 5.5, **Additional I/O Concepts and Processes:** Programmable Interrupt Controller (8259A), Direct Memory Access (DMA) and 8257 DMA controller. Programmable Peripheral Interface (Intel 8255A), Programmable Communication Interface (Intel 8251).

UNIT-III
The 8051 Architecture: Introduction, 8051 Micro controller Hardware, Input/output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/Output, Interrupts, Programming using 8051, Data Transfer and Logical Instructions. Arithmetic Operations, Decimal Arithmetic, Jump and Call Instructions, **Applications:** Interfacing with Keyboards, Displays, D/A and A/D Conversions, Multiple Interrupts.

UNIT-IV
Embedded System Design Cycle: Embedded system design and co-design issues in system development process, Design cycle in the development phase for an embedded systems. **Embedded software development tools:** Host and Target machines, Linker/Locators for embedded software, Embedded software into the target system.

UNIT – V
Debugging tools and Applications: Integration and testing of embedded hardware, Testing methods, Debugging techniques, Laboratory tools and target hardware debugging: Logic Analyzer, Simulator, Emulator

Head Dept. of IT
CBIT, Hyderabad

and In-Circuit Emulator, IDE, RTOS services, VxWorks features. Case Studies: Embedded system design for automatic vending machines and digital camera.

Text Books:

1. Ramesh S Gaonkar, "Microprocessor Architecture, Programming and Applications with the8085", 5th Edition, Prentice Hall, 2002
2. Kenneth J.Ayala, "The 8051 Microcontroller", 3rd Edition, Thomson.
3. Raj Kamal, "Embedded Systems-Architecture, Programming and Design," 3rd Edition, Tata McGraw Hill Education, 2015.

Suggested Reading:

1. William Stallings, "Computer Organization and Architecture, Design for Performance", Pearson, 9th Edition, 2013
2. Shibu K V, "Introduction to Embedded systems", 1st Edition, McGraw Hill Education, 2009.

Web Resources:

1. https://slideplayer.com/slide/3944480/
2. https://nptel.ac.in/noc/individual_course.php?id=noc17-cs05
3. https://slideplayer.com/slide/5740917/
4. http://www.technolamp.co.in/2011/04/computer-organization-carl-hamacher.html
5. https://inspirit.net.in/viewer/Li9ib29rcy9hY2FkZW1pYy84MDg1IE1pY3JvcHJvY2Vzc29yIC0gUmFtZXNoIEdhb25rYXIucGRm
6. https://nptel.ac.in/courses/106103068/

Head Dept. of IT
CBIT, Hyderabad

18IT C29 **INTERNET OF THINGS**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To provide an overview of Internet of Things, building blocks of IoT and real-world applications.
2. To explore various IoT enabling technologies.
3. To facilitate with Python scripts.
4. To identify steps in IoT design Methodology.
5. To introduce about the Raspberry Pi device, its interfaces and Django Framework.

Course Outcomes:
Upon successful completion of this course, students will be able to:

1. Outline the terminology, protocols, Communication models and Communication APIs of IoT.
2. Define the various IoT enabling technologies, Levels, Domain specific Applications and differentiation between M2M and IoT.
3. Make use the basics of Python Programming for developing IoT applications.
4. Infer the steps involved in IoT platform design methodology and interpret physical devices like Raspberry Pi3.
5. Analyze Data with Physical servers and develop web applications using Django frame work.

UNIT-I
Introduction: Internet of Things- Definitions & Characteristics of IoT, Physical Design of IoT-Physical Layer, Network Layer, Transport Layer, Application Layer, Things in IoT, IoT Protocols, Logical Design of IoT-IoT Functional Blocks, IoT Communication Models-Request-response, Publisher-Subscriber, Push-Pull, Exclusive Pair, IoT Communication APIs-REST API, Websocket API.

UNIT-II
IOT Enabling Technologies: Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IoT Levels and Deployment Templates. M2M, Differences and similarities between IoT and M2M, SDN and NFV for IoT. **Domain Specific IoT** – IoT applications for Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

UNIT-III
Introduction to Python: Motivation for using Python for designing IoT systems, Language features of Python, Data types- Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions, Data Structures: Control of flow-if, for, while, range, break/continue, pass functions, modules, packaging, file handling, data/time operations, classes, Exception handling.

UNIT-IV
IoT Platforms Design Methodology: Introduction, IoT Design Methodology Steps-Purpose and Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device and Component Integration, Application Development, Case Study on IoT System for Weather Monitoring.
IoT Physical Devices and End Points: Basic building blocks of an IoT device, Raspberry Pi About the Raspberry Pi board, Raspberry Pi interfaces-Serial, SPI, I2C, Other IoT Devices pcDuino, Beagle Bone Black, Cubie board.

UNIT-V
IoT Physical Servers and cloud offerings: Introduction to cloud storage models and communication APIs, WAMP, Xively cloud for IoT, Python Web Application Framework: Django Framework Django Architecture, Designing a RESTful Web API, Amazon web services for IoT. SkyNet IoT messaging platform.

Head Dept. of IT
CBIT, Hyderabad

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things - A Hands-on Approach, Universities Press, 2015.
2. Matt Richardson, Shawn Wallace, “Getting Started with Raspberry Pi”, O'Reilly (SPD), 2014.

Suggested Reading:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1^{st} Edition, Academic Press, 2014.
2. Francis da Costa, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1^{st} Edition, Apress Publications, 2013.
3. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347- 4, Willy Publications.

Web Resources:

1. The Internet of Things - Article https://dl.acm.org/citation.cfm?id=1862541
2. Internet of Things - Tutorial. http://archive.eurescom.eu/~pub/about-eurescom/message_2009_02/Eurescom_message_02_2009.pdf
3. Publications on the Internet of Things. http://www.itu.int/osg/spu/publications/internetofthings/InternetofThings_summary.pdf

Head Dept. of IT
CBIT, Hyderabad

18IT C30 **DISTRIBUTED SYSTEMS**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To present the basic principles and architectures of distributed systems.
2. To familiarize the concepts of processes, threads and various communication methods.
3. To introduce the concepts of naming, directory services and synchronization in Distributed environment.
4. To impart knowledge on the principles of consistency and replication, fault tolerance in distributed systems.
5. To provide understanding of various distributed object based systems.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Describe the various concepts, types and architectures of distributed systems.
2. Illustrate the processes and various communication techniques for distributed systems.
3. Demonstrate various naming and synchronization mechanism in distributed systems.
4. Analyse consistency, replication and fault tolerance in distributed systems.
5. Evaluate various distributed object-based systems with applications.

UNIT–I
Introduction: Definition of A Distributed System; Goals- Making Resources Accessible, Distribution Transparency, Openness, Scalability; Types of Distributed Systems- Distributed Computing Systems, Distributed Information Systems, Distributed Pervasive Systems.
Architectures: Architectural Styles, System Architectures- Centralized Architectures, Decentralized Architectures, Hybrid Architectures; Architectures versus Middleware-Interceptors, General Approaches to Adaptive Software.

UNIT–II
Processes: Threads - Introduction to Threads, Threads in Distributed Systems; Virtualization - The Role of Virtualization In Distributed Systems, Architectures of Virtual Machines; Clients- Networked User Interfaces, Client-Side Software for Distribution Transparency; Servers- General Design Issues, Server Clusters, Managing Server Clusters; Code Migration- Approaches to Code Migration, Migration and Local Resources, Migration in Heterogeneous Systems.
Communication: Fundamentals- Layered Protocols, Types of Communication; Remote Procedure Call- Basic RPC Operation, Parameter Passing, Asynchronous RPC; Message-Oriented Communication- Message Oriented Transient Communication, Message Oriented Persistent Communication; Stream-Oriented Communication- Support for Continuous Media, Streams and Quality of Service, Stream Synchronization; Multicast Communication- Application-Level Multicasting, Gossip-Based Data Dissemination.

UNIT-III
Naming: Names, Identifiers, and Addresses; Flat Naming- Simple Solutions, Home-Based Approaches, Distributed Hash Tables, Hierarchical Approaches; Structured Naming- Name Spaces, Name Resolution, the Implementation of a Name Space; Attribute-based Naming- Directory Services, Hierarchical Implementations: LDAP, Decentralized Implementations.
Synchronization: Clock Synchronization- Physical Clocks, Global Positioning System, Clock Synchronization Algorithms; Logical Clocks- Lamport's Logical Clocks, Vector Clocks; Mutual Exclusion-Overview, A Centralized Algorithm, A Decentralized Algorithm, A Distributed Algorithm, A Token Ring Algorithm, A Comparison of the Four Algorithms; Global Positioning of Nodes; Election Algorithms- Traditional Election Algorithms, Elections in Wireless Environments, Elections in Large Scale Systems.

Head Dept. of IT
CBIT, Hyderabad

UNIT-IV

Consistency And Replication: Introduction- Reasons for Replication, Replication as Scaling Technique; Data-Centric Consistency Models- Continuous Consistency, Consistent Ordering of Operations; Client-Centric Consistency Models- Eventual Consistency, Monotonic Reads, Monotonic Writes, Read your Writes, Writes Follow Reads; Replica Management- Replica-Server Placement, Content Replication and Placement, Content Distribution; Consistency Protocols- Continuous Consistency, Primary-Based Protocols, Replicated-Write Protocols, A Cache-Coherence Protocols, Implementing Client-Centric Consistency.

Fault Tolerance: Introduction To Fault Tolerance-Basic Concepts, Failure Models, Failure Masking by Redundancy; Process Resilience- Design Issues, Failure Masking and Replication, Agreement in Faulty Systems, Failure Detection; Reliable Client-Server Communication- Point-To-Point Communication, RPC Semantics in The Presence Of Failures; Reliable Group Communication- Basic Reliable-Multicasting Schemes, Scalability in Reliable Multicasting, Atomic Multicast; Distributed Commit-Two-Phase Commit, Three-Phase Commit; Recovery- Introduction, Checkpointing, Message Logging, Recovery-Oriented Computing.

UNIT-V

Distributed Object-Based Systems: Architecture- Distributed Objects, Example: Enterprise Java Beans, Example- Globe Distributed Shared Objects; Processes- Object Servers, Example: The Ice Runtime System; Communication- Binding a Client to an Object, Static versus Dynamic Remote Method Invocations, Parameter Passing, Example: Java RMI, Object-Based Messaging; Naming- CORBA Object References, Globe Object References; Synchronization, Consistency and Replication- Entry Consistency, Replicated Invocations; Fault Tolerance- Example: Fault-Tolerant CORBA, Example: Fault-Tolerant Java; Security- Example: GLOBE , Security for Remote Objects.

Text Books:

1. Andrew S. Tanenbaum and Van Steen "Distributed Systems: Principles and Paradigms", PHI, 2^{nd} Edition, 2014.
2. Colouris G., Dollimore Jean and Kindberg Tim, "Distributed Systems Concepts and Design", Pearson education, 5^{th} Edition, 2012.

Suggested Reading:

1. Sunitha Mahajan, Seema Shah, “Distributed Computing”, Oxford University Press, 2^{nd} Edition, 2013.
2. S.Ghosh, Chapman & Hall/CRC, “Distributed Systems”, Taylor & Francis Group, 2010.
3. Ajay D. Kshemakalyani & MukeshSinghal, “Distributed Computing, Principles, Algorithms and Systems”, Cambridge, 2010.

Web Resource:

1. https://nptel.ac.in/courses/106106168/

Head Dept. of IT
CBIT, Hyderabad

18IT E17 **CLOUD COMPUTING**

(Core Elective-5)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To familiarize basic concepts of cloud computing and enabling technologies.
2. To introduce Auto-Scaling, capacity planning and load balancing in cloud.
3. To impart knowledge on issues related to security, privacy and compliance.
4. To introduce cloud management standards and programming models.
5. To deal with the basics of Service oriented architecture and databases in cloud.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Explain different types of cloud computing concepts and the techniques.
2. Determine the issues related to scaling, capacity planning and load balancing.
3. Estimate the security and compliance issues in clouds.
4. Analyse the Portability and Interoperability issues of cloud virtualization.
5. Evaluate the importance of SOA and database technology.

UNIT-I

Introduction: Limitations of the Traditional Computing Approaches, Three Layers of Computing, Three Layers in Traditional Computing, The End of Traditional Computing, Influences behind Cloud Service Adoption. **Benefits and challenges:** Origin of the Term 'Cloud Computing', Early Initiatives, Utility Computing, Metering and Billing in Cloud, Separation of Data Center Operation, Benefits of Cloud Computing, Challenges of Cloud Computing, How Cloud Computing Addresses Business Challenges, Ethical Issues in Cloud Computing, Cloud Computing: Network as Computer, Role of Web Service, Role of API, Ubiquitous Cloud, Confusion Between Cloud and Internet. Cloud computing services, Resource Virtualization, Resource pooling, sharing and provisioning.

UNIT-II

Scaling in cloud: Introduction to Scaling, Scaling in Traditional Computing, Scaling in Cloud Computing, Foundation of Cloud Scaling, Scalable Application , Scaling Strategies in Cloud, Auto-Scaling in Cloud, Types of Scaling , Performance and Scalability , the Resource Contention Problem , Cloud Bursting: A Scenario of Flexible Scaling, Scalability is a Business Concern, **Capacity Planning:** Capacity Planning, Capacity Planning in Computing, Capacity Planning in Cloud Computing, Approaches for Maintaining Sufficient Capacity, Steps for Capacity Planning, **Load Balancing:** Load Balancing , Importance of Load Balancing in Cloud Computing, Load Balancing in Cloud, Goals of Load Balancing, Categories of Load Balancing, Load Balancing Algorithms, Case study on Google cloud and Amazon Elastic Compute Cloud (EC2), File System and Storage.

UNIT-III

Content Delivery Network: CDN Service Operations, Evolution of CDN, Advantages of CDN, Disadvantages of CDN, CDN Service Provider, Security Reference Model, **Security Issues:** Cloud security, threats to Cloud Security, Infrastructure Security, Information Security, Identity Management and Access Control, Cloud Security Design Principles, Cloud Security Management Frameworks, Security-as-a-Service, Privacy and Compliance Issues.

UNIT-IV

Portability and Interoperability Issues: Challenges in the Cloud, The Issues in Traditional Computing, Addressing Portability and Interoperability in Cloud, Portability and Interoperability Scenarios, Machine Imaging or Virtual Machine Image, Virtual Appliance, Difference between Virtual Machine Image and Virtual Appliance, Open Virtualization Format (OVF), Cloud Management and a Programming Model Case Study, Popular Cloud Services.

Head Dept. of IT
CBIT, Hyderabad

UNIT-V

Service-Oriented Architecture: The Pre-SOA Era, Role of SOA in Cloud Computing, Service-Oriented Architecture, Goal of System Designing, Service Represents Business Functionality, Open Standard Implementation, Benefits of SOA, SOA and Cloud Computing. **Database Technology:** Database in Cloud, Data Models, Database-as-a-Service, Relational DBMS in Cloud, Non-relational DBMS in Cloud.

Text Book:

1. Sandeep Bhowmik, “Cloud Computing”, Cambridge University Press, 2017.

Suggested Reading:

1. Kai Hwang, Geoffrey C.Fox, Jack J.Dongarra, “Distributed and Cloud Computing from Parallel Processing to the Internet of Things”, Elsevier, 2012.
2. Barrie Sosinsky” Cloud Computing Bible”, Wiley-India, 2010
3. Ronald L. Krutz, Russell Dean Vines “Cloud Security: A Comprehensive Guide to Secure Cloud Computing”, Wiley- India,2010
4. John W. Rittenhouse, James F. Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2009.

Web Resource:

1. https://nptel.ac.in/courses/106105167/1

Head Dept. of IT
CBIT, Hyderabad

18IT E20 **BLOCK CHAIN TECHNOLOGY**

(Core Elective – 5)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To provide Conceptual understanding of how block chain technology can be used to improve business processes.
2. To facilitate understanding of bit coin crypto currency system.
3. To impart knowledge about building and deploying block chain applications.
4. To introduce new ways of using block chain technology for applications other than crypto currency.
5. To familiarize with platforms such as Ethereum, Hyperledger Fabric involved in building block chain applications.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the concepts of Block chain technology and describe how the Block chain systems work.
2. Explain the working of bit coin crypto currency.
3. Develop and deploy block chain application for on premise and cloud-based architecture.
4. Incorporate ideas from various domains and implement them using block chain technology in different perspectives.
5. Devise smart contract using Hyperledger Fabric and Ethereum frameworks.

UNIT-I

Introduction: Overview of Block chain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Crypto currency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chain.

Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency.

UNIT-II

Bitcoin and Block chain: Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay.

Working with Consensus in Bitcoin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) —basic introduction, Hashcash PoW, Bitcoin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

UNIT-III

Permissioned Block chain: Permissioned model and use cases, Design issues for Permissioned block chains, Execute contracts, State machine replication, Overview of Consensus models for permissioned block chain-Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems.

UNIT-IV

Enterprise application of Block chain: Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade — Trade Finance Network, Supply Chain Financing, Identity on Block chain.

UNIT-V

Hyperledger Fabric: Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and Corda.

Head Dept. of IT
CBIT, Hyderabad

Text Books:

1. Melanie Swan, "Block Chain: Blueprint for a New Economy", 1st Edition O'Reilly, 2015.
2. Andreas Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”, 1st Edition, O’Relly, 2015.

Suggested Reading:

1. Iran Bashir “Mastering Blockchain” 2nd Edition Paperback 2018.
2. Daniel Drescher, “Block Chain Basics”, 1st Edition, Apress, 2017.
3. Ritesh Modi, “Solidity Programming Essentials: A Beginner’s Guide to Build Smart Contracts for Ethereum and Block Chain”, Packt Publishing.

Web Resources:

1. https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html
2. https://www.hyperledger.org/projects/fabric
3. https://www.packtpub.com/big-data-and-business-intelligence/hands-blockchain-hyperledger
4. https://www.amazon.com/Hands-Blockchain-Hyperledger-decentralized-applications/dp/1788994523
5. https://github.com/HyperledgerHandsOn/trade-finance-logistics

Head Dept. of IT
CBIT, Hyderabad

18IT C31 **BIG DATA ANALYTICS LAB**

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:

1. To provide the knowledge to setup a Hadoop Cluster and implement applications using MapReduce.
2. To introduce Pig, PigLatin and HiveQL to process big data.
3. To gain knowledge to work with NoSQL databases.
4. To get familiarize with latest big data frameworks and writing applications using Spark and Scala.
5. To learn processing large datasets in Hadoop and visualizing its results in R (RHadoop).

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand Hadoop working environment and develop applications using MapReduce framework.
2. Develop scripts using Pig to solve real world problems and query the datasets using Hive.
3. Write NoSQL queries to large datasets.
4. Develop applications in Spark environment using RDDs.
5. Analyze and visualize applications in R language by integrating Hadoop.

List of Programs

1. Understanding and using basic HDFS commands
2. Word count application using Mapper Reducer on single node cluster
3. Analysis of Weather Dataset on Multi node Cluster using Hadoop
4. Real world case studies on Map Reduce applications
5. Working with files in Hadoop file system: Reading, Writing and Copying
6. Writing User Defined Functions/Eval functions for filtering unwanted data in Pig
7. Working with HiveQL
8. Writing User Defined Functions in Hive
9. Understanding the processing of large dataset on Spark framework.
10. Integrating Hadoop with other data analytic framework like R

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Media Inc, 2015.
2. Tanmay Deshpande, “Hadoop Real-World Solutions Cookbook”, 2nd Edition, Packt Publishing 2016.

Suggested Reading:

1. Edward Capriolo, Dean Wampler, and Jason Rutherglen, "Programming Hive", O'Reilly Inc, 2012.
2. Vignesh Prajapati, "Big data Analytics with R and Hadoop", Packt Publishing, November 2013.

Web Resources:

1. https://parthgoelblog.wordpress.com/tag/hadoop-installation
2. http://www.iitr.ac.in/media/facspace/patelfec/16Bit/index.html
3. https://class.coursera.org/datasci-001/lecture
4. http://bigdatauniversity.com.

Head Dept. of IT
CBIT, Hyderabad

18IT C32 **EMBEDDED SYSTEMS AND IOT LAB**

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:

1. To familiarize with architecture, instruction set of 8085 and assembly language programming.
2. To impart knowledge about the functionality and interfacing of peripheral devices.
3. To provide an overview of basic concepts and development of embedded systems using 8051.
4. To deal with theoretical aspects of the design and development of an embedded system.
5. To facilitate understanding of different debugging techniques and hardware and software tools.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Construct the basic Assembly Language programming using instruction set of 8085 & 8051.
2. Demonstrate and Interface embedded systems applications using 8051.
3. Develop python scripts that run on Raspberry Pi3.
4. Experiment with LEDs, Sensors using Raspberry Pi3.
5. Modify and Compose IoT systems using Raspberry Pi3.

List of Experiments

A. Introduction to 8085 instruction set and microprocessor trainer kit.
   1. Assembly language programs using Arithmetic and logic instructions.
   2. Assembly language programs using branch and conditional instructions.

B. Use of 8-bit and 32-bit Microcontrollers, (such as 8051 Microcontroller, ARM2148 / ARM2378, LPC 2141/42/44/46/48) and C compiler (Keil, Ride etc.) to:
   1. Interface Input-Output and other units such as: Relays, LEDs, LCDs, Switches, Keypads, Stepper Motors, and ADCs.
   2. Develop Control Applications such as: Temperature Controller, Elevator Controller, Traffic Controller.

C. Internet of Things (IoT) Experiments

Following are some of the programs that a student should be able to write and test on Raspberry Pi3, but not limited to this only.

1. Switching LED on/off from Raspberry Pi3 Console.
2. Interfacing an LED and Switch with Raspberry Pi3.
3. Interfacing a Light Sensor with Raspberry Pi3.
4. Interfacing Rain Sensing Automatic Wiper System.
5. Interfacing to identify accident and send alert messages.
6. Interfacing smoke sensor to give alert message to fire department.
7. Implementation of Traffic Light System based on density.
8. Design and develop IoT Solar Power Monitoring System.
9. Design and develop Patient health monitoring system.
10. Implementation of Home Automation System using WiFi Module.

Text Books:

1. Ramesh S Gaonkar, “Microprocessor Architecture, Programming and Applications withthe 8085”, 5th Edition, Prentice Hall, 2002.
2. Kenneth J.Ayala, “The 8051 Microcontroller”, 3rd Edition, Thomson 2014.
3. ArshdeepBahga, Vijay Madisetti, “Internet of Things: A Hands-on Approach”, Universities Press 2014.

Head Dept. of IT
CBIT, Hyderabad

Suggested Reading:

1. Raj Kamal, "Embedded Systems", 2nd Edition, McGraw Hill 2015.
2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.

Web Resources:

1. https://www.edgefx.in/8051-microcontroller-architecture/.
2. https://nptel.ac.in/courses/108105102/11
3. http://www.circuitbasics.com/raspberry-pi-ds18b20-temperature-sensor-tutorial/.
4. https://raspberrypihq.com/making-a-led-blink-using-the-raspberry-pi-and-python/.

Head Dept. of IT
CBIT, Hyderabad

18IT C33 **DISTRIBUTED SYSTEMS LAB**

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:

1. To learn the concepts like virtual time, agreement and consensus protocols.
2. To familiarise various distributed architectures.
3. To introduce the basics of IPC, Group communication and RPC.
4. To illustrate the methods of the DFS and DSM concepts.
5. To present transaction management in distributed environment.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Design a chat server to simulate multi-client server environment.
2. Develop file transfer using FTP.
3. Develop middleware using RMI.
4. Demonstrate the functionality of a distributed environment using 2-Phase Commit Protocol.
5. Demonstrate Distributed File System using NFS.

List of Programs

1. Demonstrate the TCP and UDP Communication.
2. Develop an FTP Client with a GUI interface for the access of all services.
3. Implement Chat Server Application.
4. Implement a mini DNS protocol using RMI.
5. Implement Multicasting.
6. Implement a Two-Phase Commit for distributed transaction management.
7. Understanding of working of NFS (Includes exercises on Configuration of NFS).
8. Implement thread communication in Distributed environment.
9. Implement Database Replication.
10. Create CORBA based server-client application.

Text Book:

1. Andrew S. Tanenbaum and Van Steen, “Distributed Systems: Principles and Paradigms”, PHI, 2nd Edition (2014).

Suggested Reading:

1. Colouris, Dollimore and Kindberg, “Distributed Systems Concepts and Design”, 5th Edition (2012), Pearson Education, India.
2. Sunitha Mahajan, Seema Shah, “Distributed Computing”, Oxford University Press, 2nd Edition, 2013

Head Dept. of IT
CBIT, Hyderabad

18IT C34 **PROJECT PART-1**

Instruction	4 Hours per week
CIE	50 Marks
Credits	2

The objective of Project Part -1 is to enable the student take up investigative study in the broad field of Engineering / Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) towards R&D. The work shall include:

1. Survey and study of published literature on the assigned /selected topic.
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminary Analysis /Modeling/Simulation/Experiment/Design /Feasibility.
4. Preparing a Written Report on the Study conducted for Presentation to the Department.
5. Final Seminar, as oral Presentation before a departmental Committee.

Guidelines for the award of Marks :Max. Marks: 50

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
Supervisor	20	Project Status / Review
	5	Report
Department Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Preparation

Head Dept. of IT
CBIT, Hyderabad

18ME O04 **ENTREPRENEURSHIP**

(Open Elective- 2)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Concept and procedure of idea generation.
2. The nature of industry and related opportunities and challenges.
3. Elements of business plan and its procedure.
4. Project management and its techniques.
5. Behavioral issues and Time management.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the concept and essenceofentrepreneurship.
2. Identify business opportunities and natureof enterprise.
3. Analyze the feasibility of newbusiness plan.
4. Apply project management techniques like PERT and CPM for effective planning and executionof projects.
5. Use behavioral, leadership and time management aspects inentrepreneurialjourney

UNIT-I

Entrepreneurship: Definition, functions of entrepreneurship, qualities of entrepreneurs, identification and characteristics of entrepreneurs, entrepreneur vs. intrapreneur, first generation entrepreneurs, women entrepreneurs, conception and evaluation of ideas and their sources.

UNIT-II

Indian industrial environment: Competence, opportunities and challenges, entrepreneurship and economic growth, small scale industry in India, objectives, linkage among small, medium and heavy industries, types of enterprises, corporate social responsibility

UNIT-III

Business plan: Introduction, elements of business plan and its salient features, business model canvas, technical analysis, profitability and financial analysis, marketing analysis, feasibility studies, executive summary, selection of technology and collaborative interactions.

UNIT-IV

Behavioral aspects of entrepreneurs: Personality, determinants, attributes and models, leadership concepts and models, values and attitudes, motivation aspects, time management: approaches of time management, their strengths and weaknesses. time management matrix and the urgency addiction.

UNIT-V

Behavioral Aspects of Entrepreneurs: Personality, determinants, attributes and models, Leadership concepts and models, Values and attitudes, Motivation aspects, Change behavior.

Time Management: Approaches of time management, their strengths and weaknesses. Time management matrix and the urgency addiction.

Text Books:

1. Vasant Desai, "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House, 1997.
2. Prasanna Chandra, "Project-Planning, Analysis, Selection, Implementation and Review", Tata Mcgraw-Hill Publishing Company Ltd. 1995.
3. S.S. Khanka, "Entrepreneurial Development", S. Chand & Co. Pvt. Ltd., New Delhi, 2015.

Head Dept. of IT
CBIT, Hyderabad

Suggested Reading:

1. Robert D. Hisrich, Michael P. Peters, "Entrepreneurship", 5/e, Tata Me Graw Hill Publishing Company Ltd., 2005.
2. Stephen R. Covey and A. Roger Merrill, "First Things First", Simon and Schuster Publication, 1994.

Head Dept. of IT
CBIT, Hyderabad

18EG O01 **TECHNICAL WRITING SKILLS**

(Open Elective- 2)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Process of communication and channels of communication in general and technical writing.
2. Technical Writing and also contextual use technology specific words.
3. Business letters and technical articles.
4. Technical reports and technical proposals.
5. Transferring data from verbal to graphic and vice versa and making technical presentations.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the channels of communication and define nature and aspects of Technical communication
2. Compare and contrast technical communication to that of general communication while constructing error free sentences applying features of technical writing.
3. Analyze data, draw inferences to write Journal articles and conference papers and to compose business letters.
4. Evaluate data to draft technical reports and technical proposals.
5. Design a technical presentation by understanding the nuances of presentation skills and also transfer data from verbal to graphic and vice versa.

UNIT-I

Communication – Nature and process.

Channels of Communication – Downward, upward and horizontal and lateral communication; Barriers to communication.

Technical Communication – Definition ; oral and written communication. Importance and need for Technical communication. Nature of Technical Communication; Aspects and forms of Technical communication. Technical communication Skills – Listening, Speaking, Reading & Writing

UNIT-II

Technical Writing – Techniques of writing. Selection of words and phrases in technical writing. Differences between technical writing and general writing. Abstract and specific words. Sentence structure and requisites of sentence construction. Paragraph length and structure.

UNIT-III

Business correspondence – Sales letters, letters of Quotation; Claim and Adjustment letters.

Technical Articles: Nature, significance and types of technical articles. Writing an abstract. Journal articles and Conference papers. Elements of technical articles.

UNIT-IV

Technical Reports : Types, significance, structure, style and writing of reports. Routine reports, Project reports.

Technical Proposals : Definition, types, characteristics, structure and significance.

UNIT-V

Information Transfer – Graphic to verbal (written) and verbal to graphic.

Technical Presentations : Important aspects of oral and visual presentations.

Head Dept. of IT
CBIT, Hyderabad

Text Books:

1. Meenakshi Raman & Sangeeta Sharma, "Technical Communications-Principles and Practice", Oxford University Press, 2nd Edition, 2012.
2. M Ashraf Rizvi, "Effective Technical Communication", Tata McGraw Hill Education Pvt Ltd, 2012.

Suggested Reading:

1. Kavita Tyagi & Padma Misra, "Basic Technical Communication", PHI Learning Pvt Ltd, 2012.
2. R.C Sharma & Krishna Mohan, "Business Correspondence and Report Writing", Tata McGraw Hill, 2003.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc18_mg13/preview
2. https://www.technical-writing-training-and-certification.com/
3. https://academy.whatfix.com/technical-writing-skills

Head Dept. of IT
CBIT, Hyderabad

18ME O07 **INTELLECTUAL PROPERTY RIGHTS**

(Open Elective- 3)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Fundamental aspects of IP.
2. Salient features of IPR acts.
3. The methods of registrations of Intellectual property.
4. Awareness for innovation and its importance of protection.
5. The changes in IPR culture and techno-business aspects of IPR.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the evolution of IP, working of organization's at global level to protect and promote IP.
2. Familiarize with the patent filing process at national and international level.
3. Draw the logical conclusion of research, innovation and patent filing.
4. Compare different kinds of IP and their patenting system.
5. Understand the techno-legal-business angle of IP, infringement and enforcement mechanisms for protection.

UNIT-I

Introduction: Definition of intellectual property, the need for intellectual property rights (IPR), kinds of intellectual property rights, IPR in India – genesis and development, IPR abroad, importance of WTO, TRIPS agreement, patent cooperation treaty, Berne and universal copyright conventions.

UNIT-II

Patents: Definition of patent, commercial significance , term of patent, patentable subject- matter, rights and obligations of patentee, searching of existing patents, drafting of patent, specification of patent, filing of a patent, the different layers of the patent system (national, regional and international options), compulsory licensing and licenses of rights, revocation of patents, differences between utility model and patent.

UNIT-III

Industrial designs: Definition of designs, registration of design, rights and duties of proprietor of design, piracy of registered design.

Trademarks: Meaning of trademarks, purpose of protecting trademarks, registration of trademarks, passing off, assignment and licensing of trademarks, infringement of trademarks.

Geographical indications: Definition, differences between GI and trademarks.

UNIT-IV

Copy right: Nature and scope of copy right, term of copyright, subject matter of copyright, rights conferred by copyright ,publication, broad casting, telecasting, computer program, database protection, assignment and transmission of copyright, infringement of copy right trade secrets and know-how agreement.

UNIT-V

Enforcement of intellectual property rights: Infringement of intellectual property rights, enforcement measures, emerging issues in intellectual property protection, case studies of patents and IP Protection.

Unfair competition: What is unfair competition, relationship between unfair competition and intellectual property laws.

Head Dept. of IT
CBIT, Hyderabad

Text Books:

1. Ajit Parulekar and Sarita D' Souza, "Indian Patents Law – Legal & Business Implications"; Macmillan India ltd , 2006
2. B. L.Wadehra;" Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications"; Universal law Publishing Pvt. Ltd., India 2000
3. P. Narayanan; "Law of Copyright and Industrial Designs"; Eastern law House, Delhi 2010

Suggested Reading:

1. Cronish W.R1 "Intellectual Property; Patents, copyright, Trad and Allied rights", Sweet & Maxwell, 1993.
2. P. Narayanan, "Intellectual Property Law", Eastern Law Edn., 1997.

Head Dept. of IT
CBIT, Hyderabad

18IT C35 **TECHNICAL SEMINAR**

Instruction	2 Hours per week
CIE	50 Marks
Credits	1

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state of the art topics in a broad area of his/her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

Course Objectives:

1. To introduce students to critical reading, understanding, summarizing, explaining and preparing report on state-of- the-art topics in a broad area of his/her specialization.
2. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.
3. Documenting the seminar report in a prescribed format.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Collect, Organize, Analyze and Consolidate information about emerging technologies from the literature.
2. Exhibit effective communication skills, stage courage, and confidence.
3. Demonstrate intrapersonal skills.
4. Explain new innovations/inventions in the relevant field.
5. Prepare and experience in writing the Seminar Report in a prescribed format.

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state-of-the-art topics in a broad area of his/ her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

The seminar must be clearly structured and the power point presentation shall include following aspects:

1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Each student is required to:

1. Submit a one-page synopsis of the seminar talk for display on the notice board.
2. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes in PowerPoint, followed by Question and Answers session for 10 minutes.
3. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by the department.

- Seminars are to be scheduled from 3rdweek to the last week of the semester and any change in schedule shall be discouraged.
- For the award of sessional marks, the students are judged by three (3) faculty members and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation.

Note: Topic of the seminar shall be preferably from any peer reviewed recent Journal publications.

Head Dept. of IT
CBIT, Hyderabad

Guidelines for awarding marks (CIE): Max. Marks: 50		
S.No	**Description**	**Max. Marks**
1	Contents and relevance	10
2	Presentation skills	10
3	Preparation of PPT slides	05
4	Questions and answers	05
5	Report in a prescribed format	20

Head Dept. of IT
CBIT, Hyderabad

18IT C36 **PROJECT PART – 2**

Instruction	10 Hours per week
SEE	100 Marks
CIE	100 Marks
Credits	10

The object of 'Project: Part-2' is to enable the student extend further the investigative study taken up, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned.
2. Review and finalization of the Approach to the Problem relating to the assigned topic.
3. Preparing an Action Plan for conducting the investigation, including team work.
4. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed.
5. Final development of product/process, testing, results, conclusions and future directions.
6. Preparing a paper for Conference presentation/ Publication in Journals, if possible.
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar presentation before Departmental Committee.

Guidelines for the award of marks in CIE: (Max. Marks: 100)

Evaluation by	**Max .Marks**	**Evaluation Criteria / Parameter**
Department Review Committee	10	Review 1
	15	Review 2
	25	Submission
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	10	Quality of the work which may lead to publications
	10	Report Preparation
	10	Analytical / Programming / Experimental Skills

Guidelines for awarding marks in SEE: (Max. Marks: 100)

Evaluation by	**Max .Marks**	**Evaluation Criteria / Parameter**
External and Internal Examiners together	20	Power Point Presentation
	40	Thesis Evaluation
	20	Quality of the project • Innovations • Applications • Live Research Projects • Scope for future study • Application to society
	20	Viva-Voce

Head Dept. of IT
CBIT, Hyderabad

20MT C01

LINEAR ALGEBRA & CALCULUS

(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block chain Technology))

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To explain the solutions of system of linear equations by Matrix Methods.
2. To discuss the convergence and divergence of the Series.
3. To explain the Partial Derivatives and the extreme values of functions of two variables
4. To discuss Physical interpretations on Scalars and vector functions
5. To discuss vector line, surface and volume integrals.

Course Outcomes:

Upon completing this course, students will be able to:

1. Apply the Matrix Methods to solve the system of linear equations
2. Test the convergence and divergence of the infinite Series.
3. Determine the extreme values of functions of two variables.
4. Apply the vector differential operator to scalar and vector functions
5. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.

UNIT-I

Matrices: Rank of a matrix, Echelon form, consistency of linear System of equations, Linear dependence of vectors, Eigen values, Eigenvectors, Properties of Eigen values, Cayley-Hamilton theorem, Quadratic forms, Reduction of quadratic form to canonical form by linear transformation, Nature of quadratic form.

UNIT-II

Infinite Series: Definition of Convergence of sequence and series. Series of positive terms –Necessary condition for convergence, Comparison tests, limit form comparison test, D'Alembert's Ratio test, Raabe's test, Cauchy's root test, alternating series, Leibnitz's rule, absolutely and conditionally convergence.

UNIT-III

Partial Differentiation and Its Applications: Functions of two or more variables, Partial derivatives, Higher order partial derivatives, Total derivative, Differentiation of implicit functions, Jacobians, Taylor's expansion of functions of two variables, Maxima and minima of functions of two variables.

UNIT-IV

Vector Differential Calculus: Scalar and vector point functions, vector operator Del, Gradient, Directional derivative, Divergence, Curl, Del applied twice to point functions, Del applied to product of point functions (vector identities). Applications: Irrotational fields and Solenoidal fields.

UNIT-V

Vector Integral Calculus: Line integral, Surface integral and Volume integral. Green's theorem in the plane, verifications of Stroke's theorem (without proof) and Gauss's divergence theorem(without proof).

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

Head Dept. of IT
CBIT, Hyderabad

Suggested Reading:

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw- Hill, New Delhi, 2008.
2. R.K. Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th edition, 2016.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/ Cole, 2005.

Head Dept. of IT
CBIT, Hyderabad

20EG C01

ENGLISH
(Common to all branches)

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

Course Objectives: This course will introduce the students:

1. To the role and importance of communication while developing their basic communication skills in English.
2. To basics of writing coherent paragraphs and formal emails.
3. To techniques of writing a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. To description, definition and classification of processes while enabling them to draft formal reports following a proper structure.
5. To gaining adequate reading comprehension techniques.

Course Outcomes: After successful completion of the course the students will be able to:

1. Illustrate the nature, process and types of communication and communicate effectively without barriers.
2. Construct and compose coherent paragraphs, emails and adhering to appropriate mobile etiquette.
3. Apply techniques of precision to write a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. Distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.
5. Critique passages by applying effective reading techniques

UNIT-I Understanding Communication in English:
Introduction, nature and importance of communication; Process of communication; Types of communication - verbal and non-verbal; Barriers to communication; Intrapersonal and interpersonal communication; Understanding Johari Window.
Vocabulary &Grammar: The concept of Word Formation; Use of appropriate prepositions and articles.

UNIT-II Developing Writing Skills I:
Paragraph writing. – Structure and features of a paragraph; Cohesion and coherence. Rearranging jumbled sentences. Email and Mobile etiquette.
Vocabulary & Grammar: Use of cohesive devices and correct punctuation.

UNIT-III Developing Writing Skills II:
Précis Writing; Techniques of writing precisely. Letter Writing – Structure, format of a formal letter; Letter of request and the response
Vocabulary and Grammar: Subject-verb agreement.
Use of prefixes and suffixes to form derivatives. Avoiding redundancies.

UNIT-IV Developing Writing Skills III:
Report writing – Importance, structure, elements of style of formal reports ; Writing a formal report.
Vocabulary and Grammar: Avoiding ambiguity - Misplaced modifiers. Use of synonyms and antonyms.

Head Dept. of IT
CBIT, Hyderabad

UNIT-V Developing Reading Skills:
The reading process, purpose, different kinds of texts; Reading comprehension; Techniques of comprehension – skimming, scanning, drawing inferences and conclusions.
Vocabulary and Grammar: Words often confused; Use of standard abbreviations.

Text Books:
1. Language and Life: A Skills Approach, Board of Editors, Orient Black Swan, 2017.
2. Swan Michael, Practical English Usage.OUP. 1995.

Suggested Readings:
1. Wood F.T, Remedial English Grammar,Macmillan, 2007
2. Zinsser William, On Writing Well, Harper Resource Book, 2001
3. Sanjay Kumar and PushpLata, Communication Skills. Oxford University Press, 2011.

Head Dept. of IT
CBIT, Hyderabad

Code: 20PY C01

OPTICS AND SEMICONDUCTOR PHYSICS

(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block chain Technology))

Instruction	3L/week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The objectives of the course is to make the student

1. Understand the fundamentals of wave nature of light
2. Acquire knowledge of lasers, holography and fiber optics
3. Familiarize with quantum mechanics
4. Learn the fundamental concepts of solids

Course Outcomes: At the end of the course, the student will be able to

1. Demonstrate the physical properties of light.
2. Explain characteristic properties of lasers and fiber optics
3. Find the applications of quantum mechanics
4. Classify the solids depending upon electrical conductivity
5. Identify different types of semiconductors

UNIT-I

Wave Optics: Huygens' principle –Superposition of waves –Interference of light by wave front splitting and amplitude splitting–Fresnel's biprism – Interference in thin films in reflected light– Newton's rings– Fraunhofer diffraction from a single slit –Double slit diffraction – Rayleigh criterion for limit of resolution– Concept of N-slits–Diffraction grating and its resolving power.

UNIT-II

Lasers & Holography: Characteristics of lasers – Einstein's coefficients –Amplification of light by population inversion –Different types of lasers: solid-state lasers: Ruby & Nd:YAG; gas lasers: He-Ne & CO_2; semiconductor laser –Applications of lasers in engineering and medicine. Holography: Principle – Recording and reconstruction–Applications.

Fiber Optics: Introduction –Construction –Principle –Propagation of light through an optical fiber – Numerical aperture and acceptance angle –Step-index and graded-index fibers –Pulse dispersion –Fiber losses–Fiber optic communication system –Applications.

UNIT-III

Principles of Quantum Mechanics: Introduction –Wave nature of particles – de-Broglie hypothesis – Physical significance of ψ –Time-dependent and time-independent Schrodinger equations – Born interpretation – Probability current –Wave packets –Uncertainty principle –Particle in infinite square well potential –Scattering from potential step – Potential barrier and tunneling.

UNIT-IV

Band Theory of Solids: Salient features of free electron theory of metals (Classical and Quantum) – Fermi level –Density of states – Bloch's theorem for particles in a periodic potential – Kronig-Penney model – Classification of solids: metals, semiconductors and insulators.

UNIT-V

Semiconductors: Intrinsic and extrinsic semiconductors –Charge carrier concentration in intrinsic semiconductors –Dependence of Fermi level on carrier concentration and temperature in extrinsic semiconductors (qualitative) –Carrier generation and recombination –Carrier transport: diffusion and drift – P-N junction – Thermistor – Hall effect – LED –Solar cell.

Head Dept. of IT
CBIT, Hyderabad

TEXT BOOKS:

1. B.K. Pandey and S. Chaturvedi, *Engineering Physics*, Cengage Publications, 2012.
2. M.N. Avadhanulu and P.G. Kshirsagar, *A Text Book of Engineering Physics*, S. Chand Publications, 2014.
3. M. Arumugam, *Materials Science*, Anuradha Publications, 2015.
4. S.L. Gupta and Sanjeev Gupta, *Modern Engineering Physics*, Dhanpat Rai Publications,2011.

SUGGESTD READING:

1. R. Murugeshan and Kiruthiga Sivaprasath, *Modern Physics*, S. Chand Publications S. Chand Publications, 2014.
2. V. Rajendran, *Engineering Physics*, McGraw-Hill Education Publications, 2013.
3. P.K. Palanisamy, *Engineering Physics*, Scitech Publications, 2012.
4. V. Raghavan, *Materials Science and Engineering*, Prentice Hall India Learning Private Limited; 6th Revised edition,2015.

Head Dept. of IT
CBIT, Hyderabad

20CS C01

PROGRAMMING FOR PROBLEM SOLVING
(Common to all Programs)

Instruction	3 Periods per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The objectives of this course are

1. Identification of computer components, Operating environments, IDEs.
2. Understanding the steps in problem solving and formulation of algorithms to problems.
3. Develop programming skills as a means of implementing an algorithmic solution with appropriate control and data structures.
4. Develop in tuition to enable students to come up with creative approaches to problems.
5. Manipulation of text data using files.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify and understand the computing environments for scientific and mathematical problems.
2. Formulate solutions to problems with alternate approaches and represent them using algorithms / Flowcharts.
3. Choose data types and control structures to solve mathematical and scientific problem.
4. Decompose a problem into modules and use functions to implement the modules.
5. Apply arrays, pointers, structures, and unions to solve mathematical and scientific problems.
6. Develop applications using file I/O.

UNIT -I

Introduction to computers and Problem Solving: Components of a computer, Operating system, compilers, Program Development Environments, steps to solve problems, Algorithm, Flowchart / Pseudocode with examples.

Introduction to programming: Programming languages and generations, categorization of high-level languages.

Introduction to C: Introduction, structure of C program, keywords, identifiers, Variables, constants, I/O statements, operators, precedence, and associativity.

UNIT – II

Introduction to decision control statements: Selective, looping, and nested statements.

Functions: Introduction, uses of functions, Function definition, declaration, passing parameters to functions, recursion, scope of variables and storage classes, Case study using functions and control statements.

UNIT – III

Arrays: Introduction, declaration of arrays, accessing and storage of array elements, 1-dimensional array, Searching (linear and binary search algorithms) and sorting (Selection and Bubble) algorithms, 2-D arrays, matrix operations.

Strings: Introduction, strings representation, string operations with examples. Case study using arrays.

UNIT – IV

Pointers: Understanding computer's memory, introduction to pointers, declaration pointer variables, pointer arithmetic, pointers and strings, array of pointers, dynamic memory allocation, advantages, and drawbacks of pointers.

Structures: Structure definition, initialization and accessing the members of a structure, nested structures, structures and functions, self- referential structures, unions, and enumerated data types.

Head Dept. of IT
CBIT, Hyderabad

UNIT-V

Files: Introduction to files, file operations, reading data from files, writing data to files, error handing during file operations.

Preprocessor Directives: Types of preprocessor directives, examples.

Text Books:

1. M.T. Somashekar "Problem Solving with C", 2nd Edition, Prentice Hall India Learning Private Limited 2018
2. AK Sharma, "Computer Fundamentals and Programming", 2nd Edition, University Press, 2018
3. Pradeep Deyand Manas Ghosh, "Programming in C", Oxford Press, 2nd Edition, 2017

Suggested Reading:

1. Byron Gottfried, Schaum's Outline of Programming with C", Mc Graw-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
4. Reema Tharaja "Introduction to C Programming", Second Edition, OXFORDPress,2015.

Online Resources:

1. https://www.tutorialspoint.com/cprogramming/index.htm.
2. https://onlinecourses.nptel.ac.in/noc18-cs10/preview

Head Dept. of IT
CBIT, Hyderabad

20MT C02

LINEAR ALGEBRA & CALCULUS LAB

(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block chain Technology))

Instruction	2P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To explain basic operations of matrix algebra.
2. To discuss the behavior of the infinite Series.
3. To discuss the maxima and minima of the functions of two variables
4. To discuss Physical interpretations on Scalars and vector functions.
5. To explain vector line, surface and volume integrals.

Course Outcomes:

Upon completing this course, students will be able to:

1. Apply the Matrix operations in executing various programmes.
2. Test the convergence and divergence of the infinite Series.
3. Explore the extreme values of functions of two variables.
4. Determine the gradient, divergent and curl of scalar and vector point functions.
5. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems

LIST OF EXPERIMENTS:

1. Addition and multiplication of higher order matrices.
2. Determinant and Inverse of the matrices
3. Eigen values and Eigenvectors of Matrix.
4. Nature of quadratic form of Matrix.
5. Solution of system of linear equations.
6. Data plotting (2D,3D)
7. Test the convergence of infinite series
8. Examine the extreme values of given function
9. Examine the rotational, irrotational and divergence of the flows
10. Verify inter connection between vector theorems (Green's, Gauss and Stoke's Theorems)

Text Books / Suggested Reading / Online Resources:

1. https://www.scilab.org/sites/default/files/Scilab_beginners_0.pdf
2. https://www.scilab.org/tutorials\
3. https://nptel.ac.in/courses/106102064/
4. https://www.udemy.com/algorithms-and-data-structures-in-python/

Head Dept. of IT
CBIT, Hyderabad

20EG C02

ENGLISH LAB
(Common to all branches)

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives: This course will introduce the students:

1. To nuances of Phonetics and give them sufficient practice in correct pronunciation.
2. To word stress and intonation.
3. To IELTS and TOEFL material for honing their listening skills.
4. To activities enabling them overcome their inhibitions while speaking in English with the focus being on fluency rather than accuracy.
5. To team work, role behavior while developing their ability to discuss in groups and making oral presentations.

Course Outcomes: After successful completion of the course the students will be able to:

1. Define the speech sounds in English and understand the nuances of pronunciation in English
2. Apply stress correctly and speak with the proper tone, intonation and rhythm.
3. Analyse IELTS and TOEFL listening comprehension texts to enhance their listening skills.
4. Determine the context and speak appropriately in various situations.
5. Design and present effective posters while working in teams ,and discuss and participate in Group discussions.

Exercises

1. **Introduction to English Phonetics**: Introduction to auditory, acoustic and articulatory phonetics, organs of speech: the respiratory, articulatory and phonatory systems.
2. **Sound system of English**: Phonetic sounds and phonemic sounds, introduction to international phonetic alphabet, classification and description of English phonemic sounds, minimal pairs . The syllable: types of syllables, consonant clusters.
3. **Word stress**: Primary stress, secondary stress, functional stress, rules of word stress.
4. **Rhythm &Intonation** : Introduction to Rhythm and Intonation. Major patterns, intonation of English with the semantic implications.
5. **Listening skills** – Practice with IELTS and TOEFL material
6. **Public speaking –** Speaking with confidence and clarity in different contexts on various issues.
7. **Group Discussions -** Dynamics of a group discussion, group discussion techniques, body language.
8. **Pictionary –** weaving an imaginative story around a given picture.
9. **Information Gap Activity –** Writing a brief report on a newspaper headline by building on the hints given
10. **Poster presentation –** Theme, poster preparation, team work and presentation.

Suggested Reading

1. T Balasubramanian. A Textbook of English Phonetics for Indian Students, Macmillan, 2008.
2. J Sethi et al. A Practical Course in English Pronunciation (with CD), Prentice Hall India, 2005.
3. Priyadarshi Patnaik. Group Discussions and Interviews, Cambridge University Press Pvt Ltd 2011
4. Aruna Koneru, Professional Speaking Skills, Oxford University Press, 2016

Head Dept. of IT
CBIT, Hyderabad

20PY C03

OPTICS AND SEMICONDUCTOR PHYSICS LAB

(CSE, IT, CSE (AI&ML), AI&DS, CSE (IoT & Cyber Security including Block Chain Technology))

Instruction	4Periods/week
Duration of SEE	3Hours
SEE	50Marks
CIE	50Marks
Credits	2

Course Objectives: The objectives of the course is to make the student

1. Apply theoretical physics knowledge in doing experiments
2. Understand the behaviour of the light experimentally
3. Analyze the conduction behaviour of semiconductor materials and optoelectronic devices

Course Outcomes: At the end of the course, the student will be able to

1. Interpret the errors in the results of an experiment.
2. Demonstrate physical properties of light experimentally
3. Make use of lasers and optical fibers for engineering applications
4. Explain the V-I characteristics of some optoelectronic and semi conductor devices
5. Find the applications thermistor

Experiments

1.	Error Analysis	:	Estimation of errors in the determination of time period of a torsional pendulum
2.	Fresnel's Biprism	:	Determination of wavelength of given monochromatic source
3.	Newton's Rings	:	Determination of wavelength of given monochromatic source
4.	Single Slit Diffraction	:	Determination of wavelength of given monochromatic source
5.	Diffraction Grating	:	Determination of wavelengths of two yellow lines of light of mercury lamp
6.	Laser	:	Determination of wavelength of given semiconductor laser
7.	Holography	:	Recording and reconstruction of a hologram
8.	Optical Fiber	:	Determination of numerical aperture and power losses of given optical fiber
9.	Energy Gap	:	Determination of energy gap of given semiconductor
10.	P-N Junction Diode	:	Study of V-I characteristics and calculation of resistance of given diode in forward bias and reverse bias
11.	Thermistor	:	Determination of temperature coefficient of resistance of given thermistor
12.	Hall Effect	:	Determination of Hall coefficient, carrier concentration and mobility of charge carriers of given semiconductor specimen
13.	LED	:	Study of I-V characteristics of given LED
14.	Solar Cell	:	Study of I-V characteristics of given solar cell and calculation of fill factor, efficiency and series resistance
15.	Planck's Constant	:	Determination of Planck's constant using photo cell

NOTE: A minimum of TWELVE experiments should be conducted

Head Dept. of IT
CBIT, Hyderabad

20CS C02

PROGRAMMING FOR PROBLEM SOLVING LAB
(Common to All Programs)

Instruction	4 Periods per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2

Course Objectives: The objectives of this course are

1. Setting up programming environment.
2. Develop Programming skills to solve problems.
3. Use of appropriate C programming constructs to implement algorithms.
4. Identification and rectification of coding errors in program.
5. Develop applications in a modular fashion.
6. Manage data using files.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify and setup program development environment.
2. Design and test programs to solve mathematical and scientific problems.
3. Identify and rectify the syntax errors and debug program for semantic errors
4. Implement modular programs using functions.
5. Represent data in arrays, pointers, structures and manipulate them through a program.
6. Create, read, and write to and from simple text files.

Lab experiments

1. Familiarization with programming environment.
2. Simple computational problems using arithmetic expressions.
3. Problems involving if-then-else structures.
4. Iterative problems e.g., sum of series.
5. 1D Array manipulation.
6. 2D arrays and strings.
7. Matrix problems, String operations.
8. Simple functions.
9. Recursive functions.
10. Pointers and structures.
11. Dynamic memory allocation and error handling.
12. File handling:

Text Books:

1. Pradeep Dey and Manas Ghosh, “Programming in C”, Oxford Press, 2nd Edition, 2017.
2. Reema Tharaja “Introduction to C Programming”, Second Edition, OXFORD Press, 2015.

Online Resources:

1. https://www.tutorialspoint.com/cprogramming/index.htm
2. https://www.w3resource.com/c-programming/programming-in-c.php
3. https://www.w3schools.in/c-tutorial/

Head Dept. of IT
CBIT, Hyderabad

20ME C01

CAD AND DRAFTING

Instruction	1 T + 3 D Hours per week
Duration of SEE	3Hours
SEE	50Marks
CIE	50Marks
Credits	2.5

Course Objectives:

1. To get exposure to a cad package and its utility.
2. Understanding orthographic projections.
3. To visualize different solids and their sections in orthographic projection
4. To prepare the student to communicate effectively by using isometric projection.
5. To prepare the student to use the techniques, skills, and modern tools necessary for practice.

Outcomes: At the end of the course, the Students are able to

1. Become conversant with appropriate use of CAD software for drafting.
2. Recognize BIS, ISO Standards and conventions in Engineering Drafting.
3. Construct the projections of points, lines, planes, solids
4. Analyse the internal details of solids through sectional views
5. Create an isometric projections and views

List of Exercises:

1. Introduction to CAD package: Settings, draw, modify tools, dimensioning and documentation
2. Construction of Conic Sections by General method
3. Orthographic projection: Principles, conventions, Projection of points
4. Projection of straight lines: Simple position, inclined to one plane
5. Projection of straight lines inclined to both the planes (without traces and mid-point)
6. Projection of planes: Perpendicular planes
7. Projection of planes: Oblique planes
8. Projection of solids: Simple position
9. Projection of solids: Inclined to one plane
10. Sections of solids: Prism, pyramid in simple position
11. Sections of solids: Cone and cylinder in simple position
12. Isometric projections and views
13. Conversion of isometric views to orthographic projections and vice versa.

Text Books:

1. N.D.Bhatt, "Elementary Engineering Drawing", Charotar Publishers, 2012.
2. K.Venugopal, "Engineering Drawing and Graphics + AutoCAD", New Age International Pvt. Ltd, 2011.
3. Basanth Agrawal and C M Agrawal, "Engineering Drawing", 2/e, McGraw-Hill Education (India) Pvt. Ltd.

Suggested Reading:

1. Shaw M.B and Rana B.C., "Engineering Drawing", 2/e, Pearson, 2009.
2. K.L. Narayana and P.K. Kannaiah, "Text Book of Engineering Drawing", Scitech Publications, 2011.

Head Dept. of IT
CBIT, Hyderabad

20MBC02

COMMUNITY ENGAGEMENT

Instruction	3 Hours per week (30 hours field work & 2 hours per week)
SEE	Nil
CIE	50 Marks
Credits	1.5 Credits

Course Objectives: The main Objectives of this Course are to:
1. Develop an appreciation of Rural culture, life-style and wisdom among the Students.
2. Learn about the various livelihood activities that contribute to Rural economy.
3. Familiarize the Rural Institutions and the Rural Development Programmes in India.

Course Outcomes: After the completion of this Course, Student will be able to:
1. Gain an understanding of Rural life, Culture and Social realities.
2. Develop a sense of empathy and bonds of mutuality with Local Communities.
3. Appreciate significant contributions of Local communities to Indian Society and Economy.
4. Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economic improvements.
5. Utilise the opportunities provided by Rural Development Programmes.

Module I Appreciation of Rural Society
Rural life style, Rural society, Caste and Gender relations, Rural values with respect to Community, Nature and Resources, elaboration of 'soul of India lies in villages' (Gandhi), Rural Infrastructure.

Module II Understanding Rural Economy and Livelihood
Agriculture, Farming, Landownership, Water management, Animal Husbandry, Non-farm Livelihood and Artisans, Rural Entrepreneurs, Rural markets, Rural Credit Societies, Farmer Production Organization/Company.

Module III Rural Institutions
Traditional Rural organizations, Self-Help Groups, Panchayati Raj Institutions (Gram Sabha), Gram Panchayat, Standing Committees, Local Civil Society, Local Administration.

Module IV Rural Development Programmes
History of Rural Development in India, Current National Programmes: Sarva Shiksha Abhiyan, Beti Bhachao, Beti Padhao, Ayushman, Bharat, Swachh Bharat, PM Awas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA etc.

Text Books:

1. Singh, Katar, Rural Development: Principles, Policies and Management, Sage Publications, New Delhi, 2015.
2. A Hand book on Village Panchayat Administration, Rajiv Gandhi Chair for Panchayati Raj Studies, 2002.
3. United Nations, Sustainable Development Goals, 2015, un.org/sdgs
4. M.P Boraia, Best Practices in Rural Development, Shanlax Publishers, 2016.

Journals:

1. Journal of Rural development (published by NIRD & PR, Hyderabad).
2. Indian Journal of Social Work, (by TISS, Bombay).
3. Indian Journal of Extension Educations (by Indian Society of Extension Education).
4. Journal of Extension Education (by Extension Education Society).
5. Kurukshetra (Ministry of Rural Development, GOI).
6. Yojana (Ministry of Information & Broadcasting, GOI).

Head Dept. of IT
CBIT, Hyderabad

20MT C03

DIFFERENTIAL EQUATIONS &TRANSFORM THEORY
(CSE,IT, CSE (AI&ML), AI&DS, CSE (IOT &Cyber Security including Block Chain Technology))

Instruction	3 L per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
1. To explain the relevant methods to solve first order differential equations.
2. To explain the relevant methods to solve higher order differential equations.
3. To discuss the properties of Legendre's Polynomials and Bessel's functions
4. To explain the Z-Transform and InverseZ-Transforms.
5. To discuss Fourier transform for solving engineering problems.

Course Outcomes:
Upon completing this course, students will be able to:
1. Calculate the solutions of first order linear differential equations.
2. Calculate the solutions of higher order linear differential equations.
3. Examine the series solutions for higher order differential equations.
4. Evaluate the Improper integrals by Fourier Transform.
5. Solve the difference equations byZ-transforms.

UNIT - I
Differential Equations of First Order: Exact Differential Equations, Equations Reducible To Exact Equations, Linear Equations, Bernoulli's Equations, Riccati's and Clairaut's Equations, Orthogonal trajectories.

UNIT-II
Higher Order Linear Differential Equations: Solutions of higher order linear equations with constants coefficients, Method of variation of parameters, solution of Cauchy's homogeneous linear equation. applications: LR and LCR circuits.

UNIT-III
Series Solutions of Differential Equations: Ordinary point, singular point and regular singular point, Series solution when **x=a** is an ordinary point of the equation. Legendre's equation, Legendre's Polynomial of first kind (without proof), Rodrigue's formula, orthogonality of Legendre polynomials. Bessel's equation, Bessel's function of the first kind of order n (without proof), recurrence formulae for $\mathbf{J_n(x)}$ and related problems (i.e$J_0(x)$, $J_1(x)$, $J_{1/2}(x)$, $J_{-1/2}(x)$, $J_{3/2}(x)$, $J_{-3/2}(x)$).

UNIT-IV
Fourier Transforms: Fourier integral theorem (statement), Complex form of Fourier integrals. Fourier transforms, Inverse Fourier Transforms, Fourier Sine and Cosine transforms, Inverse Fourier Sine and Cosine Transforms. Properties of Fourier transforms: Linear property, change of scale property, shifting property and Modulation theorem.

UNIT-V
Z-Transforms: Definition, some standard Z-transforms, linearity property, damping rule, shifting U_n to the right, shifting U_n to the left, multiplication by 'n', initial and final value theorems. Inverse Z-Transform: evaluation of Inverse Z-transform by Convolution theorem, partial fractions method. Z- Transform application to difference equations.

Head Dept. of IT
CBIT, Hyderabad

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9^{th} Edition, John Wiley & Sons, 2006.
3. R.K.Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5^{th} edition, 2016.

Suggested Reading:

1. N.P.Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11^{th} Reprint, 2010.
3. A.R. Vasishtha, and R.K. Guptha Integral transforms, Krishna Prakashan Media, Reprint, 2016

Head Dept. of IT
CBIT, Hyderabad

with effect from the Academic Year 2020-21

20CY C01

CHEMISTRY

(Common to all branches)

Instruction:	3Hours per Week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE	40 Marks
Credits:	3

Course Objectives

1. This syllabus helps at providing the concepts of chemical bonding and chemical kinetics to the students aspiring to become practicing engineers
2. Thermodynamic and Electrochemistry units give conceptual knowledge about processes and how they can be producing electrical energy and efficiency of systems.
3. To teach students the value of chemistry and to improve the research opportunities knowledge of stereochemistry and organic reactions is essential.
4. Water chemistry unit impart the knowledge and understand the role of chemistry in the daily life.
5. New materials lead to discovering of technologies in strategic areas for which an insight into Polymers, nanomaterials and basic drugs of modern chemistry is essential.

Course Outcomes

At the end of the course student will be able to:

1. Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions.
2. Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells.
3. Illustrate the major chemical reactions that are used in the synthesis of organic molecules.
4. Classify the various methods used in treatment of water for domestic and industrial use.
5. Outline the synthesis of various Engineering materials & Drugs.

UNIT-I Atomic and molecular structure and Chemical Kinetics:

Atomic and molecular structure: Molecular Orbital theory - atomic and molecular orbitals. Linear combination of atomic orbitals (LCAO) method. Molecular orbitals of diatomic molecules. Molecular Orbital Energy level diagrams (MOED) of diatomic molecules & molecular ions (H_2 , He_2^+ ,N_2 , O_2 , O_2^- , CO, NO). Pi- molecular orbitals of benzene and its aromaticity.

Chemical Kinetics: Introduction, Terms involved in kinetics: rate of reaction, order & molecularity; First order reaction-Characteristics: units of first order rate constant & its half-life period, second order reaction-Characteristics: units of second order rate constant & its half- life period. Numericals.

UNIT-II Use of free energy in chemical equilibria

Use of free energy in chemical equilibria: Thermodynamic functions: Internal energy, entropy and free energy. Significance of entropy and free energy (criteria of spontaneity). Free energy and emf (Gibbs Helmholtz equations and its applications). Cell potentials, electrode potentials, – Reference electrodes (NHE, SCE)-electrochemical series. Nernst equation and its applications. Determination of pH using combined Glass & Calomel electrode. Potentiometric Acid base & Redox Titrations. Numericals.

Battery technology: Rechargeable batteries & Fuel cells.

Lithium batteries: Introduction, construction, working and applications of Li-MnO_2 and Li-ion batteries.

Fuel Cells: Introduction, difference between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell.

UNIT- III Stereochemistry and Organic reactions

Stereochemistry: Representations of 3 dimensional structures, Types of stereoisomerism- Conformational isomerism – confirmations of n-butane (Newman and sawhorse representations), Configurational isomerism -

Head Dept. of IT
CBIT, Hyderabad

Geometrical (cis-trans) isomerism & Optical isomerism- optical activity, Symmetry and chirality: Enantiomers (lactic acid)&Diastereomers (Tartaric acid), Absolute configurations, Sequence rules for R&S notation.
Types of Organic reactions: Substitution Reactions- Electrophilic substitution (Nitration of Benzene); Nucleophilic Substitution (S_N1& S_N2); Free Radical Substitution (Halogenation of Alkanes)
Addition Reactions: Electrophilic Addition – Markonikoff's rule, Free radical Addition - Anti Markonikoff's rule (Peroxide effect), Nucleophilic Addition – (Addition of HCN to carbonyl compounds)
Eliminations-E1 and E2 (dehydrohalogenation of alkyl halides)
Cyclization (Diels - Alder reaction)

UNIT–IV Water Chemistry:
Hardness of water – Types, units of hardness, Disadvantages of hard water, Alkalinity and Estimation of Alkalinity of water, Boiler troubles - scales & sludge formation, causes and effects, Softening of water by lime soda process (Cold lime soda process),ion exchange method and Reverse Osmosis. Specifications of potable water & industrial water. Disinfection of water by Chlorination; break point chlorination, BOD and COD definition, Estimation (only brief procedure) and significance, Numericals.

UNIT-V Engineering Materials and Drugs:
Introduction, Terms used in polymer science; Thermoplastic polymers (PVC) &Thermosetting polymers (Bakelite); Elastomers (Natural rubber). Conducting polymers- Definition, classification and applications.
Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography.
Nano materials-Introduction to nano materials and general applications, basic chemical methods of preparation- Sol-gel method. Carbon nanotubes and their applications. Characterisation of nanomaterials by SEM and TEM (only Principle).
Drugs-Introduction, Synthesis and uses of Aspirin (analgesic), Paracetamol (Antipyretic), Atenolol (antihypertensive).

Text Books:

1. P.C. Jain and M. Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company Ltd.,New Delhi,16th edition (2015).
2. W.U. Malik, G.D.Tuli and R.D.Madan, "Selected topics in Inorganic Chemistry", S Chand & Company Ltd, New Delhi, reprint (2009).
3. R.T. Morrison, R.N. Boyd and S.K. Bhattacharjee, "Organic Chemistry", Pearson,Delhi, 7th edition(2019).
4. A Textbook of Polymer Science and Technology , Shashi Chawla,Dhanpat Rai & Co. (2014)
5. T. Pradeep, Nano: The Essentials, Tata McGraw-Hill Education, Delhi, 2012
6. G.L. David Krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K.L.N. Reddy and C.Sudhakar, "Drugs", Universities Press (India) Limited, Hyderabad (2007).

Suggested Readings:

1. B. H. Mahan, "University Chemistry", Narosa Publishing house, New Delhi, 3rd edition (2013).
2. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", S. Nagin Chand & Company Ltd., 46th edition (2013).
3. T.W. Graham Solomons, C.B. Fryhle and S.A. Snyder, "Organic Chemistry", Wiley, 12th edition (2017).
4. P.W. Atkins, J.D. Paula, "Physical Chemistry", Oxford, 8th edition (2006).

Head Dept. of IT
CBIT, Hyderabad

20ITC01

DATA STRUCTURES AND ALGORITHMS

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To introduce representation, specification, and applications of various linear and nonlinear data structures.
2. To familiarize with asymptotic analysis of iterative and recursive functions.
3. To acquaint with various pattern matching algorithms.
4. To present different sorting algorithms.
5. To explain hashing and collision handling.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Analyse time complexity of both iterative and recursive functions.
2. Understand various sorting algorithms and their performance
3. Build optimal solutions using linear and nonlinear data structures.
4. Apply pattern matching.
5. Understand hash functions and collision handling

UNIT-I

Introduction: Data Structures, Abstract Data Types, Algorithm, Analysis of Algorithms, Running Time Analysis, Commonly Used Rates of Growth, Big O Notation, Omega Notation, Theta Notation, Guidelines for Asymptotic Analysis

Recursion: Introduction, Recursion and Memory, Recursion versus Iteration, Example algorithms of Recursion

Sorting: Introduction, Classification of Sorting Algorithms, Selection Sort, Insertion Sort, Merge Sort, Heap Sort, Quick Sort, Radix sort, Comparison of Sorting Algorithms

Searching: Introduction, Types of Searching, Unordered Linear Search, Sorted/Ordered Linear Search, Binary Search

UNIT-II

Linked Lists: Linked List ADT, Comparison of Linked Lists with Arrays and Dynamic Arrays, Singly Linked Lists, Doubly Linked Lists, Circular Linked Lists

Stacks: Stack ADT, Applications, Implementation, Comparison of Implementations, Stacks: Problems & Solutions

UNIT-III

Queues: Queue ADT, Exceptions, Applications, Implementations, Queues: Problems & Solutions

Trees: Introduction, Glossary, Binary Trees, Types of Binary Trees, Properties of Binary Trees, Binary Tree Traversals, Binary Search Trees (BSTs), Balanced Binary Search Trees, AVL Trees: Properties, rotations, insertion

UNIT-IV

Priority Queues and Heaps: Priority Queue *AD*T, Priority Queue Applications, Priority Queue Implementations, Heaps and Binary Heaps, Binary Heaps, Heap Sort

String Algorithms: Introduction, String Matching Algorithm, Brute Force Method, String Matching with Finite Automata, KMP, Tries, Ternary Search Trees, Suffix Trees

UNIT-V

Graph: Introduction, Applications of Graphs, Graph Representation, Graph Traversals, Minimal Spanning Tree

Head Dept. of IT
CBIT, Hyderabad

Hashing: Hash Table ADT, Components of Hashing, Hash Table, Hash Function, Load Factor, Collisions, Collision Resolution Techniques, Separate Chaining, Open Addressing, Comparison of Collision Resolution Techniques, Hashing Techniques, Limitations of Hash Tables.

Text Book:

1. Narasimha Karumanchi, "Data Structures And Algorithmic Thinking With Python", Career Monk Publications, 2016

Suggested Reading:

1. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, “Data Structure and Algorithms in Python”, Wiley, 2013.
2. Kenneth A. Lambert, " Fundamentals of Python: Data Structures", Cengage Learning, 2018.
3. Narasimha Karumanchi, “Data Structures and Algorithms for GATE”, Career Monk Publications, 2011.
4. D. Samantha, “Classic Data Structures”, Prentice Hall India, 2ndEdition, 2013.

Web Resources:

1. https://visualgo.net/en
2. https://www.coursera.org/specializations/data-structures-algorithms
3. https://nptel.ac.in/courses/106/106/106106182/
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms
5. https://www.edx.org/course/algorithms-and-data-structures

20ITC02

OBJECT ORIENTED PROGRAMMING USING PYTHON

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

Course Objectives:
1. To describe the principles of Object-Oriented Programming.
2. To familiarize with basics of python programming
3. To explain the usage of OOP concepts to provide solutions
4. To introduce exception handling, and file operations in python
5. To acquaint with tkinter module to develop GUI applications.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Understand the concepts Object-Oriented Programming
2. Make use of Python programming constructs to implement solutions to problems
3. Model the problem using OOP strategies and handle exceptions
4. Make use of files and perform file handling operations.
5. Develop GUI's

UNIT - I
Introduction to Object Oriented Programming (OOP): Computer Programming and Programming Languages, Features of Object Oriented Programming, Merits and Demerits of Object, Applications of Object Oriented Programming, Differences Between Popular Programming Languages

Basics of Python Programming: Features, History, Future, Writing and Executing First Python Program, Literal Constants, Variables and Identifiers, Data Types, Input Operation, Comments, Reserved Words, Indentation, Operators and Expressions, Expressions in Python, Operations on Strings, Other Data Types, Type Conversion

UNIT - II
Decision Control Statements: Introduction to Decision Control Statements, Selection/Conditional Branching Statements, Basic Loop Structures/ Iterative Statements, Nested Loops, The break Statement, The continue Statement, The pass Statement, The else Statement used with Loops

Functions and Modules: Introduction, Function Definition, Function Call, Variable Scope and Lifetime, The return statement, More on Defining Functions, Lambda Functions or Anonymous Functions, Documentation Strings, Good Programming Practices, Recursive Functions, Greatest Common Divisor, Finding Exponents, The Fibonacci Series, Recursion vs Iteration, Modules, Packages in Python, Standard Library modules, Globals(), Locals(), and Reload(), Function Redefinition

UNIT – III
Classes and Objects: Introduction, Classes and Objects, init method, Class variables, and Object variables, Public and Private Data members, calling methods from other methods, built-in class attributes, garbage collection, class methods, static methods.
File Handling: Introduction, File Path, Types of Files, Opening and Closing Files, Reading and Writing Files

UNIT-IV
Inheritance: Introduction, Inheriting classes, Types of Inheritance, Composition or Containership or complex objects, Abstract classes and interfaces.

Head Dept. of IT
CBIT, Hyderabad

Operator Overloading: Introduction, Implementation of Operator Overloading, Reverse Adding, Overriding __getitem__() and __ setitem__() Methods, Overriding the in Operator, Overloading Miscellaneous Functions, Overriding the __call__() method

UNIT-V

Error and Exception Handling: Introduction to errors and exceptions, Handling Exceptions, Multiple Except Blocks, Multiple Exceptions in a Single Block, Except Block Without Exception, The else Clause, Raising Exceptions, Instantiating Exceptions, Handling Exceptions in Invoked Functions, Built-in and User-defined Exceptions, The finally Block, Pre-defined Clean–up Action, Re-raising Exception, Assertions in Python

GUI Programming with tkinter package

Text Book:

1. Reema Thareja “Python Programming: Using Problem Solving Approach” , Oxford University Press, 2019

Suggested Reading:

1. Tony Gaddis, “Starting Out With Python”, 3rd edition, Pearson, 2015.
2. Kenneth A. Lambert, " Fundamentals of Python: Data Structures", Cengage Learning, 2018.
3. Alan D. Moore, "Python GUI programming with Tkinter", 2018

Web Resources:

1. https://www.python.org/
2. https://nptel.ac.in/courses/106/106/106106182/
3. https://www.coursera.org/learn/python
4. https://learnpythonthehardway.org/book/

Head Dept. of IT
CBIT, Hyderabad

20MT C04

DIFFERENTIAL EQUATIONS &TRANSFORM THEORY LAB

(CSE, IT, CSE (AI&ML), AI&DS, CSE (IOT & Cyber Security including Block Chain Technology)

Instruction	2P Hours per week
Duration of SEE	3Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To explain the relevant methods to solve first order differential equations.
2. To explain the relevant methods to solve higher order differential equations.
3. To discuss the properties of Legendre's Polynomials and Bessel's functions
4. To explain the Z-Transform and InverseZ-Transforms.
5. To discuss Fourier transform for solving engineering problems.

Course Outcomes:

Upon completing this course, students will be able to:

1. Explore all the possible solutions of first order differential equation.
2. Analyse the solutions of higher order linear differential equations.
3. Examine the series solutions for higher order differential equations.
4. Evaluate the Improper integrals by Fourier Transform.
5. Apply the Z-transform to solve the difference equations.

List of Programmes:

1. Solution of first order liner differential equations.
2. Solution of first order non liner differential equations
3. Geometrical view of Particular integral of higher order differential equations.
4. Simulations of Legendre's differential equations.
5. Geometrical view of Rodrigue's theorem.
6. Simulations of Bessel's first kind solution.
7. Solutions of Bessel's first kind
   (i.e. $J_0(x)$, $J_1(x)$, $J_{1/2}(x)$, $J_{3/2}(x)$, $J_{-1/2}(x)$, $J_{-3/2}(x)$)
8. Waveform generation continuous signals
9. Computation of Fourier Transformations
10. Discrete Cosine Transforms
11. Digitization of continuous functions.

Text Books / Suggested Reading / Online Resources:

1. https://www.scilab.org/sites/default/files/Scilab_beginners_0.pdf
2. https://www.scilab.org/tutorials\
3. https://nptel.ac.in/courses/106102064/
4. https://www.udemy.com/algorithms-and-data-structures-in-python/

Head Dept. of IT
CBIT, Hyderabad

20CY C02

CHEMISTRY LAB

(Common to all branches)

Instruction:	4 Hours per Week
Duration of SEE:	3 Hours
SEE:	50 Marks
CIE	50 Marks
Credits:	2

Course Objectives

1. To impart fundamental knowledge in handling the equipment / glassware and chemicals in chemistry laboratory.
2. To provide the knowledge in both qualitative and quantitative chemical analysis
3. The student should be conversant with the principles of volumetric analysis
4. To apply various instrumental methods to analyse the chemical compounds and to improve understanding of theoretical concepts.
5. To interpret the theorical concepts in the preparation of new materials like drugs and polymers.

Course Outcomes

At the end of the course student will be able to:

1. Identify the basic chemical methods to analyse the substances quantitatively & qualitatively.
2. Estimate the amount of chemical substances by volumetric analysis.
3. Determine the rate constants of reactions from concentration of reactants/ products as a function of time.
4. Calculate the concentration and amount of various substances using instrumental techniques.
5. Develop the basic drug molecules and polymeric compounds.

Chemistry Lab

1. Introduction: Preparation of standard solution of oxalic acid and standardisation of NaOH.
2. Estimation of metal ions (Co^{+2}& Ni^{+2}) by EDTA method.
3. Estimation of temporary and permanent hardness of water using EDTA solution
4. Determination of Alkalinity of water
5. Determination of rate constant for the reaction of hydrolysis of methyl acetate. (first order)
6. Determination of rate constant for the reaction between potassium per sulphate and potassium Iodide. (second order)
7. Estimation of amount of HCl Conductometrically using NaOH solution.
8. Estimation of amount of HCl and CH_3COOH present in the given mixture of acids Conductometrically using NaOH solution.
9. Estimation of amount of HCl Potentiometrically using NaOH solution.
10. Estimation of amount of Fe^{+2} Potentiometrically using $KMnO_4$ solution
11. Preparation of Nitrobenzene from Benzene.
12. Synthesis of Aspirin drug and Paracetamol drug.
13. Synthesis of phenol formaldehyde resin.

Text Books:

1. J. Mendham and Thomas , "Vogel's text book of quantitative chemical analysis", Pearson education Pvt.Ltd. New Delhi ,6th ed. 2002.
2. Senior practical physical chemistry by B.D.Khosla, V.C.Garg & A.Gulati,; R. Chand & Co. : New Delhi (2011).

Suggested Readings:

1. Dr. Subdharani , "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing, 2012.
2. S.S. Dara , "A Textbook on experiment and calculation in engineering chemistry", S.Chand and Company, 9th revised edition, 2015.

Head Dept. of IT
CBIT, Hyderabad

20IT C03 **DATA STRUCTURES AND ALGORITHMS LAB**

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To introduce predefined data structures of Python
2. To introduce Linked Lists and operations
3. To present Stacks, Queues and their applications
4. To familiarise with Sorting Algorithms and Hashing
5. To gain knowledge of Trees, Graphs, Tries and related algorithms

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Make use of predefined data structures of python to process data.
2. Evaluate the performance of Sorting algorithms
3. Demonstrate Arrays, Linked lists, Stacks, Queues, Binary Search Trees, Graphs
4. Make use of Hashing and perform data storing and retrieval
5. Build optimal solutions using linear and nonlinear data structures to real world problems.

List of Programs

1. Demonstrate the usage of predefined data structures of Python: List, Tuple, String, Set, Dictionary.
2. Implementation of recursive and iterative functions.
3. Implement the following sorting algorithms: Selection Sort, Insertion Sort, Merge Sort, Heap Sort, Quick Sort, Radix Sort.
4. Define Single Linked List ADT and perform all standard operations.
5. Define Doubly Linked List ADT and perform all standard operations.
6. Define Stack and Queue ADTs and implement standard operations.
7. Applications of Stacks and Queues.
8. Implementation of Binary Search Tree.
9. Implementation of Graph traversal techniques.
10. Implementation of Hashing.
11. Implementation of Tries.

Text Book:

1. Narasimha Karumanchi, "Data Structures And Algorithmic Thinking With Python", Career Monk Publications, 2016

Suggested Reading:

1. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, “Data Structure and Algorithms in Python”, Wiley, 2013.
2. Kenneth A. Lambert, " Fundamentals of Python: Data Structures", Cengage Learning, 2018.
3. Narasimha Karumanchi, “Data Structures and Algorithms for GATE”, Career Monk Publications, 2011.
4. D. Samantha, “Classic Data Structures”, Prentice Hall India, 2ndEdition, 2013.

Web Resources:

1. https://www.geeksforgeeks.org/data-structures/
2. https://www.coursera.org/specializations/data-structures-algorithms
3. https://nptel.ac.in/courses/106/106/106106182/
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms

Head Dept. of IT
CBIT, Hyderabad

20IT C04

OBJECT ORIENTED PROGRAMMING USING PYTHON LAB

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To familiarize with basics of python programming
2. To explain the usage of OOP concepts to provide solutions
3. To acquaint with Functions and Modules
4. To explain exception handling, file operations in python
5. To introduce library modules to develop GUI applications.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Make use of Python programming constructs to implement solutions to problems
2. Model the problem using OOP strategies and handle exceptions
3. Make use of files and perform file handling operations.
4. Develop GUI's
5. Build solutions to real world problems

List of Programs

1. Demonstrate the use of basic data types and operators.
2. Demonstrate the use of control structures.
3. Implementations of Functions, Lambda functions and parameter passing.
4. Demonstrate the usage of predefined Modules.
5. Implementation of classes with attributes and methods.
6. Demonstration of inheritance.
7. Implementation of Overloading.
8. Implementation of file operations
9. Implementation of Exception Handling
10. Building GUIs.

Text Book:

1. Reema Thareja, "Python Programming: Using Problem Solving Approach", Oxford University Press, 2019

Suggested Reading:

1. Tony Gaddis, "Starting Out With Python", 3rd edition, Pearson, 2015.
2. Kenneth A. Lambert, " Fundamentals of Python: Data Structures", Cengage Learning, 2018.
3. Alan D. Moore, "Python GUI programming with Tkinter", 2018

Web Resources:

1. https://www.python.org/
2. https://nptel.ac.in/courses/106/106/106106182/
3. https://www.coursera.org/learn/python
4. https://learnpythonthehardway.org/book/

Head Dept. of IT
CBIT, Hyderabad

20ME C02

WORKSHOP / MANUFACTURING PRACTICE

Instruction	5P Hours per week
Duration of SEE	3Hours
SEE	50Marks
CIE	50Marks
Credits	2.5

Course Objectives:

1. Give a feel of Engineering Practices & develop holistic understanding of various Engineering materials and Manufacturing processes.
2. Develop skills of manufacturing, safety, precision, quality, intelligent effort, optimization, positive &team work attitude to get things right the first time.
3. To provide basic knowledge of Steel, Plastic, Composite and other materials for suitable applications.
4. Study of Principle and hands on practice on techniques of fabrication, welding, casting, manufacturing, metrology, and allied skills.
5. To advance important hard & pertinent soft skills, productivity, create skilled manpower which is cognizant of industrial workshop components and processes and can communicate their work in a technical, clear and effective way.

Course Outcomes: At the end of the course, the students are able to

1. Understand safety measures to be followed in workshop to avoid accidents.
2. Identify various tools used in fitting, carpentry, tin smithy, house wiring, welding, casting and machining processes.
3. Make a given model by using workshop trades including fitting, carpentry, tinsmithy and House wiring.
4. Perform various operations in welding, machining and casting processes.
5. Conceptualize and produce simple device/mechanism of their choice.

List of Exercises

CYCLE 1

Exercises in Carpentry

1. To plane the given wooden piece to required size
2. To make a lap joint on the given wooden piece according to the given dimensions.
3. To make a dove tail-joint on the given wooden piece according to the given dimensions.

Exercises in Tin Smithy

1. To make a rectangular box from the given sheet metal with base and top open. Solder the corners.
2. To make a scoop.
3. To make a pamphlet box.

Exercises in Fitting

1. To make a perfect rectangular MS flat and to do parallel cuts using Hacksaw
2. To make male and female fitting using MSflats-Assembly1
3. To make male and female fitting using MSflats-Assembly2

Exercises in House Wiring

1. Wiring of one light point controlled by one single pole switch, a three pin socket controlled by a single pole switch, and wiring of one buzzer controlled by a bellpush
2. Wiring of two light points connected in series and controlled by single pole switch. Verify the above circuit with different bulbs. Wiring of two light points connected in parallel from two single pole switches and a three pin socket

Head Dept. of IT
CBIT, Hyderabad

3. Stair case wiring-wiring of one light point controlled from two different places independently using two 2- way switches.

CYCLE 2

Exercises in Casting

1. Study of Sand casting process and its applications**.**
2. Green sand moulding practice for a single piece pattern
3. Green sand moulding practice for a split pattern with a horizontal core

Exercises in Welding

1. Study of gas welding equipment and process. Identification of flames, making of Butt joint with gas welding.
2. Study of Arc welding process, making Butt joint with DCSP,DCRP
3. Study of Arc welding process, making Lap joint with A.C

Exercises in Machine shop

1. Study of Machine Tools like Lathe, Drilling, Milling and Shaper.
2. Facing, Plain turning and Step turning operations on Lathe machine.
3. Knurling and Taper turning on Lathe machine

Open ended Exercise:

1. Student should produce a component /mechanism by applying the knowledge of any one trade or combination of trades.

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I, 2008 and Vol. II, 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata Mc GrawHill House, 2017.

Suggested Reading:

1. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I", Pearson Education, 2008.
2. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.

Head Dept. of IT
CBIT, Hyderabad

20ME C03

ENGINEERING EXPLORATION
(PRACTICAL)

Instruction	4 P Hours per week
Duration of SEE	Nil
SEE	Nil
CIE	50 Marks
Credits	1.5

Prerequisites: Nil
Course Outcomes: At the end of the course, the students are able to

1. Understand the role of an engineer as a problem solver.
2. Identify multi-disciplinary approaches in solving an engineering problem.
3. Build simple systems using engineering design process.
4. Analyze engineering solutions from ethical and sustainability perspectives.
5. Use basics of engineering project management skills in doing projects.

UNIT- I
Role of Engineers: Introduction, science, engineering, technology, engineer, scientist, role of engineer, various disciplines of engineering, misconception of engineering, expectations for the 21st century engineer and NBA graduate attributes.
Engineering problems and Design: Multidisciplinary facet of design, pair wise comparison chart, introduction to econometrics system, generation of multiple solution, Pugh chart, motor and battery sizing concepts, introduction to PCB design.

UNIT- II
Mechanisms: Basic components of a mechanism, degrees of freedom or mobility of a mechanism, 4-bar chain, crank rocker mechanism, slider crank mechanism, simple robotic arm building.
Platform-based development: Introduction to programming platforms (Arduino) and its essentials, sensors, transducers and actuators and their interfacing with Arduino.

UNIT- III
Data Acquisition and Analysis: Types of data, descriptive statistics techniques as applicable to different types of data, types of graphs and their applicability, usage of tools (MS-Office /Open Office/ Libre Office / Scilab) for descriptive statistics, data acquisition (temperature and humidity) using sensors interfaced with Arduino, exporting acquired data to spreadsheets, and analysis using representation.

UNIT- IV
Process Management: Introduction to Agile practice, significance of team work, importance of communication in engineering profession, project management tools, checklist, timeline, Gantt chart, significance of documentation.

UNIT -V
Engineering Ethics & Sustainability in Engineering: Identifying Engineering as a profession, significance of professional ethics, code of conduct for engineers, identifying ethical dimensions in different tasks of engineering, applying moral theories and codes of conduct for resolution of ethical dilemmas.
Sustainability in Engineering: Introduction, sustainability leadership, life cycle assessment, carbon foot print.

Text Books:
1. Clive L. Dym, Patric Little, Elizabeth J Orwin, “Engineering Design: A project-based introduction”, 4th edition, Willey.
2. Matthew Python, “Arduino programming for beginners”, Independently published, 2020.
3. Patrick F. Dunn , “Measurement and data Analysis for engineering and science”, third edition, 2014.

Head Dept. of IT
CBIT, Hyderabad

4. Andrew Stellman, Jennifer Greene, “Head First Agile: A brain-friendly guide to Agile principles, ideas, and real-world practices”, Kindle Edition.

Suggested Reading:

1. Charles B. Fleddermann, “Engineering ethics”, fourth edition, Prentice Hall, 2012.
2. Rob Lawlor, “Engineering in society”, second edition, Royal academy of engineering.
3. Richard Dodds, Roger Venables, “Engineering for sustainable development: Guiding principles”, The Royal Academy of engineering, 2005.

   Richard S. Paul, “Robot Manipulators: Mathematics, Programming, and Control”, MIT Press.

ENGINEERING EXPLORATION ASSESSMENT SCHEME				
S. No	**Name of the module**	**Work Hours**	**Marks**	**Evaluation**
1	Role of Engineers	4	-	Evaluation - I
2	Engineering Design	16	5	
3	Mechanisms	6	3	
4	Engineering Ethics	2	2	
5	Platform-based Development	16	5	Evaluation - II
6	Data Acquisition and Analysis	6	4	Evaluation-III
7	Project Management	4	4	
8	Sustainability in Engineering	6	2	
9	Course Project Reviews	12	20	Final Evaluation
10	Code of conduct	-	5	
	Total	**72**	**50**	

Head Dept. of IT
CBIT, Hyderabad

20ECC34 **DC CIRCUITS, SENSORS AND TRANSDUCERS**

BE (AI&DS)

Instruction	3 L Hours per Week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Concepts of Semiconductor Physics and Applied Physics.

Course Objectives:
1. Understand DC circuit theory for sensors and transducers.
2. Describe semiconductor device's principles and understand the characteristics of junction diode and transistors.
3. Understand working principles of Oscillators, Sensors, and Transducers.
4. Understand Interfacing of various modules of DAQ with myDAQ and myRIO

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Understand about the basics of lower power systems, DC circuits.
2. Use semiconductor devices in making circuits like rectifiers, filters, regulators, etc.
3. Design transistorized circuits of amplifiers and oscillators
4. Acquire the data from various sensors and transducers with the help of DAQ.
5. Analyze usage of sensors/transducer for the development of real-time applications.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	2	3	2	3	2	3	2	1	-	1
CO2	3	3	3	2	1	2	3	2	3	2	3	2	-	-	1
CO3	3	2	3	2	3	3	3	2	3	2	3	2	-	1	1
CO4	3	3	3	3	3	3	3	2	3	2	3	2	1	1	1
CO5	3	3	3	3	3	3	3	2	3	2	3	2	2	2	1

UNIT-I
DC Circuit theory: Basic DC theory, Voltage and Current relationship, Power in Electronics and its calculation, Types of Current - Direct Current (DC) and Alternating Current (AC), DC Voltage, Conventional Current Flow vs. Electron Flow. Measurement of DC current and power in a circuit, Parallel and Series circuits, Batteries and alternative sources of energies.

UNIT-II
Introduction to semiconductor: Characteristics of P-N Junction diode, current equation. Characteristics of Zener Diode
Applications: Zener Diode as a voltage regulator, Half Wave Rectifier and Full Wave Rectifier
Introduction to Transistors: Classification, Bipolar Junction Transistors Configurations.

UNIT-III
Feedback Circuits: Principles of Negative Feedback Amplifiers, Advantages, Types, Topologies of negative feedback, Outline the Effect of negative feedback on Gain, Input Impedance and Output Impedance; Principle of Oscillator, Operation of LC Type- Hartley, Colpitts; RC phase shift Oscillator.
Op-Amps Circuits: Basic Principle, Ideal and practical Characteristics and Applications: Summer, Integrator, and Differentiator.
UNIT-IV
Sensors: Definition, classification of sensors
Proximity Sensors: Eddy current proximity sensors and its Applications, Inductive proximity switch and its Applications

Head Dept. of IT
CBIT, Hyderabad

Velocity, motion, force and pressure sensors: Tachogenerator, Optical encoders, Strain Gauge as force Sensor, Fluid pressure: Tactile sensors
Temperature and light sensors: Resistance Temperature detectors, Photo Diodes, Applications of Photo Diodes.

UNIT-V
Transducers: Definition, classification of Transducers
Mechanical Transducers: Displacement-to-Pressure, Seismic Displacement Transducers
Passive Electrical Transducers: LVDT, Resistor Moisture Transducer
Active Electrical Transducers: Hall Effect Transducer, Piezoelectric transducer
Data Acquisition methods: myDAQ, MyRIO-1900 Architecture, myDAQ Interfacing: Interfacing LED's, Seven segment display, temperature sensors, IR Sensors, Range Finder sensors, Motors, motor driver interfaces, Thermistors, Buzzers.

Text Books:
1. John Bird, Electrical Circuit Theory and Technology, Fifth Edition, 2014.
2. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuits Theory", Pearson Education, 9^{th} edition, LPE, Reprinted, 2006.
3. D Patranabis, Sensors and Transducers, PHI 2nd Edition 2013.
4. DVS Murthy, Transducers and Instrumentation, PHI 2nd Edition 2013
5. Ed Doering, NI myRIO Project Essentials Guide, Feb.2016

Suggested Reading:
1. Arun K. Ghosh, Introduction to measurements and Instrumentation, PHI, 4th Edition 2012.
2. Anindya Nag, Subhas Chandra Mukhopadhyay, Jurgen Kosel ,Printed Flexible Sensors: Fabrication, Characterization and Implementation, Springer International Publishing, Year: 2019, ISBN: 978-3-030-13764-9,978-3-030-13765-6
3. User guide, NI myDAQ
4. User guide and specifications NI myRIO-1900

Head Dept. of IT
CBIT, Hyderabad

20MTC09 **PROBABILITY AND STATISTICS**

Instruction	3 L+1T Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives:
1. Able to learn and Analyzing data in Linear and Non-Linear form.
2. Able to fit the hypothetical data using probability distribution.
3. Understand the data using the testing of Hypothesis.
4. Able to Analyzing time series data using trend analysis.
5. Able to formulate and get the solution of real world problem.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Use the principle of Least Squares approximating for estimating the value.
2. Use the basic probability for fitting the Random phenomenon.
3. Analyzing data using different methods of hypothesis testing.
4. Use the Moving Averages Methods for trend analysis.
5. Analyze the random phenomena of real world data.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	-	-	-	-	1	-	-	1	-	1	1
CO2	2	2	-	-	-	-	-	-	1	-	-	1	-	1	1
CO3	2	2	-	-	-	-	-	-	1	-	-	1	-	1	1
CO4	2	2	2	-	-	-	-	-	1	-	-	1	-	1	1
CO5	2	2	2	-	-	-	-	-	1	-	-	1	-	1	1

UNIT-I: Curve Fitting
Measures of Central Tendency, Measures of Dispersion, Moments (Moments about the mean and moments about a point). Skewness, Karl Pearson's coefficient of skewness and Bowley's coefficient of skewness for frequency distribution, Kurtosis. Curve fitting by the Method of Least Squares, Fitting of Straight lines, Second degree parabola and Growth curve ($\square = \square\square^{\square\square}$, $\square = \square\square^{\square}$ □□□□ $= \square\square^{\square}$).

UNIT-II: Discrete Probability Distribution
Basic Probability, Conditional Probability, Baye's theorem. Random variable, discrete random variable, Probability Mass Function, continuous random variable, probability density function. Mathematical expectation, properties of Expectation, properties of variance and co-variance. Poisson distribution, MGF and Cumulates of the Poisson distribution, Recurrence formula for the probabilities of Poisson distribution (Fitting of Poisson distribution).

UNIT-III: Continuous Probability Distribution
Normal distribution, Characteristics of normal distribution and Normal probability Curve, MGF and CGF of Normal distribution, Areas under normal curve. Uniform distribution, moment generating function, mean and variance of uniform distribution. Gamma distribution, MGF, CGF, Mean and Variance of Gamma distribution. Exponential distribution, MGF, CGF, Mean and Variance of Exponential distribution.

UNIT-IV: Large and Small Sample Tests
Tests of significance, tests of significance for large samples. Tests of significance for single proportion, and difference of proportions. Tests of significance for single mean and difference of means. Tests of significance of differences of standard deviations. Small sample test, t-test for single mean and differences of Means. F-test for equality of two population variances. Chi-Square test of goodness of fit and test of independent of attributes.

Head Dept. of IT
CBIT, Hyderabad

UNIT-V: Time Series Analysis and Analysis of Variance
One way classification-Assumptions for ANOVA Test-ANOVA for fixed effect model-Two way classification-ANOVA for fixed effect model-Components of Time series-Measurement of Trend- Method of semi Averages-Moving Averages Method (3 Years and 5 Years).

Text Books:

1. S.C.Gupta, V.K.Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.
2. S.C.Gupta, V.K.Kapoor, "Fundamentals of **Applied** Statistics", Sultan Chand and Sons, 2014.

Suggested Reading:

1. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, 3rd Ed., Wiley, 1968.
2. Sheldon Ross, "A First Course in Probability", 9th Edition, Pearson publications, 2014.

Head Dept. of IT
CBIT, Hyderabad

20ITC08 **DATABASE MANAGEMENT SYSTEMS**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To introduce the fundamental concepts and the role of a database system in an organization
2. To acquire knowledge on Data base design models, constraints and notations.
3. To familiarize with querying databases using SQL.
4. To acquaint with design and implementation issues of a database system.
5. To discuss the concepts of database security, concurrency and recoverability.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the purpose of database systems and design any domain specific database using E-R model.
2. Design and implement a database using Relational data model, formulate Relational algebra expressions. Use SQL for efficient data retrieval queries.
3. Access databases from high level languages, define triggers and apply normalization.
4. Understand the concepts of database transactions, locking protocols, concurrency control, backup and recovery.
5. Efficiently organize and manage data using indexing and hashing.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	1	1	-	-	-	1	1	1	1	3	-	2
CO2	2	1	2	1	2	-	-	-	-	-	1	-	2	-	2
CO3	2	1	2	2	1	-	-	-	-	-	-	-	2	-	2
CO4	2	1	1	1	1	-	-	-	-	-	-	1	2	-	2
CO5	2	1	1	1	1	-	-	-	-	-	-	1	3	-	2

UNIT-I

Introduction: Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, Database Design, Database Engine, Database and Application Architecture, Database Users and Administrators and History of Database Systems.

Database Design Using the E-R Model: Overview of the Design Process, The Entity- Relationship Model, Complex Attributes, Mapping Cardinalities, Primary Key, Removing Redundant Attributes in Entity Sets, Reducing E-R Diagrams to Relational Schemas, Extended E-R Features and Entity-Relationship Design Issues,

UNIT-II

Introduction to the Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages and The Relational Algebra.

Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub queries, Modification of the Database.

Intermediate SQL: Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Index Definition in SQL and Authorization.

UNIT-III

Advanced SQL: Accessing SQL from a Programming Language, Functions and Procedures, Triggers, Recursive Queries, Advanced Aggregation Features.

Relational Database Design: Features of Good Relational Designs, Decomposition using Functional Dependencies, Normal Forms, Functional-Dependency Theory, Algorithms for Decomposition Using Functional Dependencies, More Normal Forms, Atomic Domains and First Normal Form, Database-Design

Head Dept. of IT
CBIT, Hyderabad

Process.

UNIT-IV
Transactions: Transaction Concept, a Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity.
Concurrency Control: Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Timestamp-Based Protocols and Validation-Based Protocols.

UNIT-V
Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management and ARIES.
Indexing and Hashing: Basic Concepts, Ordered Indices, B+ -Tree Index Files, Hash Indices, Multiple-Key Access, Creation of Indices and Bitmap Indices.

Text Book:
1. Abraham Silberschatz, Henry F Korth, S. Sudarshan, “Database System Concepts”, 7th Edition, McGraw-Hill International Edition, 2020.

Suggested Reading:
1. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database System”, 6th Ed, Add-Wes, 2011.
2. Raghu Ramakrishnan, Johannes Gehrke, “Database Management Systems”, 3rd Ed, Mc GH Intl 2014.
3. Rick F Vander Lans, “Introduction to SQL”, 4th Ed, Pearson Education, 2007.
4. Benjamin Rosenzweig, Elena Silvestrova, “Oracle PL/SQL by Example”, 5th Ed, Pearson Ed, 2015.

Web Resources:
1. http://db-book.com/
2. https://www.tutorialspoint.com/dbms/
3. https://www.w3schools.in/dbms/
4. http://www.oracle-dba-online.com/sql/oracle_sql_tutorial.htm.
5. http://www.tutorialspoint.com/plsq

Head Dept. of IT
CBIT, Hyderabad

20ADC01 **JAVA PROGRAMMING**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
1. To familiarize with fundamentals of object-oriented programming paradigm.
2. To impart the knowledge of string handling, interfaces, packages and inner classes.
3. To acquaint with Exception handling mechanisms and Multithreading.
4. To gain knowledge on collection framework, stream classes.
5. To familiarize with the concept of Regular Expressions and new features introduced in java Version 8

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Understand object-oriented concepts.
2. Create Java applications using best OOP practices e.g. Inheritance, interfaces, packages, and inner classes.
3. Implement the concepts of Exception Handling and Multi-threading.
4. Develop applications using Collections framework and handle files.
5. Use Regular expression and java 8 concepts in application development

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	1	-	-	-	1	-	-	1	2	3	-
CO2	2	1	1	-	1	-	-	-	-	-	-	1	1	3	-
CO3	2	2	1	-	-	-	-	-	-	-	2	2	2	3	2
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	3	3
CO5	2	1	-	-	-	-	-	-	1	-	-	2	2	3	3

UNIT-I
Introduction to Java: Objects, Classes, structure a java program, difference between jdk and jre, Java Primitive Types, Basic Operators, Conditional and Logical statements. Defining Classes: Adding Instance Fields and Methods, Constructors, Access Modifiers (Visibility Modes), Object Creation Examples, Method Overloading and Constructor Overloading, Use of static and final keywords, Objects as parameters, Difference between local variable and instance field, importance of Object class.

UNIT–II
Inheritance, Interfaces and Packages in Java: Defining super / sub classes, Abstract classes, Method overriding, Interfaces and new features in latest version. Packages: Defining, Creating and Accessing a Package, importing packages.
Arrays, Strings in Java: How to create and define arrays, Introduction to java. util. Array class, Difference between String &String Buffer classes, StringTokenizer class and Wrapper classes and conversion between Objects and primitives, Autoboxing and unboxing
Inner classes in Java: Types of inner classes, Creating static / non-static inner classes, Local and anonymous inner classes.

UNIT–III
Exception Handling in Java: What are exceptions, Error vs. Exception, usage of try, catch, throw throws and finally clauses, writing your own exception classes, Difference between checked vs. unchecked Exceptions.
Generics: Need of Generics concept, Generic classes, bounded types, Generic methods and interfaces.
Multithreading in Java: The java Thread Model, How to create threads, Thread class in java, Thread priorities, Inter thread communication, Thread synchronization

Head Dept. of IT
CBIT, Hyderabad

UNIT–IV

Collections: Overview of Java Collection Framework, Collection Interfaces – Collection, Set, List, Map, Commonly used Collection classes – ArrayList, LinkedList, HashSet, TreeSet, HashMap, TreeMap, legacy and class, Iteration over Collections – Iterator and ListIterator, Enumeration interfaces, differentiate Comparable and Comparator

File Handling: Stream classes, Reader and Writer classes, File and Directory class, How to read user input from keyboard.

UNIT-V

Regular Expression : Introduction, Application areas of Regular Expression, Pattern class**,** Matcher class, Important methods of Matcher class, Character classes, Predefined character classes, Quantifiers, Pattern class split() method, String class split() method.

Java 8 new Features: Collections and Java Stream, Functional Interfaces in Java 8 Stream, Converting Java Stream to Collection or Array, Java Stream Intermediate Operations, Terminal Operations, Functional Interfaces, Lambda Expressions.

Text Books:

1. Herbert Schildt, "Java: The Complete Reference", 11th Ed, Tata McGraw Hill Publications, 2020.
2. Cay S. Horstmann, Gary Cornell, "Core Java, Volume I-Fundamentals", 8th Ed, Prentice Hall, 2008.

Suggested Reading:

1. Sachin Malhotra, Saurabh Choudhary, "Programming in Java", OUP, 2nd Ed, 2014.
2. C.Thomas Wu, "An Introduction to Object-Oriented Programming with Java", Tata Mc GH, 4th Ed, 2010.

Web Resources:

1. https://www.cse.iitb.ac.in/~nlp-ai/javalect_august2004.html
2. https://nptel.ac.in/courses/106106147/2
3. https://ocw.mit.edu/courses/electrical-engineering-and-computerscience/6-092-introduction-to-programming-in-java-january-iap-2010/ lecture-notes/

Head Dept. of IT
CBIT, Hyderabad

20ITC05 **DIGITAL LOGIC AND COMPUTER ARCHITECTURE**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
1. To familiarize with logic gates, combinational and Sequential logic circuits.
2. To provide understanding of Data representation.
3. To present the operation of the Central Processing Unit.
4. To facilitate with the techniques that computers use to communicate with input and output devices.
5. To introduce the concept of memory hierarchy and memory management.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Understand simplification of logic gates, fundamentals of combinational and sequential logic gates.
2. Design of registers, counters and representation of data using numbers.
3. Understand the architecture and functionality of central processing unit.
4. Discuss the techniques that computers use to communicate with I/O devices for data transfer.
5. Comprehend memory hierarchy, cache memory and virtual memory.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	1	-	-	-	1	-	-	1	2	-	3
CO2	2	1	1	-	1	-	-	-	-	-	-	1	1	-	3
CO3	2	2	1	-	-	-	-	-	-	-	2	2	-	-	3
CO4	2	1	-	-	-	-	-	-	-	-	-	2	-	-	3
CO5	2	2	1	-	-	-	1	-	1	-	2	2	1	-	3

UNIT-I
Digital Logic Circuits: Digital Computers, Logic Gates, Boolean Algebra, Map simplification, Product –of-sums Simplification, Don't –Care Conditions, Combinational Circuits, Half-Adder, Full–Adder, Flip-Flops: SR, D , JK, T Flip- Flops, Edge triggered Flip-Flops, Excitation Tables.

UNIT-II
Digital Components: Integrated circuits, Decoders. Encoders, Multiplexers
Registers: Register with Parallel load, Shift Register, Counters.
Data Representation: Data Types, Number Systems, Octal and Hexa decimal Numbers, Decimal Representation, Complements: (r-1)'s Complement's Complement, Subtraction of Unsigned Numbers, Fixed–Point Representation, Floating –Point Representation.

UNIT-III
Central Processing Unit: Computer Registers, General register Organization, Instruction Cycle, Instruction Formats: Three Address Instructions, Two-Address Instructions, One-Address Instructions,Zero-AddressInstructions,RISCInstructions,AddressingModes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer(RISC):CISC Characteristics, RISC Characteristics, Multicore Processors and their Performance.

UNIT-IV
Input-Output Organization: Peripheral Devices: ASCII Alphanumeric Characters, Input-output Interface: I/O Bus and Interface Modules, Asynchronous Data Transfer: Strobe Control, Handshaking, Asynchronous Communication Interface,First-In-First-OutBuffer,ModesofTransfer:Interrupt-InitiatedI/O, Priority Interrupt:

Head Dept. of IT
CBIT, Hyderabad

Daisy Chaining Priority, Parallel Priority Interrupt, Priority Encoder, Direct Memory Access(DMA): DMA Controller.

UNIT-V

Memory Organization: Memory Hierarchy, Main Memory: RAM and ROM Chips, Memory Address Map, Memory Connection to CPU, Auxiliary memory: Magnetic Disks, solid state drive and Linear Tape Open Technology, Associative Memory: Hardware Organization, MatchLogic,ReadandWriteOperations,CacheMemory:AssociativeMapping, Direct Mapping, Set-Associative Mapping, Virtual Memory: Address Space and Memory Space, Address Mapping using Pages, Associative Memory Page Table, Page Replacement.

Text Books:

1. M.MorrisMano,"ComputerSystemArchitecture",3^{rd}Edition,Pearson Education, 2016.
2. John L. Hennessy, David A. Patterson Morgan Kaufman, "Computer Architecture - A Quantitative Approach", 5^{th} edition,, Elsevier,2012
3. William Stallings, "Computer Organization and Architecture", 9^{th} edition, Pearson Education, 2013

Suggested Reading:

1. Stephen Brown, ZvonkoVranesic,"FundamentalsofDigitalLogicwithVHDLdesign",2^{nd} Edition, McGrawHill,2009.
2. ZVI Kohavi, "Switching and Finite Automata Theory", 2^{nd} Edition,TataMcGrawHill,1995.
3. William Stallings, "Computer Organization and Architecture", 8^{th}Edition, PHI.
4. CarlHamachar,Vranesic,Zaky,"ComputerOrganization",5^{th}Edition, McGraw Hill.

Web Resources:

1. https://nptel.ac.in/courses/117106114Week1%20Slides1.1Introduction.pdf
2. https://ece.gmu.edu/coursewebpages/ECE/ECE545/F10/viewgraphs/ ECE545_lecture1_digital_logic_review.ppt
3. http://www.nptelvideos.in/2012/11/computer-organization.html

Head Dept. of IT
CBIT, Hyderabad

20EGM01 **INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES**
(BE/ B.Tech. III/IV Semester - Common to all branches)

Instruction	2 L Hours per week
Duration of Semester End Examination	2 Hours
SEE	50 Marks
Credits	No Credits

Course Objectives:
The course will introduce the students to:
1. History of Indian Constitution and how it reflects the social, political and economic perspectives of the Indian society.
2. Growth of Indian opinion regarding modern Indian intellectual's constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. Various Organs of Governance and Local Administration.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Understand the making of the Indian Constitution, its features and learn the importance of Directive Principles of State Policy.
2. Identify the difference between Right to Equality and Right to Freedom and know the relevance of Fundamental Duties.
3. Analyze the structuring of the Indian Union, distribution of powers between the Union and the States, and the role and position of President in Union Government.
4. Distinguish between the LokSabha and RajyaSabha in law making process while appreciating the importance of Judiciary in interpretation of law and protection of citizens' rights.
5. Differentiate between the Municipalities and Panchayats in their functioning and know the role of Collector in district administration.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	1	1	-	1	-	-	-	-	-	-
CO2	-	-	-	-	-	1	1	1	1	-	-	-	1	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	1	1	1	-	-	-	-	1	-	-
CO5	-	-	-	-	-	1	1	1	1	-	-	-	1	-	-

UNIT-I
Constitution of India: Constitutional history-Govt of India Act 1909, 1919 and 1935, Constitution making and salient features. Directive Principles of State Policy - Its importance and implementation.

UNIT-II
Scheme of the Fundamental Rights & Duties: The Fundamental Rights **-** Right to Equality, Right to Freedom under Article 19, Right to Life and Personal Liberty Under Article 21.
Fundamental Duties - the legal status.

UNIT-III
Union Government and its Administration - Structure of the Indian Union, Federalism: distribution of legislative and financial powers between the Union and the States.
Parliamentary form of government in India: Union Executive-President's power, role and position.
Emergency Provisions: National, Constitutional and Financial Emergencies.

UNIT-IV
Union **Legislature and Judiciary:** Union Legislature-Parliament: LokSabha and RajyaSabha, functions of Parliament and Parliamentary Committees.

Head Dept. of IT
CBIT, Hyderabad

Union Judiciary: Supreme Court-Functions, Judicial Review and Judicial Activism

UNIT-V

Local Self Government - District's Administration Head (Collector): Role and Importance.
Municipalities: Introduction, Chairman/Mayor and Role of Elected Representatives, Commissioner of Municipality/Municipal Corporation.
Panchayati Raj: Zilla Panchayat-Elected Representatives and their roles, CEO of Zilla Panchayat: Position and Role. Block level: Organizational Hierarchy (Different departments). Village level: Role of Elected and Officials.

Text Books:

1. Indian Government & Politics, Ed. Prof V Ravindra Sastry, Telugu Academy, 2nd Edition, 2018.
2. Indian Constitution at Work, NCERT, First edition 2006, Reprinted- January 2020.

Suggested Reading:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, Framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Web Resource:

1. http://www.nptel.ac.in/courses/103107084/Script.pdf

Head Dept. of IT
CBIT, Hyderabad

20EGM02 **INDIAN TRADITIONAL KNOWELDGE**

Instruction	2 L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	-

Prerequisite: Knowledge on Indian Culture

Course Objectives:

1. To get a knowledge in Indian Culture
2. To Know Indian Languages and Literature and the fine arts in India
3. To explore the Science and Scientists of Medieval and Modern India

Course Outcomes:

After completion of this course, students will be able to:

1. Understand philosophy of Indian culture
2. Distinguish the Indian languages and literature
3. Learn the philosophy of ancient, medieval and modern India
4. Acquire the information about the fine arts in India
5. Know the contribution of scientists of different eras.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	1	-	-	1	-	--	-	-	-	-	-	-	-
CO2	-	1	1	-	-	1	1	1	-	-	-	-	1	-	-
CO3	-	1	-	-	-	-	-	--	-	1	-	-		-	-
CO4	1	1	1	-	-	1	-	--	-	-	-	-	1	-	-
CO5	1	1	1	1	-	-	-	--	-	-	-	1	1	-	-

UNIT-I

Culture and Civilization: Culture, civilization and heritage, general characteristics of culture, importance of culture in human life, Cultural diversity, Aesthetics, Women seers, Indus culture, Indian cuisine, Martial arts

UNIT-II

Education System: Education in ancient, medieval and modern India, aims of education, subjects, Languages, Science and Scientists of ancient, medieval and modern India

UNIT-III

Linguistic Wealth: Indian Languages and Literature: the role of Sanskrit, Paleography, Significance of scriptures to current society, Indian semantics and lexicography, Bhakti literature, Darsanas

UNIT-IV

Art, Technology & Engineering: Sculpture, Painting and Handicrafts, Indian Music, Dance Drama and Theatre, Introduction to Mayamatam, Iron and steel technology, Use of metals in medicinal preparations

UNIT-V

Science and Logic: Helio-centic system, Sulbasutras, Katapayadi, Hindu calendar, 6 pramanas in Indian logic, Scientific method applied to therapeutics, Fallacies, Tarka – Induction &Deduction, Ayurvedic biology, Definition of health

Head Dept. of IT
CBIT, Hyderabad

Essential Readings:

1. Kapil Kapoor, **Text and Interpretation: The Indian Tradition,** ISBN: 81246033375, 2005
2. Samskrita Bharati, **Science in Samskrit**, ISBN-13: 978-8187276333, 2007
3. Satya Prakash, **Founders of sciences in Ancient Indi**a, Govindram Hasan and, ISBN-10: 8170770009, 1989
4. Brajendranath Seal, **The Positive Sciences of the Ancient Hindus**, Motilal Banarasi dass, ISBN-10: 8120809254, 1915.
5. KanchaIlaiah, Turning the Pot, Tilling the Land: Dignity of Labour in Our Times

Suggested Reading:

1. Swami Vivekananda, Caste, Culture and Socialism, Advaita Ashrama, Kolkata ISBN-9788175050280
2. Swami Lokeswarananda, Religion and Culture, Advaita Ashrama, Kolkata ISBN-9788185843384
3. Kapil Kapoor, Language, Linguistics and Literature: The Indian Perspective, ISBN-10: 8171880649, 1994.
4. Karan Singh, A Treasury of Indian Wisdom: An Anthology of Spiritual Learn, ISBN: 978-0143426158, 2016
5. Swami Vivekananda, The East and the West, AdvaitaAshrama, Kolkata 9788185301860
6. Srivastava R.N., Studies in Languages and Linguistics, Kalinga Publications ISBN-13: 978-8185163475
7. SubhashKak and T.R.N. Rao, Computation in Ancient India, Mount Meru Publishing ISBN-1988207126
8. R.N Misra, Outlines of Indian Arts Architecture, Painting, Sculpture, Dance and Drama, IIAS, Shimla & Aryan Books International, ISBN 8173055149
9. S. Narain, Examinations in ancient India, Arya Book Depot, 1993
10. M. Hiriyanna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, ISBN-13: 978-8120810990, 2014
11. Ravi Prakash Arya, Engineering and Technology in Ancient India, Indian Foundation for Vedic Science, ISBN-10: 1947593072020
12. Shashi Tharoor, The Hindu Way
13. Amartya Sen, Argumentative Indian

SWAYAM / NPTEL:

History of Indian Science and Technology - https://onlinecourses.swayam2.ac.in/arp20_ap35/preview
Introduction to Ancient Indian Technology – https://onlinecourses.nptel.ac.in/noc19_ae07/preview
Indian Culture & Heritage - https://onlinecourses.swayam2.ac.in/nos21_sc11/preview
Language and Society - https://nptel.ac.in/courses/109/106/109106091/
Science, Technology & Society - https://nptel.ac.in/courses/109/103/109103024/
Introduction to Indian Philosophy - https://nptel.ac.in/courses/109/106/109106059/
Introduction to Indian Art - An appreciation - https://onlinecourses.nptel.ac.in/noc20_hs09/preview

Head Dept. of IT
CBIT, Hyderabad

20ITC10 **DATABASE MANAGEMENT SYSTEMS LAB**

Instruction	2 Hours per week
Duration of Semester End Examination	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To introduce the basic commands of SQL.
2. To familiarize with query writing.
3. To impart knowledge on triggers, procedures and triggers.
4. To introduce exception handling in PL/SQL.
5. To familiarize with design and development of database applications

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Design and implement database schemas by enforcing integrity constraints.
2. Use SQL for database administration, data manipulation and retrieval.
3. Develop PL/SQL programs and use cursors for the databases.
4. Design triggers for database validation.
5. Handle Exceptions in PL/SQL programs.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	2	-	-	-	3	1	1	-	3	-	2
CO2	1	1	-	-	1	-	-	-	-	-	-	-	-	-	2
CO3	2	1	2	2	1	-	-	-	1	1	-	-	1	-	2
CO4	2	2	2	2	1	-	-	-	1	1	-	-	3	-	2
CO5	2	2	2	2	1	-	-	-	1	1	-	-	2	-	2

List of Programs

1. Creation of database (Exercising commands like DDL and DML)
   (Note: use constraints while creating tables).
2. Exercising Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING clause and Creation and dropping of Views.
3. Exercising Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION INTERSECT Constructs.
4. Exercising all types of Joins.
5. Demonstration of PL/SQL Blocks and Cursors.
6. Demonstration of Procedures and Functions.
7. Usage of Triggers (BEFORE and AFTER Triggers, Row and Statement level Triggers and INSTEAD OF Triggers).
8. Demonstrate Exception Handling by PL/SQL procedures for data validation.
9. Creation of Forms and Generation of SQL reports.
10. Creation of full-fledged database application spreading over to 3 sessions.

Text Books:

1. Rick F Vander Lans, “Introduction to SQL”, 4th Edition, Pearson Education, 2007.
2. Benjamin Rosenzweig, Elena Silvestrova, “Oracle PL/SQL by Example”, 5th Edition, Pearson Education, 2015.
3. Alan Beaulieu, “Learning SQL”, 2nd Edition, O’Reilly, 2009.

Head Dept. of IT
CBIT, Hyderabad

Suggested Reading:

1. Albert Lulushi, "Oracle Forms Developer's Handbook", Pearson Education, 2006.

Web Resources:

1. http://www.oracle-dba-online.com/sql/oracle_sql_tutorial.htm
2. https://www.javatpoint.com/pl-sql-tutorial

Head Dept. of IT
CBIT, Hyderabad

20ADC02 **JAVA PROGRAMMING LAB**

Instruction	2 Hours per week
Duration of Semester End Examination	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To gain the fundamental programming knowledge of OOPs.
2. To use Exception handling mechanisms in application development.
3. To provide the knowledge of generics and Collections Framework.
4. To understand the Java.io package
5. To provide the knowledge in Regular Expressions and Java 8 Streams

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Develop Java applications using the concepts of Inheritance, interfaces, packages and access control modifiers.
2. Implement the concepts of Exception Handling and Multithreading in java Applications
3. Read and write data using different Java I/O streams.
4. Develop applications using Collections framework.
5. Validate inputs using regular expression and apply the knowledge of Java 8 new features in application Development.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	1	-	-	-	-	-	-	1	-	-	1	3	-
CO2	-	2	1	1	-	-	-	-	-	-	-	-	1	3	-
CO3	-	2	1	1	-	-	-	-	-	-	-	-	2	3	3
CO4	-	2	1	1	-	-	-	-	-	-	-	-	1	3	-
CO5	-	2	1	2	3	-	-	-	-	-	-	-	2	3	3

List of Programs

1. Program(s) to illustrate the concepts of constructor overloading, method overloading, static and final keywords usage.
2. Program(s) to illustrate the concepts of Inheritance, method overriding, super key word usage and Dynamic polymorphism.
3. Program(s) to illustrate concept of Abstract Class and Interface.
4. Program(s) to demonstrate String handling with String, String Buffer and String Tokenizer classes.
5. Program(s) to demonstrate various types of inner classes, Packages creation and usage.
6. Program(s) to demonstrate concept of exception handling and user defined exceptions.
7. Program(s) to demonstrate concept of Multithreading and Thread synchronization.
8. Program(s) using Generics, Collection framework classes and Interfaces.
9. Programs(s) on Comparator, Comparable interfaces to define Customized sorting order on collection objects
10. Program(s) to illustrate the usage of I/O streams.
11. Program(s) to demonstrate the use of Regular expressions
12. Program(s) on Java 8 stream concepts
13. Programs(s) on usage of java 8 function programming features.

Text Books:

1. Herbert Schildt, "Java: The Complete Reference", 11th Ed, Tata McGraw Hill Publications, 2020.
2. Cay S. Horstmann, Gary Cornell: "Core Java, Vol I-Fundamentals", 8th Ed, PrenticeHall, 2008.

Head Dept. of IT
CBIT, Hyderabad

Suggested Reading:
1. Sachin Malhotra, Saurabh Chaudhary: "Programming in Java" , Oxford University Press, 2^{nd} Ed, 2014.
2. C.Thomas Wu, "An Introduction to Object-Oriented Programming with Java", Tata McGH 4^{th} Ed, 2010.

Web Resources:
1. https://www.cse.iitb.ac.in/~nlp-ai/javalect_august2004.html
2. https://nptel.ac.in/courses/106106147/2
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-092-introduction-to-programming-in-java-january-iap-2010/ lecture-notes/

Head Dept. of IT
CBIT, Hyderabad

20ADC03 ARTIFICIAL INTELLIGENCE & MACHINE LEARNING TOOLS, TECHNIQUES AND APPLICATIONS

Instruction	2 Hours per week
CIE	50 Marks
Credits	1

Course Objectives:
1. To introduce fundamental concepts in AI
2. To demonstrate simple AI applications using Natural Language Processing, Audio engineering & Speech
3. To demonstrate simple AI applications using Computer Vision, pattern recognition and machine learning.
4. To present various modeling and formulation techniques to solve problems using AI techniques.
5. To introduce state-of-art AI tools and techniques to solve problems faced by Engineers in design and analysis.

Course Outcomes:
Upon successful completion of the course the students will be able to:
1. Understand the importance of AI.
2. Understand concepts of Machine Learning algorithms and their limitations.
3. Develop Chatbots based on the requirements.
4. Analyse complex problems involving image processing, such as quality control, visual surveillance, multimodal human-machine interfaces, and image compression.
5. Understand the application of Reinforcement Learning.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	1	1	-	2	-	2	-	3	2
CO2	-	2	-	1	-	-	1	1	-	2	-	2	-	3	2
CO3	1	3	2	2	3	-	1	1	-	1	-	2	3	3	3
CO4	3	3	2	3	3	-	1	1	-	1	-	3	3	3	3
CO5	1	1	1	1	-	-	1	1	-	2	-	2	-	3	3

List of Programs

1. **Overview of AI, AI project lifecycle**
   a. Design/Construct the workflow of a general AI project using draw.io
2. **Teachable Machine** - To introduce Machine Learning Models, Computer Vision, Natural Language Processing
   a. Train a Machine Learning model to recognize a Person or Object including gestures
   b. Train a Machine Learning model to recognize various sound bites
   c. Train a Machine Learning model to recognize speech
3. **AI with App Inventor** - To introduce Image Classification, Audio Classification, Facial Recognition, Reinforcement Learning(Markov Models)
   a. Develop an app to recognize objects using Image Classification
   b. Train a Machine Learning model to identify different facial expressions using webcam
   c. Develop an Expression Match app using the trained ML model for facial expressions
   d. Develop a Voice Authentication app that uses a trained audio model of the user using audio classification to recognize the user's voice to authenticate.
   e. Develop a Rock-Paper-Scissors game that uses Reinforcement Learning (Markov Models) to learn from the patterns in the user's game choices
4. **Amazon Lex** - To introduce Automatic Speech Recognition(Speech to Text), Natural Language Understanding(intent of text), Conversational AI agents
   a. Develop a conversational Chabot to automatically recognize speech, understand the intent of the user and generate a response accordingly using Amazon Lex

Head Dept. of IT
CBIT, Hyderabad

5. **Wolfram Technology Framework** - To introduce Supervised Learning(Classification, Prediction, Sequence Prediction), Unsupervised Learning(Feature Extraction, Clustering), Neural Networks, Model Deployment
    a. Design a program using the Wolfram Language to Classify Data(Numbers, Images, Colors) using automatic model selection.
    b. Design a program using the Wolfram Language to predict the price of a house from a housing prices dataset using Regression.
    c. Design a program using the Wolfram Language to demonstrate Vector Encoding based Feature Extraction and Clustering for a dog image dataset.
    d. Construct a neural network from an image dataset and explore the hidden layers along with their outputs using the Wolfram Language

Web Resources:
1. https://teachablemachine.withgoogle.com/v1/
2. https://appinventor.mit.edu/explore/ai-with-mit-app-inventor
3. https://aws.amazon.com/lex/
4. https://www.wolfram.com/wolfram-u/machine-learning-zero-to-AI-60-minutes/
5. https://www.coursera.org/learn/ai-for-everyone

Head Dept. of IT
CBIT, Hyderabad

20ITC12 **MINI PROJECT –I**

Instruction	2 Hours per week
CIE	50 Marks
Credits	1

Course Objectives:

1. To enable students learning by doing.
2. To develop capability to analyse and solve real world problems.
3. To inculcate innovative ideas of the students.
4. To impart team building and management skills among students.
5. To instill writing and presentation skills for completing the project.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Interpret literature with the purpose of formulating a project proposal.
2. Plan, Analyse, Design and Implement a project.
3. Find the solution of identified problem with the help of modern Technology and give priority to real time scenarios.
4. Plan to work as a team and to focus on getting a working project done and submit a report within a stipulated period of time.
5. Prepare and submit the Report and deliver presentation before the Departmental Committee.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	3	2	1	2	3	3	2	3	3
CO2	3	3	3	3	3	3	3	2	1	2	3	3	3	3	3
CO3	3	3	3	3	3	3	3	2	-	2	3	3	3	3	3
CO4	2	2	2	3	3	3	3	2	3	3	2	3	2	3	3
CO5	1	2	1	2	3	3	-	-	2	3	-	-	-	3	-

The Students are required to choose a topic for mini project related to the courses of the current semester or previous semester. The student has to implement and present the project as per the given schedule. During the implementation of the project, Personnel Software Process (PSP) has to be followed. Report of the project work has to be submitted for evaluation.

Schedule

S No	Description	Duration
1.	Problem Identification / Selection	2 weeks
2.	Preparation of Abstract	1 week
3.	Design, Implementation and Testing of the Project	7 weeks
4.	Documentation and Project Presentation	4 weeks

Guidelines for the Award of Marks

S No	Description	Max. Marks
1.	Weekly Assessment	20
2.	PPT Preparation	5
3.	Presentation	10
4.	Question and Answers	5

Head Dept. of IT
CBIT, Hyderabad

5.	Report Preparation	10

Final Mini Project demonstration and PPT presentation is to be evaluated for the entire class together by all the faculty handling Mini Project for that class.

Head Dept. of IT
CBIT, Hyderabad

20ADI01

MOOCS / TRAINING / INTERNSHIP

Instruction/Demonstration/Training	3-4 Weeks/90 Hours
Duration of Semester End Presentation	--
Semester End Evaluation	60 Marks
Mid Term Evaluation	40 Marks
Credits	2

Prerequisite: Knowledge of basic Sciences

MOOCs/Training/Internship Objectives:
This MOOCs/Training/Internship aims to:

1.
2.
3.

MOOCs/Training/Internship Outcomes:
Upon completion of this MOOCs/Training/Internship, students will be able to:

1.
2.
3.
4.
5.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1															
CO2															
CO3															
CO4															
CO5															

Refer Internship Policy Document

Head Dept. of IT
CBIT, Hyderabad

20MTC10 **STOCHASTIC PROCESS AND QUEUEING THEORY**

Instruction	3 L Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. Able to learn methods to solve bivariate probability functions.
2. Able to know characterizing the random process.
3. Able to identify the tools for interpretating the random process
4. Able to know the statistical techniques for random process
5. Able to analyse the queuing model's

Course outcomes: On successful completion of this course the students shall be able to

1. Estimate the marginal probabilities of statistical averages
2. Distinguish the random process of auto correlation and cross correlation
3. Characterize the random process of ensemble averages
4. Analyze the effect the thermal noise in the system
5. Analyze the queuing behavior of different queuing models.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	-	-	1	-	-	-	-	1	1
CO2	2	2	-	-	-	-	-	-	1	-	-	-	-	1	1
CO3	2	2	-	-	-	-	-	-	1	-	-	-	1	1	1
CO4	2	2	2	-	-	-	-	-	1	-	-	-	1	1	1
CO5	2	2	2	-	1	-	-	-	1	-	-	-	1	1	1

UNIT-I: Two-Dimensional Random Variables

Two-dimensional or Joint Probability Mass Function, Two-dimensional Distribution Function, Marginal Distribution Functions, Joint Density Function, Marginal Density Function, The Conditional Distribution Function and Conditional Probability Density Function, Stochastic Independence, Generalization of n dimensional random variable, transformation of One-dimensional Random variable, transformation of Two- dimensional random variable.

UNIT-II: Random Processes

Classification of Random Processes, Methods of Description of a Random Process, Special classes of Random Processes, Average values of Random Processes, Stationarity, Strict Strong Stationary process, Analytical Representation of a Random process, Autocorrelation Function and Its properties of R(t),Cross-Correlation Function and its Properties wide sense stationary process.

UNIT-III: Discrete Time Process

Ergodicity, Mean-Ergodic Process, Mean Ergodic Theorem, Correlation Ergodic Process, Distribution Ergodic Process, Power Spectral density function, Properties of power spectral Density function, Properties of Power Spectral Density Function, System in the Form of Convolution, Unit Impulse Response of the System, Properties.

UNIT-IV: Applications of Random Process

Definition of Gaussian process, Properties, Bank Pass Process, Narrow-Bank Gaussian process, Property, Noise, Thermal noise, Filters, Poisson process, Probability law of Poisson process, Mean and Autocorrelation of the Poisson process, Properties of Poisson process, Markow process, Definition of a Markov chain.

UNIT-V: Queueing Theory

Introduction-Queueing system-The arrival pattern-The service pattern-The queue discipline, Symbolic

Head Dept. of IT
CBIT, Hyderabad

Representation of a Queueing Model –Characteristics of Infinite Capacity, Single server Poisson Queue Model Queueing problem-Pure Birth and Death Process-Probability Distribution of Departures(pure death process)-Basic queueing Models-Measures of the (M/M/1):(∞/□□□□) □□□□-Characteristic of Finite Capacity, Single Server Poisson Queue Model III (M/M/1):(□/□□□□) Model.

Text Books:

1. "Probability Statistics and Random Processes" by T Veerarajan, 2^{nd} Edition Tata McGraw-Hill
2. "Fundamentals of Mathematical Statistics" by V.K. Kapoor & S.C. Gupta 11^{th} revised Edition Sultan Chand & Sons

Suggested Reading:

1. "Stochastic Process and Queueing Theory" by Randolph Nelson 1995, I^{st} edition, Springer-verlag New York.

Head Dept. of IT
CBIT, Hyderabad

20ITC06 **DISCRETE MATHEMATICS AND APPLICATIONS**

Instruction	3Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To introduce Propositional Logic, Proof strategy concepts and gain knowledge in Sets and Functions.
2. To acquire knowledge in Induction, Recursion and Number theory applications.
3. To gain knowledge in Counting, Permutations, Combinations and Solving recurrence relations.
4. To introduce basic concepts of graphs, digraphs and relations and their properties.
5. To familiarize with Algebraic Structures.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Symbolize the given sentence using propositional logic and apply the onto and one-to-one functions between the sets.
2. Understand the mathematical induction and apply the modular arithmetic for cryptography and congruence applications.
3. Apply permutations and combinations to handle different types of objects, understand solving homogeneous and Non-homogeneous recurrence using generating functions.
4. Apply relations and graph concepts for basic problem solving.
5. Demonstrate Algebraic systems and their Properties.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	2	3	-	-	1	1	1	3	3	3
CO2	3	3	2	3	1	2	-	-	-	1	-	1	3	3	3
CO3	3	3	3	3	1	2	2	-	-	1	1	1	3	3	3
CO4	3	3	2	3	1	2	3	-	-	1	-	1	3	3	3
CO5	3	3	2	3	-	2	-	-	-	1	-	1	3	3	3

UNIT-I

The Foundations: Logic and Proofs: Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy

Basic Structures: Sets, Functions, Sequences, Sums, and Matrices: Sets, Set Operations, Functions, Sequences and Summations, Cardinality of Sets, Matrices

UNIT-II

Number Theory and Cryptography: Divisibility and Modular Arithmetic, Integer Representations and Algorithms, Primes and Greatest Common Divisors, Solving Congruences, Applications of Congruences, Cryptography.

Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms.

UNIT-III

Counting: The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients and Identities, Generalized Permutations and Combinations, Generating Permutations and Combinations.

Advanced Counting Techniques: Applications of Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion–Exclusion,

Head Dept. of IT
CBIT, Hyderabad

Applications of Inclusion–Exclusion

UNIT-IV

Relations: Relations and Their Properties, *n*-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.

UNIT-V

Algebraic Structures: Algebraic Systems: Examples and General Properties, Semi groups and Monoids.

Groups: Definitions and Examples, Subgroups, Homomorphism's and cyclic groups.

Text Books:

1. Kenneth H Rosen, "Discrete Mathematics and its applications", 8th Edition, McGraw Hill, 2019.
2. R.K. Bishit, H.S. Dhami, "Discrete Mathematics", Oxford University Press, 2015.

Suggested Reading:

1. J.P. Trembly, R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", McGraw- Hill, 1997.
2. J. K. Sharma, "Discrete Mathematics", 2nd Edition, Macmillan, 2005.
3. Joel Mott, Abraham Kandel, T.P. Baker, "Discrete Mathematics for Computer Scientist &Mathematicians", 2nd Edition, Macmillan Prentice Hall.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs37/
2. https://www.coursera.org/learn/discrete-mathematics

Head Dept. of IT
CBIT, Hyderabad

20ITC15 **DESIGN AND ANALYSIS OF ALGORITHMS**

Instruction	3 Hours per Week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To analyse the performance of various algorithms.
2. To illustrate different paradigms of problem solving.
3. To learn about various algorithm design techniques and illustrates them using a number of well-known problems and applications.
4. To familiarize graph traversal and search techniques.
5. To discuss NP hard and NP complete problems and their applications.

Course Outcomes:

Upon successful completion of the course the students will be able to:

1. Analyze best, average and worst case complexities of algorithms and choose appropriate data structure for designing algorithm.
2. Develop solutions using Divide and Conquer, Greedy techniques.
3. Design algorithms using dynamic programming approach, apply traversal and search techniques.
4. Apply backtracking, branch and bound techniques to solve problems.
5. Identify P, NP, NP-Complete and NP-Hard classes to which an algorithm belongs and design a feasible solution.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	-	-	-	-	-	-	-	2	2	3	3
CO2	3	3	2	2	-	-	-	-	-	-	-	2	2	3	3
CO3	3	3	2	2	-	-	-	-	-	-	2	2	2	-	3
CO4	3	3	2	2	-	-	-	-	-	-	-	2	2	-	3
CO5	3	3	2	2	-	-	-	-	-	-	-	2	2	3	3

UNIT-I

Introduction: Algorithm Specification, Performance analysis: Space Complexity, Time Complexity, Asymptotic Notation (O, Omega, Theta), Searching and Sorting techniques-Performance Measurement.
Elementary Data Structures: Complexity measures for the Data Structures - Stacks and Queues, Trees, Hashing/Dictionaries, Priority Queues, Sets and Disjoint Set Union.

UNIT-II

Divide and Conquer: The general method, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Strassen's Matrix Multiplication.
Greedy Method: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum Cost Spanning Trees, Optimal Storage on Tapes, Optimal Merge Patterns, Single Source Shortest Paths.

UNIT-III

Dynamic Programming: The General Method, Multistage graphs, All Pair Shortest Paths, Single Source Shortest Paths, Optimal Binary Search Trees, -/1 Knapsack, Reliability Design, The Traveling Salesperson Problem.
Traversal and Search Techniques: Breadth First Search and Traversal, Depth First Search and Traversal, Connected Components and Spanning Trees, Biconnected Components and DFS.

UNIT-IV

Backtracking: The General Method, 8-Queens Problem, Graph Colouring, Hamilton cycles, Knapsack

Head Dept. of IT
CBIT, Hyderabad

Problem.
Branch and Bounds: The Method: Least Cost (LC) Search, The 15 puzzle, FIFO Branch and Bound, LC Branch and Bound, -/1 Knapsack Problem, Traveling Salesperson Problem.

UNIT-V
NP-Hard and NP-Complete Problems: Basic Concepts: Non-Deterministic Algorithms, the Classes NP Hard and NP Complete. Cook's theorem, NP-Hard Graph Problems: Node Cover Decision Problem, Chromatic Number Decision Problem, Directed Hamiltonian Cycle, Traveling Salesperson Decision Problem, NP Hard Scheduling Problems: Job Shop Scheduling.

Text Books:

1. Ellis Horowitz, Sartaj Sahani, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithm, 2^{nd} Edition", Universities Press, 2011.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3^{rd} Edition, Prentice Hall of India Private Limited, 2006.

Suggested Reading:

1. Levitin A, "Introduction to the Design and Analysis of Algorithms", Pearson Education, 2008.
2. Aho, Hopcroft, Ullman, "The Design and Analysis of Computer Algorithm", Pearson Education, 2000.
3. Parag H. Dave, Himanshu B. Dave, "Design and Analysis of Algorithms", 2^{nd} Edition, Pearson Education, 2014.

Web Resources:

1. http://nptel.ac.in/courses/106101060
2. http://nptel.ac.in/courses

Head Dept. of IT
CBIT, Hyderabad

20ADC04 **MACHINE LEARNING**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
1. To introduce machine learning concepts and models.
2. To familiarize with tree models and unsupervised learning.
3. To impart knowledge of dimensionality reduction and clustering techniques.
4. To learn the concepts of rule based models and kernel methods
5. To introduce the concept of neural network and ensemble methods.

Course Outcomes:
Upon successful completion of the course the students will be able to:
1. Understand basic concepts of machine learning models.
2. Apply tree models, perform classification and regression tasks.
3. Understand rule based learning and linear models.
4. Apply distance based and probabilistic models for clustering and classification of data.
5. Design and develop a neural network, use dimensionality reduction techniques, ensemble methods.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	3	-	-	-	-	-	1	-	-	-	3	3
CO2	3	2	1	3	-	-	-	-	-	-	-	-	-	3	3
CO3	3	2	1	3	1	-	-	-	-	-	-	-	-	3	3
CO4	3	2	1	3	1	-	-	-	-	-	-	-	2	3	3
CO5	3	2	1	3	1	-	-	-	-	-	-	-	2	3	3

UNIT-I
Introduction: What Is Machine Learning, Examples of Machine Learning Applications. **Machine learning Models**: Geometric Models, Logical Models, Probabilistic Models. **Features**: Feature types, Feature Construction and Transformation, Feature Selection.

UNIT-II
Binary Classification: Introduction to classification, Scoring and Ranking, Class probability Estimation.
Beyond Binary Classification: Multi Class Classification, Regression, Unsupervised and Descriptive Learning.
Tree Models: Decision trees, Ranking and probability estimation trees, Tree learning as variance reduction.

UNIT-III
Rule Models: Learning ordered and unordered rule sets, Descriptive rule learning, First-order rule learning.
Linear Models: Least Squares method, Perceptron, Support Vector Machines, Soft Margin SVM, Kernel methods for non-Linearity.

UNIT-IV
Distance Based Models: Neighbours and Examples, Nearest Neighbours Classification, Distance based clustering-K means Algorithm, Hierarchical clustering, from kernels to distances. **Probabilistic Models:** the normal distribution and its geometric interpretations, Probabilistic models for categorical data, Discriminative learning by optimising conditional likelihood, Probabilistic models with hidden variables: Expectation-Maximisation.

UNIT- V

Head Dept. of IT
CBIT, Hyderabad

Model Ensembles: Bagging and random forests, Boosting, Bias, Variance and Margin. **Multilayer Perceptron:** Introduction, Neural Networks as a Paradigm for Parallel Processing, The Perceptron, Training a Perceptron, Learning Boolean Functions, Multilayer Perceptrons, MLP as a Universal Approximator, Back propagation Algorithm, Training Procedures, Tuning the Network Size, Bayesian View of Learning, Dimensionality Reduction, Learning Time.

Text Books:

1. Peter Flach "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", Cambridge University Press, Edition 2012.
2. Ethem Alpaydin, "Introduction to Machine Learning", PHI, 2nd Edition, 2013.

Suggested Reading:

1. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer 1st Edition-2013

Web Resource:

1. https://www.coursera.org/specializations/machine-learning

Head Dept. of IT
CBIT, Hyderabad

20MBC01 **ENGINEERING ECONOMICS AND ACCOUNTANCY**

Instruction	3 Hours per Week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
1. To demonstrate the importance of Managerial Economics in Decision Making.
2. To explain the concept of Accountancy and provide basic knowledge on preparation of Final accounts.
3. To understand the importance of Project Evaluation in achieving a firm's Objective.

Course Outcomes:
Upon successful completion of the course the students will be able to:
1. Apply fundamental knowledge of Managerial Economics concepts and tools.
2. Analyze various aspects of Demand Analysis, Supply and Demand Forecasting.
3. Understand Production and Cost relationships to make best use of resources available.
4. Apply Accountancy Concepts and Conventions and preparation of Final Accounts.
5. Evaluate Capital and Capital Budgeting decision based on any technique.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	3	1	1	1	1	1	1	1	-	-	1	-	1
CO2	2	2	2	2	-	1	1	1	-	1	-	1	1	-	-
CO3	1	2	1	2	2	-	2	1	-	1	-	-	1	-	-
CO4	2	2	1	2	2	1	1	3	-	1	-	-	-	-	-
CO5	1	3	1	2	1	1	2	-	-	1	2	1	-	-	-

UNIT-I: Introduction to Managerial Economics
Introduction to Economics and its evolution - Managerial Economics - its Nature and Scope, Importance; Relationship with other Subjects. Its usefulness to Engineers; Basic concepts of Managerial economics - Incremental, Time perspective, Discounting Principle, Opportunity Cost, Equimarginal Principle, Contribution, Negotiation Principle.

UNIT-II: Demand and Supply Analysis
Demand Analysis - Concept of Demand, Determinants, Law of demand - Assumptions and Exceptions; Elasticity of demand - Price, Income and Cross elasticity - simple numerical problems; Concept of Supply - Determinants of Supply, Law of Supply; Demand Forecasting - Methods.

UNIT-III: Production and Cost Analysis
Theory of Production - Production function - Isoquants and Isocosts, MRTS, Input-Output Relations; Laws of returns; Internal and External Economies of Scale.
Cost Analysis: Cost concepts – Types of Costs, Cost-Output Relationship – Short Run and Long Run; Market structures – Types of Competition, Features, Price Output Determination under Perfect Competition, Monopoly and Monopolistic Competition; Break-even Analysis – Concepts, Assumptions, Limitations, Numerical problems.

UNIT-IV: Accountancy
Book-keeping, Principles and Significance of Double Entry Book Keeping, Accounting Concepts and Conventions, Accounting Cycle, Journalization, Subsidiary books, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments. Ratio Analysis.

Head Dept. of IT
CBIT, Hyderabad

UNIT-V: Capital and Capital Budgeting

Capital and its Significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Capital Budgeting, Methods: Traditional and Discounted Cash Flow Methods - Numerical problems.

Text Books:

1. Mehta P.L., “Managerial Economics: Analysis, Problems and Cases”, Sultan Chand & Son’s Educational publishers, 2016.
2. Maheswari S.N. “Introduction to Accountancy”, Vikas Publishing House, 11^{th} Edition, 2013.

Suggested Reading:

1. Panday I.M. “Financial Management”, 11th edition, Vikas Publishing House, 2015.
2. Varshney and K L Maheswari, Managerial Economics, Sultan Chand, 2014.
3. M. Kasi Reddy and S. Saraswathi, Managerial Economics and Financial Accounting, Prentice Hall of India Pvt Ltd, 2007.
4. A. R. Aryasri, Managerial Economics and Financial Analysis, McGraw-Hill, 2013.

Head Dept. of IT
CBIT, Hyderabad

20CEM01 **ENVIRONMENTAL SCIENCE (MANDATORY COURSE)**

Instruction	2 L Hours per week
Duration of Semester End Examination	2 Hours
SEE	50 Marks
Credits	No Credits

Course Objectives:

1. Identify environmental problems arising due to over utilization of natural resources and understand the importance of use of renewable energy sources
2. Become aware about the importance of eco system and interlinking of food chain.
3. Identify the importance of biodiversity in maintaining ecological balance.
4. Learn about various attributes of pollution management and waste management practices.
5. Contribute for capacity building of nation for arresting and/or managing environmental disasters.

Course Outcomes:

Upon successful completion of the course the students will be able to:

1. Identify the natural resources and realise the importance of water, food, forest, mineral, energy, land resources and affects of over utilisation.
2. Understand the concept of ecosystems and realise the importance of interlinking of food chains.
3. Contribute for the conservation of bio-diversity.
4. Suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
5. Follow the environmental ethics and contribute to the mitigation and management of environmental disasters.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	3	-	-	-	-	1	1	-	-
CO2	1	-	-	-	-	-	2	1	-	-	-	1	1	-	-
CO3	1	-	-	-	-	-	2	1	-	-	-	1	1	-	-
CO4	1	-	-	-	-	1	2	1	-	-	-	1	1	-	-
CO5	1	-	-	-	-	1	2	1	-	-	-	1	2	-	-

UNIT-I

Environmental Studies: Definition, Scope and importance, need for public awareness.
Natural resources: Use and over utilization of Natural Resources - Water resources, Food resources, Forest resources, Mineral resources, Energy resources, Land resources.

UNIT–II

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, role of producers, consumers and decomposers, energy flow in an ecosystem, food chains, food webs, ecological pyramids, Nutrient cycling, Bio-geo chemical cycles, Terrestrial and Aquatic ecosystems.

UNIT–III

Biodiversity: Genetic, species and ecosystem biodiversity, Bio-geographical classification of India, India as a Mega diversity nation. Values of biodiversity, hot-spots of biodiversity, threats to biodiversity, endangered and endemic species of India, methods of conservation of biodiversity.

UNIT–IV

Environmental Pollution: Cause, effects and control measures of air pollution, water pollution, marine pollution, soil pollution, noise pollution and Solid waste management, nuclear hazards
Environmental Legislations: Environment protection Act, Air, Water, Forest & Wild life Acts, issues involved in enforcement of environmental legislation, responsibilities of state and central pollution control boards

Head Dept. of IT
CBIT, Hyderabad

UNIT–V

Social Issues and the Environment: Water conservation methods: Rain water harvesting and watershed management, Environmental ethics, Sustainable development and Climate change: Global warming, Ozone layer depletion, forest fires, and Contemporary issues.

Text Books:

1. Y. Anjaneyulu, "Introduction to Environmental Science", B S Publications, 2004.
2. Suresh K. Dhameja, "Environmental Studies", S. K. Kataria& Sons, 2009.

Suggested Reading:

1. C. S. Rao," Environmental Pollution Control Engineering", Wiley, 1991.
2. S. S. Dara, "A Text Book of Environmental Chemistry & Pollution Control", S. Chand Limited, 2006

Head Dept. of IT
CBIT, Hyderabad

20MTC11 **STOCHASTIC PROCESS AND QUEUEING THEORY (LAB)**

Instruction	2 L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. Able to learn methods to solve probability functions.
2. Able to know characterizing the random process.
3. Able to identify the tools for interpretating the random process
4. Able to know the statistical techniques for random process
5. Able to analyse the queueing models.

Course Outcomes:

On successful completion of this course the students shall be able to

1. Execute marginal probabilities of statistical averages.
2. Compute the auto correlation and cross correlation of random process.
3. Characterize the random process of ensemble averages.
4. Analyze the effect of the thermal noise in the system.
5. Analyze the queuing behavior of different queuing models.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	-	-	-	-	-	-	-	1	-	1	1
CO2	1	2	-	-	-	-	-	-	-	-	-	1	-	1	-
CO3	1	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	1	2	-	-	-	-	-	-	-	-	-	1	-	1	-
CO5	1	2	-	-	-	-	-	-	-	-	-	1	-	1	1

List of Experiments

1. Find estimated and true mean of Uniform and Exponential distributed data.
2. Find density and distribution function of a function of random variable Y = 2X + 1. Where X is r.v.
3. Estimate the mean and variance of Y = 2X + 1, where X is a random variable.
4. Plot Joint density and distribution function of sum of two random variables.
5. Estimate the mean and variance of ar.v. Z = X+Y. Where X and Y are also random variables.
6. Calculate marginal distributions of X and Y. Also find the conditional distributions of Y for X=x, when joint PMF is given.
7. Calculate marginal distributions of X and Y. Also find the conditional distributions of Y for X=x, when joint PDF is given.
8. Execute the problems on discrete process.
9. Execute problems on Continuous random process
10. Execute a program on Gaussian process.
11. Execute single server Poisson queuing model

Text Books:

1. Scilab Textbook Companion for Probability and Statistics For Engineers And Scientists by S. M. Ross.
2. S. M. Ross, Probability And Statistics For Engineers And Scientists, Edition: 3, 2005 Elsevier, New Delhi. ISBN: 81-8147-730-8

Head Dept. of IT
CBIT, Hyderabad

20ITC17 **DESIGN AND ANALYSIS OF ALGORITHMS LAB**

Instruction	2 L Hours per Week
Duration of Semester End Examination	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:
1. To introduce Divide and Conquer algorithmic strategy.
2. To familiarize Greedy Algorithms.
3. To introduce Dynamic programming algorithms.
4. To gain knowledge of connected and biconnected components.
5. To introduce Backtracking technique.

Course Outcomes:
Upon successful completion of the course the students will be able to:
1. Implement Divide and Conquer Algorithms.
2. Build solutions using Greedy technique.
3. Apply Dynamic programming algorithms to solve problems.
4. Implement connected and biconnected components algorithms.
5. Design solutions using Backtracking technique.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3	3
CO2	3	3	2	2	1	-	-	-	-	-	-	2	2	3	3
CO3	3	3	2	2	1	-	-	-	-	-	2	2	2	-	3
CO4	3	3	2	2	1	-	-	-	-	-	-	2	2	-	3
CO5	3	3	2	2	1	-	-	-	-	-	-	2	2	3	3

List of Programs

1. Implement Binary Search Tree Operations.
2. Find Maximum and Minimum elements from a given list of elements using Divide and Conquer technique.
3. Implement Merge sort algorithm for sorting a list of integers in ascending order.
4. Implement greedy algorithm for job sequencing with deadlines.
5. Implement Prim's algorithm to generate minimum cost spanning tree.
6. Implement Kruskal's algorithm to generate minimum cost spanning tree.
7. Implement Dijkstra's algorithm for the Single source shortest path problem.
8. Implement Dynamic Programming algorithm for the -/1 Knapsack problem.
9. Implement Dynamic Programming algorithm for the Optimal Binary Search Tree Problem.
10. Check whether given graph having connected components or not.
11. To find articulation points of a given graph..
12. Implement backtracking algorithm for the N-queens problem.
13. Implement backtracking algorithm for the Hamiltonian Cycle problem.
14. Implement backtracking algorithm for the Graph Coloring problem.
15. Implement Least Cost Branch and Bound for the -/1 Knapsack problem

Note: All the programs can be implemented using Java Programming.

Text Books:
1. Ellis Horowitz, Sartaj Sahani, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithm", 2nd Edition, Universities Press, 2011.

Head Dept. of IT
CBIT, Hyderabad

2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, “Introduction to Algorithms”, 3rd Edition, Prentice Hall of India Private Limited, 2006.

Suggested Reading:

1. Levitin A, “Introduction to the Design And Analysis of Algorithms”, Pearson Education, 2008.
2. Goodrich M.T, R Tomassia, “Algorithm Design foundations Analysis and Internet Examples”, John Wiley and Sons, 2006.
3. Base Sara, Allen Van Gelder,“Computer Algorithms Introduction to Design and Analysis”, Pearson, 3rd Edition, 1999.

Web Resources:

1. http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html
2. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms
3. http://nptel.ac.in/courses/ 106101060
4. http://www.facweb.iitkgp.ernet.in/~sourav/daa.html

Head Dept. of IT
CBIT, Hyderabad

20ADC05 **MACHINE LEARNING LAB**

Instruction	2 L Hours per week
CIE	50 Marks
SEE	50 Marks
Credits	1

Course Objectives:
1. To introduce the concept of decision tree for supervised learning.
2. To familiarize with bayesian decision theory and probabilistic methods.
3. To impart knowledge of dimensionality reduction and clustering techniques.
4. To introduce the concept of neural network and SVM.
5. To familiarize with ensemble methods.

Course Outcomes:
Upon successful completion of the course the students will be able to:
1. Build decision trees for classification.
2. Perform dimensionality reduction of a dataset.
3. Apply distance based models for clustering and classification of data.
4. Design and build neural networks.
5. Build solutions using SVM, ensemble methods.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	3	2	-	-	-	-	1	-	-	2	3	3
CO2	3	3	1	3	2	-	-	-	-	-	-	-	2	3	3
CO3	3	2	1	3	2	-	-	-	-	-	-	-	2	3	3
CO4	3	3	1	3	2	-	-	-	-	-	-	-	2	3	3
CO5	3	3	1	3	2	-	-	-	-	-	-	-	2	3	3

List of Programs

1. Build a decision tree algorithm for classification on a given data set.
2. Implement naïve Bayesian classifier and Compute its accuracy on test data set.
3. Construct a Bayesian network using standard Heart Disease Data Set to diagnosis heart patients.
4. Implement Support Vector Machine for linear and nonlinear data.
5. Build a Neural Network by implementing the Back propagation algorithm.
6. Implement k-Nearest Neighbour algorithm to classify the iris data set.
7. Apply EM algorithm, k-Means algorithm to cluster a given data and compare the quality these clusters.
8. Implement Linear and Logistic Regression algorithms.
9. Implement Bagging and Boosting methods.
10. Implement Principle Component Analysis.

Note: Students are supposed to implement the algorithms in Java/Python/R.

Text Books:
1. Aurelien Geron,"Hands-on Machine Learning with Scikit-Learn, Keras, and Tensor Flow", O'Reilly Media, Second Edition 2019.
2. Peter Flach: Machine Learning: "The Art and Science of Algorithms that Make Sense of Data", Cambridge University Press, Edition 2012.

.

Suggested Reading:
1. Ethem Alpaydin, "Introduction to Machine Learning", PHI 2nd Edition-2013.

Datasets:
1. https://www.kaggle.com/datasets

Head Dept. of IT
CBIT, Hyderabad

2. https://www.csie.ntu.edu.tw/~cjlin/libsvmtools/datasets/multilabel.html#siam-competition2007

Web Resources:

1. https://www.coursera.org/specializations/machine-learning

Head Dept. of IT
CBIT, Hyderabad

20ITC18 **MINI PROJECT –II**

Instruction	2 L Hours per week
CIE	50 Marks
Credits	1

Course Objectives:
1. To enable students learning by doing.
2. To develop capability to analyse and solve real world problems.
3. To inculcate innovative ideas of the students.
4. To impart team building and management skills among students.
5. To instill writing and presentation skills for completing the project.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Interpret Literature with the purpose of formulating a project proposal.
2. Plan, Analyse, Design and Implement a project using SDLC model.
3. Find the solution of identified problem with the help of modern Technology and give priority to real time scenarios.
4. Plan to work as a team and to focus on getting a working project done and submit a report within a stipulated period of time.
5. Prepare and submit the Report and deliver presentation before the Departmental Committee.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	3	2	1	2	3	3	2	3	3
CO2	3	3	3	3	3	3	3	2	1	2	3	3	3	3	3
CO3	3	3	3	3	3	3	3	2	-	2	3	3	3	3	3
CO4	2	2	2	3	3	3	3	2	3	3	2	3	2	3	3
CO5	1	2	1	2	3	3	-	-	2	3	-	-	-	3	-

The Students are required to choose a topic for mini project related to the courses of the current semester or previous semester. The student has to implement and present the project as per the given schedule. During the implementation of the project, Personnel Software Process (PSP) has to be followed. Report of the project work has to be submitted for evaluation.

Schedule

S No	Description	Duration
1.	Problem Identification / Selection	2 weeks
2.	Preparation of Abstract	1 week
3.	Design, Implementation and Testing of the Project	7 weeks
4.	Documentation and Project Presentation	4 weeks

Guidelines for the Award of marks

S No	Description	Max. Marks
1.	Weekly Assessment	20
2.	PPT Preparation	5
3.	Presentation	10
4.	Question and Answers	5
5.	Report Preparation	10

Head Dept. of IT
CBIT, Hyderabad

Final Mini Project demonstration and PPT presentation is to be evaluated for the entire class together by all the faculty handling Mini Project for that class.

Head Dept. of IT
CBIT, Hyderabad

20ITE01 **DIGITALIMAGE PROCESSING**

(Professional Elective – I)

Instruction	3 L Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To introduce the fundamental concepts and applications of digital image processing.
2. To impart knowledge on the image processing concepts: intensity transformations, spatial filtering, Smoothing and sharpening both in spatial and frequency domain.
2. To familiarize the image analysis concepts: morphological image processing, image segmentation, image representation and description, and object recognition.
3. To introduce colour image processing techniques.
4. To understand with various image compression methods.

Course Outcomes:

Upon successful completion of the course the students will be able to:

1. Illuminate the fundamental concepts and applications of digital image processing techniques.
2. Demonstrate intensity transformations, spatial filtering, smoothing and sharpening in both spatial and frequency domains, image restoration concepts
3. Demonstrate image restoration and morphological image processing methods
4. Apply object recognition techniques by using image segmentation and image representation &description methods
5. Illustrate the various colour models and Application of image compression methods

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	1	-	1	-	-	-	-	1	2	3	3
CO2	2	2	2	1	-	2	1	-	-	1	-	1	2	3	3
CO3	2	2	2	1	-	2	1	-	-	1	-	1	2	3	3
CO4	2	1	1	2	1	-	1	-	-	-	-	1	2	3	3
CO5	2	2	2	1	-	2	1	-	-	1	-	1	2	3	3

UNIT-I

Introduction: Fundamental Steps in Digital Image Processing, Image Sampling and Quantization, Some Basic Relationships between Pixels; **Intensity Transformations:** Some Basic Intensity Transformation Functions, Histogram Processing - Histogram Equalization, Histogram Matching (Specification)

UNIT-II

Spatial Filtering: Fundamentals of Spatial Filtering, Smoothing Spatial Filters; Sharpening Spatial Filters; **Filtering in the Frequency Domain**: The 2-D Discrete Fourier Transform and its inverse; The Basics of Filtering in the Frequency Domain; Image Smoothing Using Frequency Domain Filters - Ideal, Butterworth and Gaussian Low pass Filters; Image Sharpening Using Frequency Domain Filters - Ideal, Butterworth and Gaussian High pass Filters.

UNIT-III

Image Restoration and Reconstruction: A Model of the Image Degradation/Restoration Process, Noise Models; Restoration in the Presence of Noise Only—Spatial Filtering; Periodic Noise Reduction by Frequency Domain Filtering; Estimating the Degradation Function; Inverse Filtering; Minimum Mean Square Error (Wiener) Filtering;

Morphological Image Processing: Preliminaries; Erosion and Dilation; Opening and Closing, The Hit or Miss Transform

Head Dept. of IT
CBIT, Hyderabad

UNIT-IV

Image Segmentation: Fundamentals; Points, Line and Edge Detection, Thresholding; Segmentation by Region Growing, Region Splitting and Merging

Feature Extraction: Boundary Pre-processing, Boundary Feature Descriptors, Some Simple Region Descriptors.

Image Pattern Classification: Patterns and Pattern Classes, Pattern Classification by Prototype Matching

UNIT-V

Colour Image Processing: Colour Fundamentals; Colour Models, Pseudo Colour Image Processing, Basics of full Colour Image Processing;

Image Compression: Fundamentals, Huffman Coding, Arithmetic Coding, LZW Coding

Text Book:

1. Rafael C Gonzalez and Richard E Woods, "Digital Image Processing", Pearson Education, 4th Edition, 2020.

Suggested Reading:

1. Vipula Singh, "Digital Image Processing with MatLab and lab View", Elsevier.
2. Thomas B. Moeslund, "Introduction to Video and Image Processing: Building Real Systems and Applications", Springer, 2012.
3. Milan Sonka, Vaclav Halvac and Roger Boyle, "Image Processing, Analysis, and Machine Vision", 2nd Edition, Thomson Learning Publishers.
4. Kenneth R.Castleman, "Digital Image Processing", Pearson Education, 2006.

Web Resources:

1. www.imageprocessingplace.com
2. https://in.mathworks.com/discovery/digital-image-processing.html
3. https://imagemagick.org/
4. https://nptel.ac.in/courses/117105079/

Head Dept. of IT
CBIT, Hyderabad

20ADE01 **DATA ANALYSIS AND VISUALIZATION**

(Professional Elective – I)

Instruction	3 L Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To introduce the Numpy library in Python to support storage and operations on large multi-dimensional arrays and matrices
2. To introduce large collection of mathematical functions to operate on multidimensional sequential data structures
3. To demonstrate the functionality of the Pandas library in Python for open source data analysis and manipulation
4. To demonstrate Data Aggregation, Grouping and Time Series analysis with Pandas
5. To introduce the Matplotlib library in Python for resting static, animated and interactive visualizations

Course Outcomes:

Upon successful completion of the course the students will be able to:

1. Efficiently store and manipulate dense data in arrays with Numpy
2. Apply high level mathematical functions to aggregate, broadcast, index and sort multidimensional arrays.
3. Create Series and DataFrame objects to operate on datasets.
4. Perform Data cleaning, transformation, merging, aggregation on datasets.
5. Apply 2-D and 3-D plotting techniques on datasets

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	3	-	-	2
CO2	3	2	-	1	1	-	-	-	-	-	-	3	-	-	2
CO3	3	1	-	3	1	-	-	-	-	1	-	3	3	3	3
CO4	3	2	1	3	1	-	-	-	-	3	-	3	3	3	3
CO5	2	2	-	2	1	-	-	-	-	3	-	3	2	-	2

UNIT-I

Introduction to Numpy: Data types in Python - Fixed type arrays, creating arrays, array indexing, array slicing, reshaping arrays, array concatenation and splitting, Universal Functions, Aggregations, Broadcasting rules, Comparisons, Boolean Arrays, Masks Fancy Indexing, Fast Sorting using np.sort and np.argsort, partial sorting - partitioning with K-nearest neighbors, Creating Structured Arrays, Compound types and Record Arrays.

UNIT- II

Introduction to Pandas: Series Object, DataFrame Object, Data Indexing and Selecting for Series and DataFrames, Universal Functions for Index Preservation, Index Alignment and Operations between Series and DataFrames, Handling missing data, Operating on Null values, Hierarchical Indexing.

UNIT-III

Combining Datasets: Concat, Append, Merge and Joins, Aggregation and Grouping, Pivot Tables, Vectorized String Operations, Working with Time Series, High-Performance functions - query() and eval()

UNIT-IV

Inferential Statistics - Normal distribution, Poisson distribution, Bernoulli distribution, z-score, p-score, One-tailed and two-tailed, Type 1 and Type-2 errors, Confidence interval, Correlation, Z-test vs T-test, F- distribution, Chi-square distribution, the chi-square test of independence, ANOVA, data mining, titanic survivors dataset analysis

Head Dept. of IT
CBIT, Hyderabad

UNIT-V

Visualization with Matplotlib : Simple Line plots, Scatter plots, Visualizing errors, Density and Contour plots, Histograms, Binnings, Multiple subplots, Three-dimensional plotting with Matplotlib, Geographic data with Basemap, Visualization with Seaborn.

Text Books:

1. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly Media, 2016.
2. Samir Madhavan, “Mastering Python for Data Science”, Packt Publishing, 2015.

Web Resources:

1. https://www.coursera.org/learn/python-data-analysis?specialization=data-science-python
2. https://www.coursera.org/learn/python-plotting

Head Dept. of IT
CBIT, Hyderabad

20ITE02 **MOBILE APPLICATION DEVELOPMENT WITH ANDROID AND KOTLIN**

(Professional Elective – I)

Instruction	3 L Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
1. To introduce the Kotlin Programming Language for Mobile Application Development
2. To demonstrate the development of basic mobile applications on android operating system
3. To demonstrate the Android Application Architecture
4. To introduce basic app design guidelines as well as styles, themes and material design
5. To demonstrate the publishing of a mobile app on Google Play

Course Outcomes:
Upon completing this course, students will be able to:
1. Understand the benefits of using Kotlin for Mobile application development
2. Understand the android project structure
3. Understand activity and fragment life cycles
4. Apply various styles, themes and material design to apps
5. Apply best practices to prepare and publish apps on Play store

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	1	2	-	2	-	-	-	1	-	-	2	3	-
CO2	-	2	1	2	-	2	-	-	-	-	-	-	1	3	-
CO3	-	2	1	2	-	2	-	-	-	-	-	-	2	3	3
CO4	-	2	1	2	-	2	-	-	-	-	-	-	2	3	-
CO5	-	2	2	2	3	2	-	-	3	-	-	1	2	3	3

UNIT-I
Introduction to Kotlin, Basic expressions, Control flow statements, null safety, Functions, passing functions as arguments, simple lambdas
Object oriented programming in Kotlin, Classes and Objects, Constructors, Visibility modifiers, Subclasses and Inheritance, Interfaces, Data classes, Singleton class enums, Pairs, Triples, Collections and Extensions in Kotlin

UNIT-II
Installing Android Studio, Android app project, deploying app on emulator or device, image resources and click handler, view layouts, adding libraries to module gradle file, layouts using XML and layout editor, app interactivity, ConstraintLayout, Data binding, Fragments, Navigation graphs, Navigational paths, Options menu, Safe Args plugin, External activity,

UNIT-III
Activity and Fragment life cycles, Android lifecycle library, configuration changes, Android App Architecture, Classes of Lifecycle, ViewModel and ViewModelFactory, LiveData and LiveData observers, Data binding with ViewModel and LiveData, LiveData Transformations
Room Persistence library, Coroutines, RecyclerView, Data binding with Recycler View, Retrofit library for web services, Moshi library for parsing JSON response, loading and displaying images from the internet, filtering data from the internet, Offline cache and repository, WorkManager, Background workers and periodic WorkerRequest

UNIT-IV
Basic App design, Styles and Themes, Material Design, best practices for app design Permissions, App

Head Dept. of IT
CBIT, Hyderabad

performance, Security, Handling user data, Compliance with personal data policies, logs, encryption of sensitive data, External storage, IP networking

UNIT-V

Firebase, Firebase analytics, Firebase notifications, Firebase database, App monetization, In-app purchases, Subscriptions, Advertising using Admob

Generate Signed APK, Preparing app for release, GooglePlay filters, Google Play developer console, Alpha and beta tests on Google Play, Pre-launch reports and Publishing

Text Books / Online Resources:

1. Android Development with Kotlin by Google
2. Android Development with Kotlin online videos

Head Dept. of IT
CBIT, Hyderabad

20MTC101 **MATHEMATICAL FOUNDATIONS FOR DATA SCIENCE**

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
1. To discuss vector space and sub space.
2. To explain the linear transformation.
3. To discuss about the stochastic process
4. To explain different estimates
5. To discuss the least squares approximation for fitting**.**

Course Outcomes:
Upon completing this course, students will be able to:
1. Identify the Basis and Dimension of vector space.
2. Calculate the Rank and Nullity of linear transformation.
3. Determine the stochastic measures for the process.
4. Infer the estimation of the statistical observations.
5. Analysing appropriate model for the raw data.

UNIT I
General Vector Spaces: Introduction to General Vector Spaces, Subspace of a Vector Space, Linear Independence and Basis, Dimension, Properties of a Matrix, solutions to a non-homogeneous system of linear equations
UNIT II
Linear Transformations: Introduction to Linear Transformations, Kernel and Range of a Linear Transformation, Rank and Nullity, Inverse Linear Transformations, The Matrix of a Linear Transformation, Composition and Inverse Linear Transformations.
UNIT III:
Expectation: Introduction, Moments, Expectation Based on Multiple Random Variables, Transform Methods, Moments and Transforms of Some Distributions (Weibul and Exponential), Computation of Mean Time to Failure. **Stochastic Process:** Classification of Stochastic Processes, the Bernoulli Process, the Poisson Process andthe normal process.
Unit – IV
Concepts of Inference: Point Estimation, Maximum Likelihood Estimation, Confidence Interval Estimation, Hypothesis Testing, Likelihood Ratio Tests; **Inferences for Single Samples:** Inferences on Mean (Large Samples), Inferences on Mean (Small Samples), Inferences on Variance.
Unit – V
The least squares Approximation: The least squares method, The model for simple linear regression, Fitting a line, goodness of fit, Statistical inference with the simple linear regression model, perdition and confidence intervals, Regression diagnostics. Multiple linear regression, The model for multiple linear regression, Goodness of fit, multiple correlation coefficient, Statistical inference for multiple regression, ANOVA tables.

Text Books.

1. Kishor S. Trivedi, Probability and Statistics with Reliability, Queuing, and Computer Science Applications, John Wiley & Sons, 2016:
2. Randall Pruim, Foundations and Applications of Statistics (An Introduction Using R), American Mathematical Society, 2010.
3. Kuldeep Singh, Linear Algebra Step by Step, Oxford University Press,2014.

Reference Books:

1. William M. Mendenhall Terry L. Sincich, STATISTICS for Engineering and the Sciences, SIXTH EDITION, CRC Press Taylor & Francis Group,2016.
2. David.Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/ Cole, 2005.

Head Dept. of IT
CBIT, Hyderabad

20ITC101 **ARTIFICIAL INTELLIGENCE**

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To learn basics of AI and concept of Intelligent Agent.
2. To learn the various Searching techniques
3. To learn first order and second order predicate Logic to infer knowledge
4. To learn classical and real world planning approaches
5. To learn uncertainty and probabilistic reasoning models

Course Outcomes:

Upon completing this course, students will be able to:

6. Understand the basics of AI and concept of Intelligent Agent.
7. Compare the Searching techniques
8. Understand and apply the first order and second order predicate Logic to infer the knowledge
9. Analyze classical and real world planning approaches
10. Understand the uncertainty and apply the probabilistic reasoning models

Unit – I

Introduction: AI Definition, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art ; **Intelligent Agents :** Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, The Structure of Agents; **Solving Problems by Searching:** Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions

Unit - II

Beyond Classical Search: Local Search Algorithms and Optimization Problems, Local Search in Continuous Spaces, Searching with Nondeterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environments, **Adversarial Search:** Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions, Stochastic Games, Partially Observable Games, State-of-the-Art Game Programs; Alternative Approaches; **Constraint Satisfaction Problems:** Defining Constraint Satisfaction Problems, Constraint Propagation: Inference in CSPs , Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

Unit - III

Logical Agents : Knowledge-Based Agents, the Wumpus World, Logic, Propositional Logic: A Very Simple Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic; **First-Order Logic:** Representation Revisited, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic; **Inference in First-Order Logic:** Propositional Vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

Unit - IV

Classical Planning: Definition of Classical Planning, Algorithms for Planning as State-Space Search, Planning Graphs, Other Classical Planning Approaches, Analysis of Planning Approaches; **Planning and Acting in the Real World:** Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multiagent Planning; **Knowledge Representations:** Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information, The Internet Shopping World.

Unit - V

Quantifying Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use, The Wumpus World Revisited; **Probabilistic Reasoning:** Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient

Head Dept. of IT
CBIT, Hyderabad

Representation of Conditional Distributions, Exact Inference in Bayesian Networks, **Probabilistic Reasoning over Time:** Time and Uncertainty, Inference in Temporal Models, Hidden Markov Models

Text Books:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Edition, 4th Edition.

Suggested Reading:

1. Rich, Knight, Nair: “Artificial intelligence”, Tata McGraw Hill, Third Edition, 2009.
2. Nilsson, N., “Artificial Intelligence: A New Synthesis”, San Francisco, Morgan Kaufmann, 1998.
3. Kulkarni, Parag, Joshi, Prachi , “Artificial Intelligence : Building Intelligent Systems”, PHI, 2015.
4. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc19_cs19/
2. https://www.coursera.org/learn/ai-for-everyone

Head Dept. of IT
CBIT, Hyderabad

20ITC102 **INTRODUCTION TO DATA SCIENCE**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
1. To introduce the fundamentals of Data Science.
2. To familiarise with Numpy, Pandas and handle large data.
3. To facilitate learning of data pre-processing.
4. To introduce plotting and visualisation.
5. To present grouping and aggregate operations

Course Outcomes:
Upon completing this course, students will be able to:
1. Comprehend the process of Data Science.
2. Understand machine learning and handle large unstructured data.
3. Make use of the packages Numpy, Pandas and interact with Web API and databases.
4. Choose suitable pre-processing techniques to process raw data.
5. Interpret the data from visualisations.
6. Apply appropriate group and aggregation operations.

UNIT-I
Data science in a big data world: Benefits and uses of data science and big data, Facets of data, The data science process, **The data science process:** Overview of the data science process, Don't be a slave to the process, Defining research goals and creating a project charter, Retrieving data, Cleansing, integrating, and transforming data, Exploratory data analysis, Build the models, Presenting findings and building applications on top of them

UNIT-II
Machine learning: machine learning, The modeling process, Types of machine learning, Semi-supervised learning, **Handling large data on a single computer:** The problems you face when handling large data, General techniques for handling large volumes of data, General programming tips for dealing with large data sets, Introduction to NoSQL

UNIT-III
Graph databases: Introducing connected data and graph databases, **Text mining and text analytics:** Text mining in the real world, Text mining techniques. **NumPy Basics:** The NumPy ndarray, Universal Functions: Fast Element-Wise ArrayFunctions, **Getting Started with Pandas:** Introduction to pandas data structures, Essential functionality

UNIT-IV
Data Loading, Storage, and File Formats: Reading and writing data in text format, Binary data formats, Interacting with Web APIs, Interacting with Databases, **Data Cleaning and Preparation:** Handling missing data, Data transformation, **Data Wrangling: Join, Combine, and Reshape**: Hierarchical Indexing, Combining and Merging Datasets, Reshaping: Reshaping with hierarchical indexing

UNIT-V
Plotting and Visualization: Matplotlib primer, Plotting with pandas and seaborn, **Data Aggregation and Group Operations**: GroupBy Mechanics, Data Aggregation, Apply: General split-apply-combine, Pivot Tables and Cross-Tabulation.

Text Books:
1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science: Big Data, Machine Learning, and more, using Python Tools", Manning Publications, 2016

Head Dept. of IT
CBIT, Hyderabad

2. William McKinney, "Python for Data Analysis Data Wrangling with Pandas, NumPy and IPython", Second Edition, O'Reilly Media, 2017.

Suggested Reading:

1. Joel Grus, "Data Science from Scratch-First Principles with Python", O'Reilly Media, 2015
2. John V. Guttag, "Introduction to Computation and Programming Using Python– with Application to Understanding Data", Second Edition, The MIT Press, 2016.
3. Alberto Boschetti, Luca Massaron, "Python Data Science Essentials: A Practitioner's Guide Covering Essential Data Science Principles, Tools, and Techniques", Third Edition, 2018.
4. Allen B. Downey, "Think Python How to Think Like a Computer Scientist", Second Edition, O'Reilly, 2016.

Web Resources:

1. https://www.kaggle.com
2. https://www.dataschool.io/
3. https://www.analyticsvidhya.com/blog/2018/05/24-ultimate-data-science-projects-to-boost-your-knowledge-and-skills/
4. https://www.linkedin.com/in/randylaosat

Head Dept. of IT
CBIT, Hyderabad

20ITC103 **MACHINE LEARNING**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
1. To impart knowledge on the basic concepts underlying machine learning.
2. To acquaint with the process of selecting features for model construction.
3. To familiarize different types of machine learning techniques.
4. To facilitate understanding of neural networks, artificial neural networks and genetic algorithms
5. To provide basic knowledge analytical learning and reinforcement learning.

Course Outcomes:
After successful completion of the course, student will be able to:
1. Understand the concepts of Machine learning and Concept learning
2. Build classification algorithms and artificial neural networks and evaluate the accuracy.
3. Examine the Bayesian classifier and its variants for predicting the probabilities.
4. Design solutions based on optimization using genetic algorithms.
5. Develop search control knowledge by inductive and analytical learning
6. Understand reinforcement learning and choose the best learning mechanism to the problem.

UNIT-I
Introduction: Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning, types of Machine Learning.
Concept learning and the general to specific ordering: Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias.
Decision Tree learning: Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

UNIT-II
Artificial Neural Networks: Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptrons, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition, Advanced topics in artificial neural networks.
Evaluating Hypotheses: Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms.

UNIT-III
Bayesian learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm.
Instance-Based Learning: Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning.

UNIT-IV
Genetic Algorithms: Motivation, Genetic Algorithms, An illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms
Analytical Learning: Introduction, Learning with Perfect Domain Theories: Prolog-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge.

Head Dept. of IT
CBIT, Hyderabad

UNIT- V

Combining Inductive and Analytical Learning: Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operators

Reinforcement Learning: Introduction, The Learning Task, Q Learning, Non-Deterministic, Rewards and Actions, Temporal Difference Learning, Generalizing from Examples, Relationship to Dynamic Programming

Text Books:

1. Tom Mitchel "Machine Learning", Tata McGraW Hill, 2017.
2. Giuseppe Bonaccorso, "Machine Learning Algorithms", 2nd Edition, Packt, 2018,

Suggested Reading:

1. Ethem Alpaydin, "Introduction to Machine Learning", PHI, 2004
2. StephenMarshland, "Machine Learning: An Algorithmic Perspective",CRC PressTaylor & Francis, 2nd Edition, 2015
3. Abhishek Vijavargia "Machine Learning using Python", BPB Publications, 1st Edition, 2018
4. ReemaThareja "Python Programming", Oxford Press, 2017
5. Yuxi Liu, "Python Machine Learning by Example", 2nd Edition, PACT, 2017

Web Resource:

1. https://nptel.ac.in/courses/106/106/106106139/
2. https://www.geeksforgeeks.org/machine-learning/
3. https://www.guru99.com/machine-learning-tutorial.htm
4. https://www.tutorialspoint.com/machine_learning_with_python/index.htm

Head Dept. of IT
CBIT, Hyderabad

20MTC102 **MATHEMATICAL FOUNDATIONS FOR DATA SCIENCE LAB**

Instruction	2 Hours per week
CIE	50 Marks
Credits	1

Course Objectives:

1. Setting up programming environment.
2. Develop Programming skills to solve problems.
3. Use of appropriate R programming constructs to implement algorithms.
4. Identification and rectification of coding errors in program.
5. Develop applications in R statistical packages.
6. Manage data using files.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Identify and setup program development environment.
2. Implement the algorithms using R programming language constructs.
3. Identify and rectify the syntax errors and debug program for semantic errors.
4. Solve problems in a statistical approach using functions.
5. Implement file operations.

List of Programs

1. Execution of Eigen values and Eigen vectors
2. Solution of non homogenous system of linear equations
3. Inverse matrix of linear transformation
4. Verification of MTTF for the continuous Distributions.
5. Likely Hood Ratio Test by Hypothesis Testing.
6. F-Test by Hypothesis Testing.
7. Compute the significance level (P value).
8. Linear Predicted Model.
9. Multiple Regression Model.
10. ANOVA for Multiple Regression)

Reference Books:

1. R For Statistics by Cornillon Pierre Andre Et Al , T and F India,January 2015
2. An Introduction to Statistical Learning: with Applications in R,Springer; 2017.R Statistics Cookbook, Francisco Jureting, Packt publishing ltd,2019.

Head Dept. of IT
CBIT, Hyderabad

20ITC104 **ARTIFICIAL INTELLIGENCE LAB**

Instruction	2 Hours per week
CIE	50 Marks
Credits	1

Course Objectives:
1. To familiarize with search and game playing strategies.
2. To introduce logic programming concepts through Prolog.
3. To learn probabilistic reasoning on uncertain data.
4. To learn knowledge representation and inference
5. To learn building AI Systems

Course Outcomes:
Upon completion of this course, students will be able to:
1. Solve AI problems through Python Programming
2. Demonstrate an intelligent agent
3. Evaluate Search algorithms
4. Build knowledge representation system and infer knowledge from it.
5. Apply probabilistic reasoning on data.

List of Programs
1. Implementation of uninformed search techniques.
2. Implementation of informed search techniques.
3. Implementation of game search.
4. Implementation of a program to represent knowledge
5. Implementation of a program to construct a Bayesian network from given data.
6. Implementation of a program to infer from the Bayesian network.
7. Installation of Prolog and demonstration of basic operations.
8. Mini Project work

Text Books:
1. Russell, Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, Third Edition, 2015
2. Allen B. Downey, "Think Python How to Think Like a Computer Scientist", Second Edition, O'Reilly, 2016.

Suggested Reading:
1. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011.
2. Rich, Knight, Nair: "Artificial intelligence", Tata McGraw Hill, Third Edition, 2009.
3. Nicole Bauerle, Ulrich Rieder, "Markov Decision Process with Applications to Finance", Springer, 2011.
4. Nilsson. N., "Artificial Intelligence: A New Synthesis", First Edition, Morgan Kaufmann, 1998.
5. Trivedi, M.C., "A Classical Approach to Artificial Intelligence", Khanna Publishing House, Delhi.

Web Resources:
1. https://ai.berkeley.edu/project_overview.html
2. http://aima.cs.berkeley.edu/

Head Dept. of IT
CBIT, Hyderabad

20ITC105 **INTRODUCTION TO DATA SCIENCE LAB**

Instruction	2 Hours per week
CIE	50 Marks
Credits	1

Course Objectives:
1. To introduce data structures in Python.
2. To familiarise with data types and file formats.
3. To gain knowledge on data pre processing and data visualization.
4. To acquaint with supervised and unsupervised learning algorithms.
5. To explore various case studies.

Course Outcomes:
Upon completing this course, students will be able to:
1. Identify appropriate data structures for storing and processing the data.
2. Choose suitable data type to handle real time data and explain file formats.
3. Apply pre processing techniques on raw data
4. Interpret the data from visualisations.
5. Build supervised and unsupervised models to solve real world problems.

List of Programs
1. Implementation of Python programs using Functions, Conditionals, Recursion, Iteration, Strings.
2. Demonstrate the usage of Python data structures. (List, Tuples, Sets, Dictionaries, Strings)
3. Explore various kinds of data like time series, text, etc.
4. Implement file handling operations in Python for various file formats.
5. Implementation of pre processing techniques on any two datasets.
6. Visualise data using packages matplotlib, seaborn, etc., and provide your inference.
7. Build Classifiers and perform prediction.
8. Demonstrate various Clustering Techniques.
9. Predict the price of a house (Boston Housing Dataset).

Text Books:
1. Allen B. Downey, “Think Python How to Think Like a Computer Scientist”, Second Edition, O'Reilly, 2016.
2. William McKinney, “Python for Data Analysis Data Wrangling with Pandas, NumPy, and IPython”, Second Edition, O’Reilly Media, 2017.
3. Samir Madhavan, “Mastering Python for Data Science”, Packt Publishing, 2015.

Suggested Reading:
1. Joel Grus, “Data Science from Scratch-First Principles with Python”, O’Reilly Media, 2015.
2. Rachel Schutt, Cathy O’Neil, “Doing Data Science, Straight Talk from the Frontline”, O’Reilly, 2014.

Datasets:
1. https://www.kaggle.com/datasets
2. https://www.csie.ntu.edu.tw/~cjlin/libsvmtools/datasets/multilabel.html#siam-competition2007
3. https://archive.ics.uci.edu/ml/index.php

Web Resources:
1. https://www.analyticsvidhya.com/blog/2018/05/24-ultimate-data-science-projects-to-boost-your-knowledge-and-skills/
2. https://www.learndatasci.com/tutorials/data-science-statistics-using-python/
3. https://www.kaggle.com/getting-started
4. https://www.datacamp.com/community/tutorials

Head Dept. of IT
CBIT, Hyderabad

20MEM103 **RESEARCH METHODOLOGY AND IPR**

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

Course Objectives:
To make the students to
1. Motivate to choose research as career
2. Formulate the research problem, prepare the research design
3. Identify various sources for literature review and data collection report writing
4. Equip with good methods to analyze the collected data
5. Know about IPR copyrights

Course Outcomes:
At the end of the course, student will be able to
1. Define research problem, review and asses the quality of literature from various sources
2. Improve the style and format of writing a report for technical paper/ Journal report, understand and develop various research designs
3. Collect the data by various methods: observation, interview, questionnaires
4. Analyze problem by statistical techniques: ANOVA, F-test, Chi-square
5. Understand apply for patent and copyrights

UNIT - I
Research Methodology: Research Methodology: Objectives and Motivation of Research, Types of Research, research approaches, Significance of Research, Research Methods verses Methodology, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India, Benefits to the society in general. Defining the Research Problem: Selection of Research Problem, Necessity of Defining the Problem

UNIT - II
Literature Survey Report writing: Literature Survey: Importance and purpose of Literature Survey, Sources of Information, Assessment of Quality of Journals and Articles, Information through Internet. Report writing: Meaning of interpretation, layout of research report, Types of reports, Mechanics of writing a report. Research Proposal Preparation: Writing a Research Proposal and Research Report, Writing Research Grant Proposal

UNIT - III
Research Design: Research Design: Meaning of Research Design, Need of Research Design, Feature of a Good Design, Important Concepts Related to Research Design, Different Research Designs, Basic Principles of Experimental Design, Developing a Research Plan, Steps in sample design, types of sample designs.

UNIT - IV
Data Collection and Analysis: Data Collection: Methods of data collection, importance of Parametric, non parametric test, testing of variance of two normal population, use of Chi-square, ANOVA, Ftest, z-test

UNIT - V
Patents and Copyright: Patent: Macro economic impact of the patent system, Patent document, How to protect your inventions. Granting of patent, Rights of a patent, how extensive is patent protection. Copyright: What is copyright. What is covered by copyright. How long does copyright last? Why protect copyright? Related Rights: what are related rights? Enforcement of Intellectual Property Rights: Infringement of intellectual property rights, Case studies of patents and IP Protection

Head Dept. of IT
CBIT, Hyderabad

Text Books:

1. C.R Kothari, "Research Methodology, Methods & Technique"; New Age International Publishers, 2004
2. R. Ganesan, "Research Methodology for Engineers", MJP Publishers, 2011
3. Y.P. Agarwal, "Statistical Methods: Concepts, Application and Computation", Sterling Publs., Pvt., Ltd., New Delhi, 2004

Suggested Reading:

1. Ajit Parulekar and Sarita D' Souza, "Indian Patents Law – Legal & Business Implications"; Macmillan India ltd , 2006
2. B. L.Wadehra; "Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications"; Universal law Publishing Pvt. Ltd., India 2000.
3. P. Narayanan; "Law of Copyright and Industrial Designs"; Eastern law House, Delhi 2010

Head Dept. of IT
CBIT, Hyderabad

20ITC106 **MACHINE LEARNING LAB**

Instruction	2 Hours per week
CIE	50 Marks
Credits	1

Course Objectives:
1. To impart knowledge on the basic concepts underlying machine learning.
2. To acquaint with the process of selecting features for model construction.
3. To familiarize different types of machine learning techniques.
4. To facilitate understanding of neural networks, artificial neural networks and genetic algorithms
5. To provide basic knowledge analytical learning and reinforcement learning.

Course Outcomes:
After successful completion of the course, student will be able to:
1. Build classification algorithms and artificial neural networks and evaluate the accuracy.
2. Examine the Bayesian classifier and its variants for predicting the probabilities.
3. Design solutions based on optimization using genetic algorithms.
4. Implement k-means, k-nearest and SVM algorithms.
5. Understand reinforcement learning and choose the best learning mechanism to the problem.

List of Programs

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples of .csv file.
2. For a given set of training data examples stored in a .csv file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Back propagation Algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .csv file. Compute the accuracy of the classifier, considering few test data sets.
6. Design genetic algorithm which reflects the process of natural selection where the fittest individuals are selected for reproduction in order to produce offspring of the next generation.
7. Demonstrate SVM algorithm used for character recognition task.
8. Apply EM algorithm to cluster a set of data stored in a .csv file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for the experiment and draw graphs.

Text Books:

1. Tom Mitchel "Machine Learning", Tata McGraW Hill, 2017.
2. Giuseppe Bonaccorso, "Machine Learning Algorithms", 2nd Edition, Packt, 2018,

Suggested Reading:

1. Ethem Alpaydin, "Introduction to Machine Learning", PHI, 2004
2. StephenMarshland, "Machine Learning: An Algorithmic Perspective",CRC PressTaylor & Francis, 2nd Edition, 2015
3. Abhishek Vijavargia "Machine Learning using Python", BPB Publications, 1st Edition, 2018
4. ReemaThareja "Python Programming", Oxford Press, 2017
5. Yuxi Liu, "Python Machine Learning by Example", 2nd Edition, PACT, 2017

Head Dept. of IT
CBIT, Hyderabad

Datasets:

1. https://www.kaggle.com/datasets
2. https://www.csie.ntu.edu.tw/~cjlin/libsvmtools/datasets/multilabel.html#siam-competition2007
3. https://archive.ics.uci.edu/ml/index.php

Web Resource:

1. https://nptel.ac.in/courses/106/106/106106139/
2. https://towardsdatascience.com/introduction-to-genetic-algorithms-including-example-code-e396e98d8bf3
3. https://www.geeksforgeeks.org/machine-learning/
4. https://www.guru99.com/machine-learning-tutorial.htm
5. https://www.tutorialspoint.com/machine_learning_with_python/index.htm

Head Dept. of IT
CBIT, Hyderabad

20ITE103 **INFORMATION RETRIEVAL SYSTEMS**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To familiarize with different Information Retrieval models.
2. To learn query languages for data retrieval.
3. To introduce various methods for efficient retrieval of information.
4. To impart knowledge on text operations.
5. To introduce Parallel and Distributed IR models.

Course Outcomes:

After successful completion of the course, student will be able to:

1. Understand different Information Retrieval models.
2. Evaluate the performance of queries for retrieval of data.
3. Analyze the methods for efficient information retrieval.
4. Perform text operations and build indices.
5. Analyze searching techniques and understand Parallel and Distributed IR models.

UNIT-I

Introduction: Basic concepts, Past, Present and Future of IR, The Retrieval Process.
Modeling: Introduction, A Taxonomy of IR Models, Retrieval: Adhoc and Filtering, A formal characterization of IR Models, Classic Information Retrieval, Alternative Set Theoretic Models, Alternative Algebraic Models, Alternative Probabilistic Models.

UNIT-II

Structured Text Retrieval Models, **Models for Browsing Retrieval Evaluation:** Introduction, Retrieval Performance Evaluation, Reference Collections **Query languages:** Introduction, Keyword-based querying, pattern Matching, Structural Queries, Query Protocols

UNIT-III

Query operations: Introduction, User Relevance Feedback, Automatic Local Analysis, Automatic Global Analysis
Text and Multimedia Languages and Properties: Introduction, Metadata, Text, Markup Languages, Multimedia

UNIT-IV

Text Operations: Introduction, Document Preprocessing, Document Clustering, Text Compression, Comparing Text Compression Techniques **Indexing:** Introduction, Inverted Files, Other Indices for Text, Boolean Queries

UNIT- V

Searching: Sequential Searching, Pattern Matching, Structural Queries, Compression
Parallel and Distributed IR: Introduction, Parallel IR, Distributed IR.

Text Book:

1. Ricardo, Baeza-yates, BerthierRibeiro-Neto, “Modern Information Retrieval”, Pearson Education, 2008.

Suggested Reading:

1. Christopher D. Manning, PrabhakarRaghavan, HinrichSchütze, “Introduction to Information Retrieval”, Cambridge University Press, 2009.
2. David A. Grossman, OphirFrieder, "Information Retrieval - Algorithms and Heuristics", Springer, 2nd Edition, 2004.
3. Gerald Kowalski, “Information Retrieval Systems: Theory and Implementation”, Springer.

Head Dept. of IT
CBIT, Hyderabad

4. William B. Frakes, Ricardo Baeza- Yates, “Information Retrieval – Data Structures & Algorithms”, Pearson Education, 2008.

Web Resources:

1. https://class.coursera.org/nlp/lecture
2. http://www.dcs.gla.ac.uk/Keith/Preface.html

Head Dept. of IT
CBIT, Hyderabad

20ITE105 **SOCIAL NETWORK ANALYSIS**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. Describe about the current web development and emergence of social web
2. Design modeling, aggregating and knowledge representation of semantic web
3. Describe Association rule mining algorithms
4. Summarize knowledge on extraction and analyzing of social web
5. To know the application in real time systems.

Course Outcomes:

After successful completion of the course, student will be able to:

1. Understand the basics of social network analysis.
2. Analyze Ontology representation of social network data.
3. Apply supervised and unsupervised algorithms on social networks.
4. Interpret the semantic content of social media data.
5. Build social network model for real time applications.

UNIT-I

INTRODUCTION: Introduction to Web - Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Statistical Properties of Social Networks -Network analysis - Development of Social Network Analysis - Key concepts and measures in network analysis - Discussion networks - Blogs and online communities - Web-based networks.

UNIT-II

MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION:

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation – Ontology languages for the Semantic Web: Resource Description Framework – Web Ontology Language – Modeling and aggregating social network data: State-of-the-art in network data representation – Ontological representation of social individuals – Ontological representation of social relationships – Aggregating and reasoning with social network data – Advanced representations.

UNIT-III

ALGORITHMS AND TECHNIQUES: Association Rule Mining, Supervised Learning, Unsupervised Learning, Semi-supervised Learning, Markov models, K-Nearest Neighboring, Content-based Recommendation, Collaborative Filtering Recommendation, Social Network Analysis, Detecting Community Structure in Networks, the Evolution of Social Networks.

UNIT-IV

EXTRACTING AND ANALYZING WEB SOCIAL NETWORKS: Extracting Evolution of Web Community from a Series of Web Archive, Temporal Analysis on Semantic Graph using Three-Way Tensor, Decomposition, Analysis of Communities and their Evolutions in Dynamic Networks.

.

UNIT- V

APPLICATIONS:A Learning Based Approach for Real Time Emotion Classification of Tweets, A New Linguistic Approach to Assess the Opinion of Users in Social Network Environments, Explaining Scientific and Technical Emergence Forecasting, Social Network Analysis for Biometric Template Protection.

Head Dept. of IT
CBIT, Hyderabad

Text Books:

1. Peter Mika, "Social Networks and the Semantic Web", Springer, 1st edition, 2007.
2. Guandong Xu , Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", Springer, 1st edition, 2012.
3. Przemyslaw Kazienko, Nitesh Chawla,"Applications of Social Media and Social Network Analysis", Springer,2015.

Suggested Reading:

1. Ajith Abraham, Aboul Ella Hassanien, Václav Snášel, "Computational Social Network Analysis: Trends, Tools and Research Advances", Springer, 2012
2. Borko Furht, "Handbook of Social Network Technologies and Applications", Springer, 1 st edition, 2011
3. Charu C. Aggarwal, "Social Network Data Analytics", Springer; 2014
4. Giles, Mark Smith, John Yen, "Advances in Social Network Mining and Analysis", Springer, 2010.

Web Resource:

1. https://swayam.gov.in/nd1_noc19_cs66/preview

Head Dept. of IT
CBIT, Hyderabad

20ITE106 **BLOCK CHAIN TECHNOLOGY**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To provide Conceptual understanding of how block chain technology can be used to improve business processes.
2. To facilitate understanding of bit coin and working with consensus in Bitcoin.
3. To impart knowledge about designing and building Permissioned block chains.
4. To introduce the concepts of Cryptocurrency, Ethereum virtual machine, Crytpocurrency regulations.
5. To familiarize with platforms such as Hyperledger Fabric involved in building block chain applications.

Course Outcomes:
After successful completion of the course, student will be able to:

1. Outline the concepts of block chain technology.
2. Understand the bit coin, working with consensus in Bitcoin.
3. Develop knowledge about designing and building Permissioned block chains.
4. Describe the concepts of Cryptocurrency, Ethereum virtual machine, Crytpocurrency regulations.
5. Design smart contract using Hyperledger Fabric frameworks.

UNIT-I

Introduction: Overview of Block chain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Crypto currency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chain Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography.

UNIT-II

Bitcoin and Block chain: Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay. **Working with Consensus in Bitcoin:** Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) —basic introduction, HashcashPoW, BitcoinPoW

UNIT-III

Permissioned Block chain: Permissioned model and use cases, Design issues for Permissioned block chains, Overview of Consensus models for Permissioned block chain Distributed consensus in closed environment. Enterprise application of Block chain: Cross border payments, Know Your Customer (KYC), Food Security, Block chain enabled Trade, We Trade — Trade Finance Network, Supply Chain Financing, Identity on Block chain

UNIT-IV

Crypto currency: History, Distributed Ledger, Mining strategy and rewards, Ethereum- Construction,- Ethereum Virtual Machine(EVM)-Wallets for Ethereum, Decentralized Autonomous Organization, Smart Contract, Vulnerability Attacks. Crypto currency Regulation: Stake holders, Roots of Bitcoin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy.

UNIT- V

Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and Corda. Applications: Internet of Things, Payments in Automotive Suppliers, Tracing the Food/Meat, Monitoring Cold Chain, Health Industry, Medical Record Management System, Supply chain management, and future of Block chain.

Head Dept. of IT
CBIT, Hyderabad

Text Books:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten,Andrew Miller and Steven Gold feder, Bitcoin and Crypto currency Technologies: A Comprehensive Introduction, Princeton University Press(July19,2016).
2. Melanie Swan, "Block Chain: Blueprint for a New Economy", 1st Edition O'Reilly, 2015.

Suggested Reading:

1. Iran Bashir "Mastering Blockchain" 2nd Edition Paperback 2018.
2. Daniel Drescher, "Block Chain Basics", 1st Edition, Apress, 2017.
3. Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Block Chain", Packt Publishing.

Web Resource:

1. www.blockchain.com
2. https://www.blockchain.com/btc/blocks?page=1
3. https://andersbrownworth.com/blockchain/hash

Head Dept. of IT
CBIT, Hyderabad

20ITE114 **BIG DATA ANALYTICS**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To introduce big data and HDFS.
2. To impart knowledge on Mapper and Reducer.
3. To provide the concepts of NoSQL and MongoDB.
4. To introduce programming tools PIG and HIVE in Hadoop echo system.
5. To facilitate learning of Spark with machine learning applications.

Course Outcomes:

Upon completing this course, students will be able to:

1. Perform data analysis in Hadoop framework.
2. Build applications using MapReduce.
3. Model the data using NoSQL and MongoDB.
4. Perform analysis on large datasets using Pig and Hive.
5. Develop machine learning solutions in Spark.

.

UNIT-I

Introduction to Big Data: Big Data Important, Big Data Solution, Big Data Use Cases: IT for IT Log Analytics, the Fraud Detection Pattern, Social Media Pattern.

The Hadoop Distributed Files system: The Design of HDFS, HDFS Concepts, Blocks, Name nodes and Data nodes, Block Caching, HDFS Federation, HDFS High Availability, The Command-Line Interface, Basic File system Operations, Hadoop File systems, Interfaces, The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the File System API, Writing Data, Directories, Querying the File system, Deleting Data, Data Flow, Anatomy of a File Read, Anatomy of a File Write.

UNIT-II

MapReduce: Introduction, Architecture of map reduce, Anatomy of a MapReduce Job Run, Job Submission, Job Initialization, Task Assignment, Task Execution, Progress and Status Updates, Job Completion, Failures, Task Failure, Application Master Failure, Node Manager Failure, Resource Manager Failure, Shuffle and Sort, The Map Side, The Reduce Side, **MapReduce Types and Formats:** MapReduce Types, The Default MapReduce Job, Input Formats, Input Splits and Records, Text Input, Output Formats, Text Output, Developing a MapReduce Application.

Hadoop Ecosystem and YARN: Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New Features NameNode High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN.

UNIT-III

No SQL Databases: Review of traditional Databases, Need for NoSQL Databases, Columnar Databases, Failover and reliability principles, CAP Theorem, Differences between SQL and NoSQL databases, **Working Mechanisms of Mongo DB**: Overview, Advantages, Environment, Data Modelling, Create Database, Drop Database, Create collection, Drop collection, Data types, Insert, Query, Update and Delete operations, Limiting and Sorting records, Indexing, Aggregation

UNIT-IV

Pig: Generating Examples, Comparison with Databases, Pig Latin, User-Defined Functions, Data Processing Operators, Pig in Practice.

Hive: Comparison with Traditional Databases, HiveQL, Tables, Querying Data, User-Defined Functions, Writing a User Defined Functions, Writing a User Defined Aggregate Function.

UNIT-V

Spark: Spark and its Purpose, Components of the Spark Unified Stack, Batch and Real-Time Analytics with Apache Spark, Resilient Distributed Dataset, **Scala** (Object Oriented and Functional Programming)

Head Dept. of IT
CBIT, Hyderabad

Machine Learning with Spark: Designing a Machine Learning System, Obtaining, Processing and Preparing Data with Spark, Building a Recommendation Engine with Spark, Building a Classification Model with Spark, Building a Regression Model with Spark and Building a Clustering Model with Spark.

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", Fourth Edition, O'Reilly Media Inc, 2015.
2. Nick Pentreath, “Machine Learning with Spark”, First Edition, Packt Publishing, 2015.

Suggested Reading:

1. Thilinagunarathne, “Hadoop MapReduce v2 Cookbook”, Second Edition, Packet Publishing, 2015.
2. Chuck Lam, Mark Davis, Ajit Gaddam, “Hadoop in Action”, Manning Publications Company, 2016.
3. Alex Holmes, “Hadoop in Practice”, Manning Publications Company, 2012.
4. Alan Gates, "Programming Pig", O'Reilly Media Inc, 2011.
5. Edward Capriolo, Dean Wampler, Jason Rutherglen, "Programming Hive", O'Reilly Media Inc, 2012.

Web Resources:

1. http://www.planetcassandra.org/what-is-nosql
2. https://stanford.edu/~rezab/sparkworkshop/slides/xiangrui.pdf
3. https://class.coursera.org/datasci-001/lecture

Head Dept. of IT
CBIT, Hyderabad

20ITE116 **PREDICTIVE ANALYTICS WITH 'R'**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
1. To introduce Predictive Modeling.
2. To familiarize Regression and Classification Techniques.
3. To impart knowledge on the concepts of Support vector machines and Neural Networks.
4. To explore tree based classifiers and ensemble methods
5. To introduce Topic modeling.

Course Outcomes:
Upon completing this course, students will be able to:
1. Comprehend predictive modeling and assess the performance
2. Apply regression techniques and analyse the performance
3. Demonstrate Support Vector Machines and build an efficient networking model
4. Analyze ensemble methods by choosing Tree based classifiers
5. Select appropriate probabilistic Graphic models and identify topics through topic modeling

UNIT-I
Gearing Up for Predictive Modeling: Models**, Types of models :** Supervised, unsupervised, semi-supervised, and reinforcement learning models, Parametric and nonparametric models, Regression and classification models, Real-time and batch machine learning models, **The process of Predictive Modeling:** Defining the model's objective, Collecting the data, Picking a model, Preprocessing the data, Exploratory data analysis, Feature transformations, Encoding categorical features, Missing data, Outliers, Removing problematic features, Feature engineering and dimensionality reduction, Training and assessing the model, Repeating with different models and final model selection, Deploying the model, **Performance metrics:** Assessing regression models, Assessing classification models, Assessing binary classification models.

UNIT-II
Linear Regression: Introduction to linear regression, Simple linear regression, Multiple linear regression, Assessing linear regression models, Problems with linear regression, Feature selection, Regularization, Ridge regression**.**
Logistic Regression: Classifying with linear regression, Assessing logistic regression models, Regularization with the lasso, Classification metrics, Extensions of the binary and Multinomial logistic classifier

UNIT-III
Support Vector Machines: Maximal margin classification, Support vector classification, Inner products**,** Kernels and support vector machines, Cross-validation.
Neural Networks: Stochastic gradient descent**:** Gradient descent and local minima, The perceptron algorithm, Linear separation, The logistic neuron, **Multilayer perceptron networks:** Training multilayer perceptron networks.

UNIT-IV
Tree-based Methods: The intuition for tree models, Algorithms for training decision trees-
Classification and regression trees, CART regression trees, Tree pruning, Missing data, Regression model trees
CART classification trees, C5.0, Predicting complex skill learning, Variable importance in tree models,
Ensemble Methods: Bagging - Margins and out-of-bag observations, Predicting heart disease with bagging, Limitations of bagging, **Boosting –** AdaBoost, Limitations of boosting, **Random forests-** The importance of variables in random forests

UNIT-V
Probabilistic Graphical Models: A little graph theory, Bayes' Theorem, Conditional independence, Bayesian networks, The Naïve Bayes classifier. Hidden Markov models- Predicting letter patterns in English words.

Head Dept. of IT
CBIT, Hyderabad

Topic Modeling: An overview of topic modeling, Latent Dirichlet Allocation, The Dirichlet distribution, The generative process, Fitting an LDA model, Modeling the topics of online news stories, Model stability, Finding the number of topics, Topic distributions, Word distributions, LDA extensions.

Text Books:

1. Rui Miguel Forte, "Mastering Predictive Analytics with R", Packt Publishing Ltd, 2015.
2. Roger D. Peng,"R Programming for Data Science", Lean Publishing, 2015.

Suggested Reading:

1. Lantz Brett, "Machine Learning with R", 2nd Edition, Packt Publishing Limited.
2. SunilaGollapudi, "Practical Machine Learning", Packt Publishing Ltd.
3. EthemAlpaydin, "Introduction to Machine Learning", 2nd Edition, PHI, 2013.

Web Resources:

1. https://data-flair.training/blogs/r-predictive-and-descriptive-analytics/
2. https://www.littlemissdata.com/blog/predictive-analytics-tutorial-part-1
3. http://uc-r.github.io/mars

Head Dept. of IT
CBIT, Hyderabad

Instruction	4 Hours per week
CIE	50 Marks
Credits	2

Course Objectives

1. To give an overview about TCP and Port Scanning using NMAP.
2. To familiarize with the concepts of Netcat and Open VAS
3. 3.To impart knowledge on penetration testing and sql injection.
4. 4.To facilitate understanding of DAMN and Cross site scripting.
5. 5.To provide knowledge on snort tool and Net stumbler.

Course Outcomes:

After successful completion of the course, student will be able to:

1. Examine Port scanning to determine what services are running on the systems that have been identified.
2. Illustrate the Netcat and Open VAS and uses such as simple sniffing abilities, port redirection.
3. Demonstrate SQL injection technique often used to attack data driven applications.
4. Experiment with Cross-site Scripting (XSS) is a client-side attack that leverages the user's browser to execute malicious code.
5. Design and develop intrusion prevention system capable of real-time traffic analysis and packet logging.

List of Programs

1. Demonstrate TCP Scanning Using NMAP.
2. Illustrate Port scanning Using NMAP.
3. Implement TCP/UDP Connectivity using Netcat.
4. Examine Network Vulnerability using Open VAS.
5. Demonstrate Practice of Web Application Penetration Testing.
6. Implement SQL injection manually using Damn Vulnerable Web App.
7. Experiment on Practical Identification of SQL-Injection Vulnerabilities.
8. Implement Cross-site Scripting Techniques to check malicious code.
9. Demonstrate intrusion detection system using SNORT tool or any other sofware.
10. Perform wireless audit on an access point or a router and decrypt WEP and WPAUsing Net Stumbler.

Text Books:

1. Nina,Godbole,SunitBelapure, "Cyber Security understanding Cyber Crimes,Computer forensics and Legal Perspectives",Wiley India Pvt.Ltd., 2013
2. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema,Fourth Edition, Publication McGraw Hill,2014.

Suggested Reading:

1. William Stallings "Cryptography and Network Security Principles and Practice, 6th Edition, Pearson 2014.
2. Dr.V.K.Jain, "Cryptography and Network Security", First Edition ,Khanna Book publishing New Delhi 2013.
3. Nina Godbole,"Information Systems Security Security Management, Metrics, Frameworks and Best Practices",Wiley ,2nd Edition,2012

Web Resources:

1. https://www.udemy.com/the-complete-cyber-security-course-end-point-protection/

Head Dept. of IT
CBIT, Hyderabad

20ITE124 **BIG DATA ANALYTICS LAB**

Instruction	4 Hours per week
CIE	50 Marks
Credits	2

Course Objectives:

1. To provide the knowledge to setup a Hadoop Cluster.
2. To impart knowledge to develop programs using MapReduce
3. To introduce Pig, PigLatin and HiveQL to process big data
4. To introduce NoSQL databases
5. To introduce the latest big data frameworks and writing applications using Spark and Scala
6. Integrate Hadoop with R (RHadoop) to process and visualize.

Course Outcomes:

After successful completion of this course student will be able to

1. Understand Hadoop working environment
2. Work with big data applications in multi node clusters
3. Write scripts using Pig to solve real world problems.
4. Write queries using Hive to analyse the datasets
5. Use Spark working environment.

List of Programs

1. Understanding and using basic HDFS commands
2. Word count application using Map Reduce on single node cluster
3. Analysis of Weather Dataset on Multi node Cluster using Hadoop
4. Real world case studies on Map Reduce applications
5. Working with Hadoop file system: Reading, Writing and Copying
6. Writing User Defined Functions/Eval functions for filtering unwanted data in Pig
7. Working with HiveQL
8. Writing User Defined Functions in Hive
9. Processing large datasets on Spark framework.
10. Integrating Hadoop with other data analytic frameworks like R

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Media Inc, 2015.
2. TanmayDeshpande, “HadoopReal-World Solutions Cookbook”, Second Edition, Packt Publishing 2016.

Suggested Reading:

1. Edward Capriolo, Dean Wampler, and Jason Rutherglen, "Programming Hive", O'Reilly Media Inc, October 2012.
2. VigneshPrajapati, "Big data Analytics with R and Hadoop", Packt Publishing, November 2013.
3. Nick Pentreath, “Machine Learning with Spark”, First Edition, Packt Publishing, 2015.

Web Resources:

1. https://parthgoelblog.wordpress.com/tag/hadoop-installation
2. http://www.iitr.ac.in/media/facspace/patelfec/16Bit/index.html
3. https://class.coursera.org/datasci-001/lecture
4. http://bigdatauniversity.com.

Head Dept. of IT
CBIT, Hyderabad

20ITE125 AUGMENTED AND VIRTUAL REALITY LAB

Instruction	4 Hours per week
CIE	50 Marks
Credits	2

Course Objectives:
1. To introduce AR and VR Apps
2. To present Mobile VR in Unity
3. To familiarize AR Space - Pose Tracking and Environment Detections
4. To illustrate the UX in Augmented Reality
5. To introduce AR Content with Unity and Vuforia

Course Outcomes:
After successful completion of the course, student will be able to:
1. BuildAR and VR Apps with Unity
2. Develop Mobile VR in Unity
3. Demonstrate Augmented Reality SpacePose Tracking and Environment Detections
4. Design the UX in Augmented Reality
5. Create AR Content with Unityand Vuforia

List of Programs
1. Develop AR App using Unity
2. Develop VR App using Unity
3. Implement Handheld AR App with Unity
4. Implement Mobile VR in Unity
5. Build AR Foundation with Unity's AR Foundation Package
6. Demonstrate AR Space - Pose Tracking and Environment Detections
7. Develop UX in AR - Raycast, Light Estimation, Physics and Occlusion
8. Implement AR Content with Unity
9. Implement AR Content with Vuforia

Text Books:
1. Steve Aukstakalnis Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR 1st Edition
2. Dieter Schmalstieg and Tobias Hollerer, Augmented Reality: Principles and Practice, 1st Edition

Suggested Reading:
1. Tony Parisi, Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile, 1st Edition
2. Jason Jerald, The VR Book: Human-Centered Design for Virtual Reality

Web Resources:
1. https://www.coursera.org/specializations/unity-xr
2. https://www.coursera.org/learn/xr-introduction
3. https://www.coursera.org/learn/mobile-vr-app-development-unity
4. https://www.coursera.org/learn/handheld-ar

Head Dept. of IT
CBIT, Hyderabad

20ITE126 **PREDICTIVE ANALYTICS WITH 'R' - LAB**

Instruction	4 Hours per week
CIE	50 Marks
Credits	2

Course Objectives:

1. To introduce R libraries for managing and interrogating raw and derived, observed, experimental datasets.
2. To build programs using Predictive Modeling.
3. To familiarize Regression and Classification Techniques with case studies.
4. To impart knowledge on the concepts of Neural Networks and various model Evaluation Techniques.
5. To explore time series models, Topic Modeling and Recommender Systems.

Course Outcomes:

After successful completion of the course, student will be able to:

1. Demonstrate the basic functions and implement R packages and commands
2. Apply regression analysis methods and infer the problems
3. Develop applications of neural networks and evaluate the techniques
4. Evaluation of ensemble methods
5. Build a system to perform topic modeling on real time datasets

List of Programs

1. Implementation of basic statistical functions of R programming
2. Demonstrate the file operations read and write, importing and exporting datasets
3. Demonstrate the regularization with the lasso in R
4. Implement the pocket perceptron algorithm for classification with neural networks
5. Solve a real-world regression problem by evaluating a neural network model to predict the energy
6. efficiency of the buildings
7. Build a neural network model that predicts a numerical digit (0-9) from *MNIST* database of handwritten digits
8. Explore the field of Banking and Finance and build a classification model which predicts credit scores
9. Design and evaluate a decision tree classifier which predicts whether a particular banknote is genuine or whether it has been forged
10. Build a model to predict heart disease based on their profile and a series of medical tests with bagging
11. Design a bagging model for predicting atmospheric gamma ray radiation
12. Predict promoters in gene sequences using Hidden Markov Model. The Data set contains a number of gene sequences from DNA belonging to the bacterium *E. Coli*
13. Implement Topic Modeling on online news stories

Text Books:

1. Rui Miguel Forte, "Mastering Predictive Analytics with R", Packt Publishing Ltd, 2015.
2. Roger D. Peng,"R Programming for Data Science", Lean Publishing, 2015.

Suggested Reading:

1. Lantz Brett, "Machine Learning with R", 2nd Edition, Packt Publishing Limited.
2. SunilaGollapudi, "Practical Machine Learning", Packt Publishing Ltd.
3. EthemAlpaydin, "Introduction to Machine Learning", 2nd Edition, PHI, 2013.

Datasets:

1. https://archive.ics.uci.edu/ml/index.php
2. https://www.kaggle.com/datasets
3. Energy Efficiency Data Set: http://archive.ics.uci.edu/ml/datasets/Energy+efficiency
4. MNIST dataset of handwritten digits http://yann.lecun.com/exdb/mnist/
5. German Credit Dataset: https://archive.ics.uci.edu/ml/datasets/Statlog+%28German+Credit+Data%29
6. Banknote Authentication Data Set: https://archive.ics.uci.edu/ml/datasets/banknote+authentication
7. MAGIC Gamma Telescope data set: https://archive.ics.uci.edu/ml/datasets/magic+gamma+telescope

8. Promoter Gene Sequences Data Set:https://archive.ics.uci.edu/ml/datasets/Molecular+Biology+(Promoter+Gene+Sequences)
9. http://mlg.ucd.ie/datasets/bbc.html

Web Resources:

1. https://data-flair.training/blogs/r-predictive-and-descriptive-analytics/
2. https://www.littlemissdata.com/blog/predictive-analytics-tutorial-part-1
3. http://uc-r.github.io/mars

Head Dept. of IT
CBIT, Hyderabad

20ITC107 **MINI PROJECT WITH SEMINAR**

Instruction	4 Hours per week
CIE	50 Marks
Credits	2

Course Outcomes:

Upon completing this course, students will be able to:

1. Formulate a specific problem and give solution.
2. Develop model/models either theoretical/practical/numerical form.
3. Solve, interpret/correlate the results and discussions.
4. Conclude the results obtained.
5. Write the documentation in standard format.

Guidelines:

- As part of the curriculum in the II- semester of the programme each students shall do a mini project, generally comprising about three to four weeks of prior reading, twelve weeks of active research, and finally a presentation of their work for assessment.
- Each student will be allotted to a faculty supervisor for mentoring.
- Mini projects should present students with an accessible challenge on which to demonstrate competence in research techniques, plus the opportunity to contribute something more original.
- Mini projects shall have inter disciplinary/ industry relevance.
- The students can select a mathematical modelling based/Experimental investigations or Numerical modelling.
- All the investigations are clearly stated and documented with the reasons/explanations.
- The mini-project shall contain a clear statement of the research objectives, background of the work, literature review, techniques used, prospective deliverables, and detailed discussion on results, conclusions and references.

Department Review Committee: Supervisor and Two Faculty Coordinators

Guidelines for awarding marks (CIE):		**Max. Marks: 50**
Evaluation by	**Max .Marks**	**Evaluation Criteria / Parameter**
Supervisor	20	Progress and Review
	05	Report
Department Committee	05	Relevance of the Topic
	05	PPT Preparation
	05	Presentation
	05	Question and Answers
	05	Report Preparation

Head Dept. of IT
CBIT, Hyderabad

20EG A101 **ENGLISH FOR RESEARCH PAPER WRITING**
(AUDIT COURSE)

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
Credits	0

Course Objectives:
1. To understand the nuances of language and vocabulary in writing a Research Paper.
2. To develop the content, structure and format of writing a research paper.
3. To enable the students to produce original research papers without plagiarism.

Course Outcomes:
Upon completing this course, students will be able to:
1. Interpret the nuances of research paper writing.
2. Differentiate the research paper format and citation of sources.
3. To review the research papers and articles in a scientific manner.
4. Avoid plagiarism and be able to develop their writing skills in presenting the research work.
5. Create a research paper and acquire the knowledge of how and where to publish their original research papers.

UNIT -I
Academic Writing: Meaning & Definition of a research paper– Purpose of a research paper – Scope – Benefits – Limitations – outcomes.

UNIT- II
Research Paper Format: Title – Abstract – Introduction – Discussion – Findings – Conclusion – Style of Indentation – Font size/Font types – Indexing – Citation of sources.

UNIT –III
Research Methodology: Methods (Qualitative – Quantitative) Review of Literature. Criticizing, Paraphrasing & Plagiarism.

UNIT- IV
Process of Writing a research paper: Choosing a topic - Thesis Statement – Outline – Organizing notes - Language of Research – Word order, Paragraphs – Writing first draft –Revising/Editing - The final draft and proof reading.

UNIT- V
Research Paper Publication: Reputed Journals – National/International – ISSN No, No. of volumes, Scopus Index/UGC Journals – Free publications - Paid Journal publications – /Advantages/Benefits

Text Book:
1. C. R Kothari, Gaurav, Garg, **Research Methodology Methods and Techniques,** New Age International Publishers. 4th Edition.

Suggested Reading:
1. Day R (2006) "How to Write and Publish a Scientific Paper**",** Cambridge University Press
2. MLA **"**Hand book for writers of Research Papers**"**, East West Press Pvt. Ltd, New Delhi, 7th Edition.
3. Lauri Rozakis, Schaum's, "Quick Guide to Writing Great Research Papers**"**, Tata McGraw Hills Pvt. Ltd, New Delhi.

Online Resource:
1. NPTEL: https://onlinecourses.nptel.ac.in/noc18_mg13/preview

Head Dept. of IT
CBIT, Hyderabad

20EC A101 **VALUE EDUCATION**
(AUDIT COURSE)

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
Credits	0

Course Objectives:
1. Understand the need and importance of Values for self-development and for National development.
2. Imbibe good human values and Morals
3. Cultivate individual and National character.

Course outcomes:
Upon completing this course, students will be able to:
1. Gain necessary Knowledge for self-development
2. Learn the importance of Human values and their application in day to day professional life.
3. Appreciate the need and importance of interpersonal skills for successful career and social life
4. Emphasize the role of personal and social responsibility of an individual for all-round growth.
5. Develop a perspective based on spiritual outlook and respect women, other religious practices, equality, non-violence and universal brotherhood.

UNIT I
Human Values, Ethics and Morals: Concept of Values, Indian concept of humanism, human values; Values for self-development, Social values, individual attitudes; Work ethics, moral and non- moral behaviour, standards and principles based on religion, culture and tradition.

UNIT II
Value Cultivation, and Self-management: Need and Importance of cultivation of values such as Sense-of Duty, Devotion to work, Self-reliance, Confidence, Concentration, Integrity & discipline, and Truthfulness.

UNIT III
Spiritual outlook and social values: Personality and Behavior, Scientific attitude and Spiritual (soul) outlook; Cultivation of Social Values Such as Positive Thinking, Punctuality, Love & Kindness, Avoiding fault finding in others, Reduction of anger, forgiveness, Dignity of labour, True friendship, Universal brotherhood and religious tolerance.

UNIT IV
Values in Holy Books : Self-management and Good health; **and internal & external Cleanliness,** Holy books versus Blind faith, Character and Competence, Equality, Nonviolence, Humility, Role of Women.

UNIT V
Dharma, Karma and Guna: Concept of soul; Science of Reincarnation, Character and Conduct, Concept of Dharma; Cause and Effect based Karma Theory; The qualities of Devine and Devilish; Satwic, Rajasic and Tamasicgunas.

Suggested Reading:

1. Chakroborty, S.K. "Values & Ethics for organizations Theory and practice", Oxford University Press, New Delhi, 1998.
2. Jaya Dayal Goyandaka, "Srimad Bhagavad Gita", with Sanskrit Text, Word meaning and Prose meaning, Gita Press, Gorakhpur, 2017.

Head Dept. of IT
CBIT, Hyderabad

20CSO101

BUSINESS ANALYTICS
(OPEN ELECTIVE)

Instruction	3 hrs per week
Duration of End examination	3 hrs
Semester end examinations	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
1. Understanding the basic concepts of business analytics and applications
2. Study various business analytics methods including predictive, prescriptive and prescriptive analytics
3. Prepare the students to model business data using various data mining, decision making methods

Course Outcomes:
Upon completing this course, students will be able to:
1. To understand the basic concepts of business analytics
2. Identify the application of business analytics and use tools to analyze business data
3. Become familiar with various metrics, measures used in business analytics
4. Illustrate various descriptive, predictive and prescriptive methods and techniques
5. Model the business data using various business analytical methods and techniques

UNIT-I
Introduction to Business Analytics: Introduction to Business Analytics, need and science of data driven (DD) decision making, Descriptive, predictive, prescriptive analytics and techniques, Big data analytics, Web and Social media analytics, Machine Learning algorithms, framework for decision making, challenges in DD decision making and future.

UNIT-II
Descriptive Analytics: Introduction, data types and scales, types of measurement scales, population and samples, measures of central tendency, percentile, decile and quadrille, measures of variation, measures of shape-skewness, data visualization

UNIT-III
Forecasting Techniques: Introduction, time-series data and components, forecasting accuracy, moving average method, single exponential smoothing, Holt's method, Holt-Winter model, Croston's forecasting method, regression model for forecasting, Auto regression models, auto-regressive moving process, ARIMA, Theil's coefficient

UNIT-IV
Decision Trees: CHAID, Classification and Regression tree, splitting criteria, Ensemble and method and random forest. **Clustering**: Distance and similarity measures used in clustering, Clustering algorithms, K-Means and Hierarchical algorithms, **Prescriptive Analytics**- Linear Programming(LP) and LP model building,

UNIT-V
Six Sigma: Introduction, introduction, origin, 3-Sigma Vs Six-Sigma process, cost of poor quality, sigma score, industry applications, six sigma measures, DPMO, yield, sigma score, DMAIC methodology, Six Sigma toolbox

Text Books:
1. U Dinesh Kumar, "Data Analytics", Wiley Publications, 1st Edition, 2017
2. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, "Business analytics Principles, Concepts, and Applications with SAS", Associate Publishers, 2015

Suggested Reading:
1. S. Christian Albright, Wayne L. Winston, "Business Analytics - Data Analysis and Decision Making", 5th Edition, Cengage, 2015

Web Resources:
1. https://onlinecourses.nptel.ac.in/noc18-mg11/preview
2. https://nptel.ac.in/courses/110105089/

Head Dept. of IT
CBIT, Hyderabad

20ITC108 **DISSERTATION PHASE- I**

Instruction	20 Hours per week
CIE	100 Marks
Credits	10

Course Outcomes:
At the end of the course:

1. Students will be exposed to self-learning various topics.
2. Students will learn to survey the literature such as books, national/international refereed journals and contact resource persons for the selected topic of research.
3. Students will learn to write technical reports.
4. Students will develop oral and written communication skills to present.
5. Student will defend their work in front of technically qualified audience.

Guidelines:

- The Project work will preferably be a problem with research potential and should involve scientific research, design, generation/collection and analysis of data, determining solution and must preferably bring out the individual contribution.
- Seminar should be based on the area in which the candidate has undertaken the dissertation work.
- The CIE shall include reviews and the preparation of report consisting of a detailed problem statement and a literature review.
- The preliminary results (if available) of the problem may also be discussed in the report.
- The work has to be presented in front of the committee consists of Head, Chairperson-BoS, Supervisor and Project coordinator.
- The candidate has to be in regular contact with his supervisor and the topic of dissertation must be mutually decided by the guide and student.

Guidelines for the award of Marks:		Max. Marks: 50
Evaluation by	**Max .Marks**	**Evaluation Criteria / Parameter**
Supervisor	30	Project Status / Review(s)
	20	Report
Department Committee	10	Relevance of the Topic
	10	PPT Preparation(s)
	10	Presentation(s)
	10	Question and Answers
	10	Report Preparation

Note : Department committee has to assess the progress of the student for every two weeks.

Head Dept. of IT
CBIT, Hyderabad

20ITC109 **DISSERTATION PHASE- II**

Instruction	32 Hours per week
Duration of SEE	Viva
SEE	100 Marks
CIE	100 Marks
Credits	16

Course Outcomes:

At the end of the course:

1. Students will be able to use different experimental techniques and will be able to use different software/ computational/analytical tools.
2. Students will be able to design and develop an experimental set up/ equipment/test rig.
3. Students will be able to conduct tests on existing set ups/equipments and draw logical conclusions from the results after analyzing them.
4. Students will be able to either work in a research environment or in an industrial environment.
5. Students will be conversant with technical report writing and will be able to present and convince their topic of study to the engineering community.

Guidelines:

- It is a continuation of Project work started in III semester.
- The student has to submit the report in prescribed format and also present a seminar.
- The dissertation should be submitted in standard format as provided by the department.
- The candidate has to prepare a detailed project report consisting of introduction of the problem statement, literature review, objectives of the work, methodology (experimental set up or numerical details as the case may be) of the solution and results with analysis.
- The report must bring out the conclusions of the work and future scope for the study.
- The work has to be presented in front of the examiners panel consisting of an approved external examiner, an internal examiner (HoD and BoS Chair Person), supervisor/co-supervisor.
- The candidate has to be in regular contact with his/her supervisor/co-supervisor.

Guidelines for awarding marks in CIE:		**Max. Marks: 100**
Evaluation by	**Max. Marks**	**Evaluation Criteria / Parameter**
Department Review Committee	05	Review 1
	10	Review 2
	10	Review 3
	15	Final presentation with the draft copy of the report in standard format
	20	Submission of the report in a standard format
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	10	Quality of the work which may lead to publications
	10	Analytical / Programming / Experimental Skills Preparation
	10	Report preparation in a standard format

Head Dept. of IT
CBIT, Hyderabad

Guidelines for awarding marks in SEE: (Max. Marks: 100)

Evaluation by	**Max. Marks**	**Evaluation Criteria / Parameter**
External and Internal Examiner(s)	20	Power Point Presentation
	40	Quality of thesis and evaluation
	20	Quality of the project • Innovations • Applications • Live Research Projects • Scope for future study • Application to society
	20	Viva-Voce

Head Dept. of IT
CBIT, Hyderabad

SCHEME OF INSTRUCTION AND SYLLABI (R-20)

OF

B.E. I & II SEMESTERS

IN

ELECTRICAL & ELECTRONICS ENGINEERING

(For the batch admitted in 2020-21)

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)
Affiliated to Osmania University
Kokapet Village, Gandipet Mandal, Hyderabad- 500 075. Telangana
E-Mail: principal@cbit.ac.in; Website: www.cbit.ac.in; Phone Nos.: 040-24193276 / 277 / 279

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INSTITUTE VISION AND MISSION:

Vision:
To be centre of excellence in technical education and research

Mission:
To address the emerging needs through quality technical education and advanced research

DEPARTMENT VISION AND MISSION:

Vision:

To achieve Academic and Professional Excellence in Teaching and Research in the frontier areas of Electrical and Electronics Engineering Vis-a -Vis serve as a Valuable Resource for Industry and Society.

Mission:

Empowering the Faculty and Student Rendezvous to Nurture Interest for Conceptual Keystone, Applied Multidisciplinary Research, Inspiring Leadership and Efficacious Entrepreneurship culture , Impeccable Innovation in frontier areas to be synergetic with Environmental, Societal and Technological Developments of the National and International community for Universal Intimacy.

M1: Emphasis on providing Strong Theoretical Foundation & Engineering Leadership Eminence, infusion of Creativity and Management skill while maintaining Ethics and Moral for Sustainable Development. **(Individual development**)

M2: Enable the Faculty and Student Interactions to trigger interest for Applied Multidisciplinary Research and Entrepreneurship Culture resulting in Significant Advancement of the field of Specialization with Involvement of Industries and Collaborative Educational Networks. **(Sense of Ownership, Networking and Eco system Development)**

M3: Extend the Conducive Neighborhoods for Innovation in frontier areas to keep pace with Environmental, Societal and Technological Developments of the National and International Community to Serve Humanity. **(Service to Society, Atmanirbhar Bharat)**

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS):

- **PEO1-** Graduates will Ennoble in offering Design solutions for Complex Engineering Problems using appropriate modern Software tools, with the specified need of the Industry and Protagonist in transforming the Society into a Knowledge Society.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

- **PEO2-** Graduates will Elevate Engineering Leadership and will be recognized as Experts working in Government, Consulting firms, International organizations with their Creativity in Design of Experiments, Analysis and Interpretation of Data and Synthesis of Information.

- **PEO 3-** Graduates will Exalt in their Professional career by Persistence in Team work, Ethical behavior, Proactive involvement, and Effective Communication.

- **PEO 4-** Graduate will Excel by becoming Researches, Professors and Entrepreneurs who will create and Disseminate new knowledge in the frontier areas of Engineering, Technology and Management

PROGRAM OUTCOMES (POs):

1. **Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem Analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

4. **Conduct Investigations of Complex Problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

5. **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project Management and Finance**: Demonstrate knowledge and understanding of the

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

12. **Life-long Learning**: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOS):

PSO 1: Evaluate complex Engineering Problems to meet the distinct need of Industry & Society, by utilizing knowledge of Mathematics, Science, Emerging Technologies such as AI, Block chain & IT tools.

PSO 2: Exhibit Latent talent in understanding the Engineering and Administration standards at work place as a team leader to manage Projects in the Multi-Disciplinary Environments.

PSO 3: Establish Engineering Expertise in Power system, Machines and Drives Systems and also Pursue Research in the Frontier areas such as Embedded systems, Renewable Energy, E-Mobility and Smart grid.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

ABOUT THE DEPARTMENT:

The EEE Department at CBIT operates with one eye on Excellence and the other one on the Future. This is because we know just how fast the world is changing. As such, our students are armed with not only with the traditional knowledge and wisdom in the field of electrical engineering, but also with an interdisciplinary perspective that helps them work in tandem with other specializations in the world of technology and science.

The department of EEE bestowed with Elite students, Eminent Staff and Efficacious Infrastructure is endeavouring the synergy with Research, Innovation and Education Eco system. In order to meet the target the department

(i) heed its Alumni to transfer their expertise to their juniors**; [ALTEREGO]**

(ii) takes the students to Industrial visits for a practical exposure**; [VIKASA]**

(iii) conducts annual technical fest '**ELECTRET**' under 'SUDHEE' banner in order to create a platform to manifest technical skills and leadership qualities;

(iv) arranges Guest Lectures by Industry experts to complement the class room Instruction;

(v) organizes Conferences, Seminars & workshops to bring out the latent talent in the students;

(vi) showcases the achievements of students and staff in order to boast their confidence levels.

As the Head of the Department, I have a vision to carve a niche in the Power and Electronics arena so that the department stands out and most of the students get motivated towards having start-ups of their own.

In order to achieve the vision, the set mission is to amplify the Industry- Institute Interaction in manifold. In this direction, the department entered into an MoU with Industries such as M/s EesaVyasa Technologies Private Limited ; Interleaved Multi disciplinary Research Centre; CARES-Renewable-Coimbatore; HIEE; In this regard, the department has also launched **VIKASA** (**VI**dyuth **KA**rmagara **SA**mmelanam) to create an avenue for the students to get placements in the core sector and become self-reliant as well (Swayam Tejaswin Bhava).

My wish is that our department should be looked up to as a **ROLE MODEL – sculptor** and get International recognition in training Engineering students as **Industry-Ready Ethical Professional Engineers** of our nation. Though the existing qualified staff and well-equipped labs are assets to the department, a lot more is required to achieve the set vision of the department and college.

There is a dire need to coherently work with Premier Institutes and Industries.

Sincerity in implementing an effective **Teaching-Learning Process** blended with **Morals** is one of the top reasons for parents and student aspirants to opt for the EEE department of the prestigious CBIT.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Scheme of Instructions of I Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2020-21

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

SEMESTER – I

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20MT C05	Calculus	3	1	-	3	40	60	4
2	20CYC01	Chemistry	3	-	-	3	40	60	3
3	20CE C01	Engineering Mechanics-I	3	-	-	3	40	60	3
4	20CS C01	Programming for Problem Solving	3	-	-	3	40	60	3
PRACTICAL									
5	20CY C02	Chemistry Lab	-	-	4	3	50	50	2
6	20CS C02	Programming for Problem Solving Lab	-	-	4	3	50	50	2
7	20ME C02	Workshop/ Manufacturing Practice	-	-	5	3	50	50	2.5
8	20ME C03	Engineering Exploration	90 Hours / 4P			-	50	-	1.5
TOTAL			**12**	**1**	**13**	**-**	**360**	**390**	**21**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20MT C05

CALCULUS
(Common to ECE, EEE, MECH, CHEM, CIVIL)

Instruction	3 L+1T /2P Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives:
1. To explain the solutions of system of linear equations by Matrix Methods.
2. To discuss mean value theorems.
3. To explain the Partial Derivatives and the extreme values of functions of two variables.
4. To discuss the convergence and divergence of the series.
5. To explain the expansion of functions in sine and cosine series.

Course Outcomes:
Upon completing this course, students will be able to:
1. Apply the Matrix Methods to solve system of linear equations.
2. Analyse the geometrical interpretation of Mean value theorems.
3. Determine the extreme values of functions of two variables.
4. Examine the convergence and divergence of infinite Series.
5. Calculate the Euler's coefficients for Fourier series of a function.

UNIT-I
Matrices: Rank of a matrix, Echelon form, consistency of linear system of equations, Linear dependence and independence of vectors. Eigen values, Eigenvectors, Properties of Eigen values& Eigen vectors, Cayley-Hamilton theorem, Quadratic form, Reduction of quadratic form to canonical form by linear transformation, Nature of quadratic form.

UNIT-II
Calculus: Rolle's Theorem, Lagrange's Mean value theorem, Cauchy's mean value theorem (without proofs). Curvature, Radius of curvature, Centre of curvature, Evolute and Involute.

UNIT-III
Multivariable Calculus (Differentiation): Functions of two variables, Partial derivatives, Higher order partial derivatives, Total derivative, Differentiation of implicit functions , Change of variables, Jacobians, Taylor's theorem for functions of two variables, Maxima and minima of functions of two variables.

UNIT-IV
Sequences and Series: Convergence of sequence and series. Tests for convergence of series: Comparison test, limit comparison test, D'Alembert's ratio test, Raabe's test, Cauchy's root test, alternating series, Leibnitz's series, absolute and conditional convergence.

UNIT-V
Fourier series: Periodic functions, Euler' formulae**,** Conditions for a Fourier expansion, functions having points of discontinuity, change of interval, even and odd functions, half range sine series, half range cosine series, and its applications in practical Harmonic analysis.

Text Books:

1. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. B.V.Ramana., Higher Engineering Mathematics, Tata McGraw-Hill, New Delhi, 11th Reprint, 2010.

Suggested Reading:

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw- Hill, New Delhi, 2008.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

2. R.K.Jain, S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th edition, 2016.
3. David.Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/ Cole, 2005.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20CY C01

CHEMISTRY
(Common to all branches)

Instruction:	3Hours per Week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE:	40 Marks
Credits:	3

Course Objectives

1. This syllabus helps at providing the concepts of chemical bonding and chemical kinetics to the students aspiring to become practicing engineers
2. Thermodynamic and Electrochemistry units give conceptual knowledge about processes and how they can be producing electrical energy and efficiency of systems.
3. To teach students the value of chemistry and to improve the research opportunities knowledge of stereochemistry and organic reactions is essential.
4. Water chemistry unit impart the knowledge and understand the role of chemistry in the daily life.
5. New materials lead to discovering of technologies in strategic areas for which an insight into Polymers, nanomaterials and basic drugs of modern chemistry is essential.

Course Outcomes
At the end of the course student will be able to:

1. Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions.
2. Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells.
3. Illustrate the major chemical reactions that are used in the synthesis of organic molecules.
4. Classify the various methods used in treatment of water for domestic and industrial use.
5. Outline the synthesis of various Engineering materials & Drugs.

UNIT-I Atomic and molecular structure and Chemical Kinetics:
Atomic and molecular structure: Molecular Orbital theory - atomic and molecular orbitals. Linear combination of atomic orbitals (LCAO) method.Molecular orbitals of diatomic molecules. Molecular Orbital Energy level diagrams (MOED) of diatomic molecules & molecular ions (H_2 , He^+ ,N_2 , O_2 , O_2^- , CO, NO). Pi- molecular orbitals of benzene and its aromaticity.
Chemical Kinetics: Introduction, Terms involved in kinetics: rate of reaction, order & molecularity; First order reaction-Characteristics: units of first order rate constant & its half-life period, second order reaction-Characteristics: units of second order rate constant & its half- life period. Numericals.

UNIT-II Use of free energy in chemical equilibria
Use of free energy in chemical equilibria: Thermodynamic functions: Internal energy, entropy and free energy. Significance of entropy and free energy (criteria of spontaneity).Free energy and emf (Gibbs Helmholtz equations and its applications). Cell potentials, electrode potentials, – Reference electrodes (NHE, SCE)-electrochemical series. Nernst equation and its applications. Determination of pH using combined Glass & Calomel electrode. Potentiometric Acid base & Redox Titrations.Numericals.
Battery technology: Rechargeable batteries & Fuel cells.
Lithium batteries: Introduction, construction, working and applications of Li-MnO_2 and Li-ion batteries.
Fuel Cells: Introduction, difference between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell.

UNIT- III Stereochemistry and Organic reactions
Stereochemistry: Representations of 3 dimensional structures, Types of stereoisomerism- Conformational isomerism – confirmations of n-butane (Newman and sawhorse representations), Configurational isomerism - Geometrical (cis-trans) isomerism & Optical isomerism- optical activity, Symmetry and chirality: Enantiomers (lactic acid) & Diastereomers (Tartaric acid), Absolute configurations, Sequence rules for R&S notation.
Types of Organic reactions: Substitution Reactions- Electrophilic substitution (Nitration of Benzene);

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Nucleophilic Substitution (S_N1& S_N2); Free Radical Substitution (Halogenation of Alkanes)

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Addition Reactions: Electrophilic Addition – Markonikoff's rule, Free radical Addition - Anti Markonikoff's rule (Peroxide effect), Nucleophilic Addition – (Addition of HCN to carbonyl compounds)
Eliminations-E1 and E2 (dehydrohalogenation of alkyl halides)
Cyclization (Diels - Alder reaction)

UNIT–IV Water Chemistry:
Hardness of water – Types, units of hardness, Disadvantages of hard water, Alkalinity and Estimation of Alkalinity of water, Boiler troubles - scales & sludge formation, causes and effects, Softening of water by lime soda process (Cold lime soda process),ion exchange method and Reverse Osmosis.Specifications of potable water & industrial water.Disinfection of water by Chlorination; break point chlorination, BOD and COD definition, Estimation (only brief procedure) and significance, Numericals.

UNIT-V Engineering Materials and Drugs:
Introduction, Terms used in polymer science; Thermoplastic polymers (PVC) &Thermosetting polymers (Bakelite); Elastomers (Natural rubber).Conducting polymers- Definition, classification and applications.
Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography.
Nano materials-Introduction to nano materials and general applications, basic chemical methods of preparation-Sol-gel method. Carbon nanotubes and their applications.Characterisation of nanomaterials by SEM and TEM (only Principle).
Drugs-Introduction, Synthesis and uses of Aspirin (analgesic), Paracetamol (Antipyretic), Atenolol (antihypertensive).

Text Books:

1. P.C. Jain and M. Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company Ltd., New Delhi,16th edition (2015).
2. W.U. Malik, G.D.Tuli and R.D.Madan, "Selected topics in Inorganic Chemistry", S Chand & Company Ltd, New Delhi, reprint (2009).
3. R.T. Morrison, R.N. Boyd and S.K. Bhattacharjee, "Organic Chemistry", Pearson, Delhi, 7th edition (2019).
4. A Textbook of Polymer Science and Technology , Shashi Chawla, Dhanpat Rai & Co. (2014)
5. T. Pradeep, Nano: The Essentials, Tata McGraw-Hill Education, Delhi, 2012
6. G.L. David Krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K.L.N. Reddy and C.Sudhakar, "Drugs", Universities Press (India) Limited, Hyderabad (2007).

Suggested Readings:

1. B. H. Mahan, "University Chemistry", Narosa Publishing house, New Delhi, 3rd edition (2013).
2. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", S. Nagin Chand & Company Ltd., 46th edition (2013).
3. T.W. Graham Solomons, C.B. Fryhle and S.A. Snyder, "Organic Chemistry", Wiley, 12th edition (2017).
4. P.W. Atkins, J.D. Paula, "Physical Chemistry", Oxford, 8th edition (2006).

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20CE C01

ENGINEERING MECHANICS – I

Instruction:	3 L Hours per week
Duration of Semester End Examination:	3 Hours
Semester End Examination:	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits:	3

Course Outcomes: At the end of the course the student will be able to

1. Calculate the components and resultant of coplanar forces system.
2. Understand free body diagram and apply equilibrium equations to solve for unknown forces.
3. Apply concepts of friction for solving engineering problems.
4. Analyse simple trusses for forces in various members of a truss.
5. Determine centroid for elementary, composite figures and bodies.

UNIT- I:
Resolution and Resultant of Force System: Basic concepts of a force system. Components of forces in a plane. Resultant of coplanar concurrent force system. Moment of a force, couple and their applications. Resultant of coplanar non-concurrent force system.

UNIT - II:
Equilibrium of Force System: Free body diagram, equations of equilibrium. Lami's theorem, equilibrium of coplanar force systems.

UNIT - III:
Friction: Theory of static friction, Laws of friction, applications to single body, connected systems, wedge friction and belt friction.

UNIT - IV:
Analysis of Simple Trusses: Introduction to trusses, analysis of simple trusses using method of joints and method of sections.

UNIT - V:
Centroid and Centre of Gravity:
Centroid of lines and areas from first principles, centroid of composite figures, theorems of Pappus, centre of gravity of bodies and composite bodies.

Text Books:

1. K. Vijaya Kumar Reddy and J. Suresh Kumar, "*Singer's Engineering Mechanics: Statics and Dynamics*", B. S. Publications (SI Units), 3rd edn. Rpt., 2019.
2. A. Nelson., "*Engineering Mechanics*", Tata McGraw Hill, Delhi, 2010.

Suggested Reading:

1. Irving H. Shames, *"Engineering Mechanics",* 4th Edition, Prentice Hall, 2006.
2. R. C. Hibbeler, *"Engineering Mechanics: Principles of Statics and Dynamics",* Pearson Press, 2006.
3. Basudeb Bhattacharyya, "*Engineering Mechanics*", Oxford University Press, 2nd edn., 2016.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20CS C01

PROGRAMMING FOR PROBLEM SOLVING
(Common to all Programs)

Instruction	3 Periods per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The objectives of this course are

1. Identification of computer components, Operating environments , IDEs.
2. Understanding the steps in problem solving and formulation of algorithms to problems.
3. Develop programming skills as a means of implementing an algorithmic solution with appropriate control and data structures.
4. Develop in tuition to enable students to come up with creative approaches to problems.
5. Manipulation of text data using files.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify and understand the computing environments for scientific and mathematical problems.
2. Formulate solutions to problems with alternate approaches and represent them using algorithms / Flowcharts.
3. Choose data types and control structures to solve mathematical and scientific problem.
4. Decompose a problem into modules and use functions to implement the modules.
5. Apply arrays, pointers, structures, and unions to solve mathematical and scientific problems.
6. Develop applications using file I/O.

UNIT -I

Introduction to computers and Problem Solving: Components of a computer, Operating system, compilers, Program Development Environments, steps to solve problems, Algorithm, Flowchart / Pseudocode with examples.

Introduction to programming: Programming languages and generations, categorization of high-level languages.

Introduction to C: Introduction, structure of C program, keywords, identifiers, Variables, constants, I/O statements, operators, precedence, and associativity.

UNIT – II

Introduction to decision control statements: Selective, looping, and nested statements.

Functions: Introduction, uses of functions, Function definition, declaration, passing parameters to functions, recursion, scope of variables and storage classes, Case study using functions and control statements.

UNIT – III

Arrays: Introduction, declaration of arrays, accessing and storage of array elements, 1-dimensional array, Searching (linear and binary search algorithms) and sorting (Selection and Bubble) algorithms, 2-D arrays, matrix operations.

Strings: Introduction, strings representation, string operations with examples. Case study using arrays.

UNIT – IV

Pointers: Understanding computer's memory, introduction to pointers, declaration pointer variables, pointer arithmetic, pointers and strings, array of pointers, dynamic memory allocation, advantages, and drawbacks of pointers.

Structures: Structure definition, initialization and accessing the members of a structure, nested structures, structures and functions, self- referential structures, unions, and enumerated data types.

UNIT-V

Files: Introduction to files, file operations, reading data from files, writing data to files, error handing during

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

file operations.
Preprocessor Directives: Types of preprocessor directives, examples.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Text Books:

1. M.T. Somashekar "Problem Solving with C", 2nd Edition, Prentice Hall India Learning Private Limited 2018
2. AK Sharma, "Computer Fundamentals and Programming", 2nd Edition, University Press, 2018
3. Pradeep Deyand Manas Ghosh, "Programming in C", Oxford Press, 2^{nd} Edition, 2017

Suggested Reading:

1. Byron Gottfried, Schaum's Outline of Programming with C", Mc Graw-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
4. Reema Tharaja "Introduction to C Programming", Second Edition, OXFORD Press, 2015.

Online Resources:

1. https://www.tutorialspoint.com/cprogramming/index.htm.
2. https://onlinecourses.nptel.ac.in/noc18-cs10/preview

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20CY C02

CHEMISTRY LAB
(Common to all branches)

Instruction:	4 Hours per Week
Duration of SEE:	3 Hours
SEE:	50 Marks
CIE:	50 Marks
Credits:	2

Course Objectives

1. To impart fundamental knowledge in handling the equipment / glassware and chemicals in chemistry laboratory.
2. To provide the knowledge in both qualitative and quantitative chemical analysis
3. The student should be conversant with the principles of volumetric analysis
4. To apply various instrumental methods to analyse the chemical compounds and to improve understanding of theoretical concepts.
5. To interpret the theoretical concepts in the preparation of new materials like drugs and polymers.

Course Outcomes

At the end of the course student will be able to:

1. Identify the basic chemical methods to analyse the substances quantitatively & qualitatively.
2. Estimate the amount of chemical substances by volumetric analysis.
3. Determine the rate constants of reactions from concentration of reactants/ products as a function of time.
4. Calculate the concentration and amount of various substances using instrumental techniques.
5. Develop the basic drug molecules and polymeric compounds.

Chemistry Lab

1. Introduction: Preparation of standard solution of oxalic acid and standardisation of NaOH.
2. Estimation of metal ions (Co^{+2}& Ni^{+2}) by EDTA method.
3. Estimation of temporary and permanent hardness of water using EDTA solution
4. Determination of Alkalinity of water
5. Determination of rate constant for the reaction of hydrolysis of methyl acetate. (first order)
6. Determination of rate constant for the reaction between potassium per sulphate and potassium Iodide. (second order)
7. Estimation of amount of HCl Conductometrically using NaOH solution.
8. Estimation of amount of HCl and CH_3COOH present in the given mixture of acids Conductometrically using NaOH solution.
9. Estimation of amount of HCl Potentiometrically using NaOH solution.
10. Estimation of amount of Fe^{+2}Potentiometrically using $KMnO_4$ solution
11. Preparation of Nitrobenzene from Benzene.
12. Synthesis of Aspirin drug and Paracetamol drug.
13. Synthesis of phenol formaldehyde resin.

Text Books:

1. J. Mendham and Thomas , "Vogel's text book of quantitative chemical analysis", Pearson education Pvt. Ltd. New Delhi ,6th ed. 2002.
2. Senior practical physical chemistry by B.D.Khosla, V.C.Garg & A.Gulati,; R. Chand & Co. : New Delhi (2011).

Suggested Readings:

1. Dr. Subdharani , "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing, 2012.
2. S.S. Dara , "A Textbook on experiment and calculation in engineering chemistry", S. Chand and Company, 9th revised edition, 2015.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20CS C02

PROGRAMMING FOR PROBLEM SOLVING LAB
(Common to All Programs)

Instruction	4 Periods per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2

Course Objectives: The objectives of this course are
1. Setting up programming environment.
2. Develop Programming skills to solve problems.
3. Use of appropriate C programming constructs to implement algorithms.
4. Identification and rectification of coding errors in program.
5. Develop applications in a modular fashion.
6. Manage data using files.

Course Outcomes: On Successful completion of the course, students will be able to
1. Identify and setup program development environment.
2. Design and test programs to solve mathematical and scientific problems.
3. Identify and rectify the syntax errors and debug program for semantic errors
4. Implement modular programs using functions.
5. Represent data in arrays, pointers, structures and manipulate them through a program.
6. Create, read, and write to and from simple text files.

Lab experiments
1. Familiarization with programming environment.
2. Simple computational problems using arithmetic expressions.
3. Problems involving if-then-else structures.
4. Iterative problems e.g., sum of series.
5. 1D Array manipulation.
6. 2D arrays and strings.
7. Matrix problems, String operations.
8. Simple functions.
9. Recursive functions.
10. Pointers and structures.
11. Dynamic memory allocation and error handling.
12. File handling:

Text Books:
1. Pradeep Dey and Manas Ghosh, "Programming in C", Oxford Press, 2nd Edition, 2017.
2. Reema Tharaja "Introduction to C Programming", Second Edition, OXFORD Press, 2015.

Online Resources:
1. https://www.tutorialspoint.com/cprogramming/index.htm
2. https://www.w3resource.com/c-programming/programming-in-c.php
3. https://www.w3schools.in/c-tutorial/

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20ME C02

WORKSHOP / MANUFACTURING PRACTICE

Instruction	5P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2.5

Course Objectives:
1. Give a feel of Engineering Practices & develop holistic understanding of various Engineering materials and Manufacturing processes.
2. Develop skills of manufacturing, safety, precision, quality, intelligent effort, optimization, positive &team work attitude to get things right the first time.
3. To provide basic knowledge of Steel, Plastic, Composite and other materials for suitable applications.
4. Study of Principle and hands on practice on techniques of fabrication, welding, casting, manufacturing, metrology, and allied skills.
5. To advance important hard & pertinent soft skills, productivity, create skilled manpower which is cognizant of industrial workshop components and processes and can communicate their work in a technical, clear and effective way.

Course Outcomes: At the end of the course, the students are able to
1. Understand safety measures to be followed in workshop to avoid accidents.
2. Identify various tools used in fitting, carpentry, tin smithy, house wiring, welding, casting and machining processes.
3. Make a given model by using workshop trades including fitting, carpentry, tinsmithy and House wiring.
4. Perform various operations in welding, machining and casting processes.
5. Conceptualize and produce simple device/mechanism of their choice.

List of Exercises

CYCLE 1

Exercises in Carpentry
1. To plane the given wooden piece to required size
2. To make a lap joint on the given wooden piece according to the given dimensions.
3. To make a dove tail-joint on the given wooden piece according to the given dimensions.

Exercises in Tin Smithy
1. To make a rectangular box from the given sheet metal with base and top open. Solder the corners.
2. To make a scoop.
3. To make a pamphlet box.

Exercises in Fitting
1. To make a perfect rectangular MS flat and to do parallel cuts using Hacksaw
2. To make male and female fitting using MSflats-Assembly1
3. To make male and female fitting using MSflats-Assembly2

Exercises in House Wiring
1. Wiring of one light point controlled by one single pole switch, a three pin socket controlled by a single pole switch, and wiring of one buzzer controlled by a bellpush
2. Wiring of two light points connected in series and controlled by single pole switch. Verify the above circuit with different bulbs. Wiring of two light points connected in parallel from two single pole switches and a three pin socket
3. Stair case wiring-wiring of one light point controlled from two different places independently using

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

two 2- ways witches.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CYCLE 2

Exercises in Casting

1. Study of Sand casting process and its applications.
2. Green sand moulding practice for a single piece pattern
3. Green sand moulding practice for a split pattern with a horizontal core

Exercises in Welding

1. Study of gas welding equipment and process. Identification of flames, making of Butt joint with gas welding.
2. Study of Arc welding process, making Butt joint with DCSP, DCRP
3. Study of Arc welding process, making Lap joint with A.C

Exercises in Machine shop

1. Study of Machine Tools like Lathe, Drilling, Milling and Shaper.
2. Facing, Plain turning and Step turning operations on Lathe machine.
3. Knurling and Taper turning on Lathe machine

Open ended Exercise:

1. Student should produce a component /mechanism by applying the knowledge of any one trade or combination of trades.

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I, 2008 and Vol. II, 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata Mc Graw Hill House, 2017.

Suggested Reading:

1. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I", Pearson Education, 2008.
2. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20ME C03

ENGINEERING EXPLORATION
(PRACTICAL)

Instruction	4 Hours per week
Duration of SEE	Nil
SEE	Nil
CIE	50 Marks
Credits	1.5

Prerequisites: Nil

Course Outcomes: At the end of the course, the students are able to

1. Understand the role of an engineer as a problem solver.
2. Identify multi-disciplinary approaches in solving an engineering problem.
3. Build simple systems using engineering design process.
4. Analyze engineering solutions from ethical and sustainability perspectives.
5. Use basics of engineering project management skills in doing projects.

UNIT- I

Role of Engineers: Introduction, science, engineering, technology, engineer, scientist, role of engineer, various disciplines of engineering, misconception of engineering, expectations for the 21^{st} century engineer and NBA graduate attributes.

Engineering problems and Design: Multidisciplinary facet of design, pair wise comparison chart, introduction to econometrics system, generation of multiple solution, Pugh chart, motor and battery sizing concepts, introduction to PCB design.

UNIT- II

Mechanisms: Basic components of a mechanism, degrees of freedom or mobility of a mechanism, 4-bar chain, crank rocker mechanism, slider crank mechanism, simple robotic arm building.

Platform-based development: Introduction to programming platforms (Arduino) and its essentials, sensors, transducers and actuators and their interfacing with Arduino.

UNIT- III

Data Acquisition and Analysis: Types of data, descriptive statistics techniques as applicable to different types of data, types of graphs and their applicability, usage of tools (MS-Office /Open Office/ Libre Office / Scilab) for descriptive statistics, data acquisition (temperature and humidity) using sensors interfaced with Arduino, exporting acquired data to spreadsheets, and analysis using representation.

UNIT- IV

Process Management: Introduction to Agile practice, significance of team work, importance of communication in engineering profession, project management tools, checklist, timeline, Gantt chart, significance of documentation.

UNIT -V

Engineering Ethics & Sustainability in Engineering: Identifying Engineering as a profession, significance of professional ethics, code of conduct for engineers, identifying ethical dimensions in different tasks of engineering, applying moral theories and codes of conduct for resolution of ethical dilemmas.

Sustainability in Engineering: Introduction, sustainability leadership, life cycle assessment, carbon foot print.

Text Books:

1. Clive L. Dym, Patric Little, Elizabeth J Orwin, “Engineering Design: A project-based introduction”, 4th edition, Willey.
2. Matthew Python, “Arduino programming for beginners”, Independently published, 2020.
3. Patrick F. Dunn , “Measurement and data Analysis for engineering and science” , third edition, 2014.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

4. Andrew Stellman, Jennifer Greene, “Head First Agile: A brain-friendly guide to Agile principles, ideas, and real-world practices”, Kindle Edition.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Suggested Reading:

1. Charles B. Fleddermann, "Engineering ethics", fourth edition, Prentice Hall, 2012.
2. Rob Lawlor, "Engineering in society", second edition, Royal academy of engineering.
3. Richard Dodds, Roger Venables, "Engineering for sustainable development: Guiding principles", The Royal Academy of engineering, 2005.
4. Richard S. Paul, "Robot Manipulators: Mathematics, Programming, and Control", MIT Press.

ENGINEERING EXPLORATION ASSESSMENT SCHEME				
S. No	**Name of the module**	**Work Hours**	**Marks**	**Evaluation**
1	Role of Engineers	4	-	Evaluation - I
2	Engineering Design	16	5	
3	Mechanisms	6	3	
4	Engineering Ethics	2	2	
5	Platform-based Development	16	5	Evaluation - II
6	Data Acquisition and Analysis	6	4	Evaluation-III
7	Project Management	4	4	
8	Sustainability in Engineering	6	2	
9	Course Project Reviews	12	20	Final Evaluation
10	Code of conduct	-	5	
	Total	**72**	**50**	

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Scheme of Instructions of II Semester of B.E. – Electrical &Electronics Engineering as per AICTE Model Curriculum 2020-21

B.E. –ELECTRICAL & ELECTRONICS ENGINEERING

SEMESTER -II

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20MT C06	Vector Calculus and Differential Equations	3	1	-	3	40	60	4
2	20EG C01	English	2	-	-	3	40	60	2
3	20PY C06	Electromagnetic Theory and Quantum Mechanics	3	-	-	3	40	60	3
4	20EE C01	Basic Electrical Engineering	3	-	-	3	40	60	3
PRACTICAL									
5	20EG C02	English lab	-	-	2	3	50	50	1
6	20PY C09	Electromagnetic Theory and Quantum Mechanics Lab	-	-	4	3	50	50	2
7	20EE C02	Basic Electrical Engineering Lab	-	-	2	3	50	50	1
8	20ME C01	CAD and Drafting	-	1	3	3	50	50	2.5
9	20MB C02	Community Engagement	30 field + 2P/W			-	50	-	1.5
TOTAL			**11**	**2**	**11**	**-**	**410**	**440**	**20**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20MT C06

VECTOR CALCULUS AND DIFFERENTIAL EQUATIONS
(Common to ECE, EEE, MECH, CHEM, CIVIL)

Instruction	3 L+1T /2P Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives:
1. To explain double and triple integrals of various functions and their significance.
2. To explain Scalar and vector functions with its Physical interpretations.
3. To discuss vector line, surface and volume integrals.
4. To explain relevant methods to solve first order differential equations.
5. To discuss the solution of higher order differential equations.

Course Outcomes:
Upon completing this course, students will be able to:
1. Calculate the areas and volumes.
2. Apply the vector differential operators to Scalars and Vector functions.
3. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.
4. Calculate the solutions of first order linear differential equations.
5. Solve higher order linear differential equations.

UNIT-I
Multivariable Calculus (Integration): Applications of definite integrals to evaluate surface areas and volumes of revolutions. Double integrals, Change of order of integration, Area enclosed by plane curves, Triple integrals, Volumes of solids.

UNIT-II
Vector Differential Calculus: Scalar and vector point functions, Gradient, Directional derivative, potential function. Divergence, Physical interpretation of Divergence, Curl, Physical interpretation of curl, vector identities.

UNIT-III
Vector Integral Calculus: Line integral, Surface integral and Volume integral, Green's theorem in a plane, Stoke's theorem and Gauss's divergence theorem (without proof).Fluid flow, Physical interpretation of the divergence.

UNIT-IV
First Order Ordinary Differential Equations: Exact differential equations, Equations reducible to exact equations, Linear equations, Bernoulli's equation, Clairaut's equation, Riccati's equation, Orthogonal trajectories, Chemical reactions and solutions, Rate of decay of Radio-active materials.

UNIT-V
Higher Orders Linear Differential Equations: Higher order linear differential equations with constant coefficients, rules for finding Complementary function, Particular Integral and General solution. Method of variation of parameters, solution of Euler-Cauchy equation. Ordinary point, singular point, regular singular point and Power Series solution. Applications: LR and LCR circuits.

Text Books:
1. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

Suggested Reading:
1. N.P.Bali and Dr.Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 9th edition, 2014.

2. R.K.Jain, S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th edition, 2016.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic Geometry, 9th Edition, Pearson, Reprint, 2002

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20 EG C01

ENGLISH
(Common to all branches)

Instruction	2 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	2

Course Objectives: This course will introduce the students:
1. To the role and importance of communication while developing their basic communication skills in English.
2. To basics of writing coherent paragraphs and formal emails.
3. To techniques of writing a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. To description, definition and classification of processes while enabling them to draft formal reports following a proper structure.
5. To gaining adequate reading comprehension techniques.

Course Outcomes: After successful completion of the course the students will be able to:
1. Illustrate the nature, process and types of communication and communicate effectively without barriers.
2. Construct and compose coherent paragraphs, emails and adhering to appropriate mobile etiquette.
3. Apply techniques of precision to write a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. Distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.
5. Critique passages by applying effective reading techniques

UNIT-I Understanding Communication in English:
Introduction, nature and importance of communication; Process of communication; Types of communication - verbal and non-verbal; Barriers to communication; Intrapersonal and interpersonal communication; Understanding Johari Window.
Vocabulary &Grammar: The concept of Word Formation; Use of appropriate prepositions and articles.

UNIT-II Developing Writing Skills I:
Paragraph writing. – Structure and features of a paragraph; Cohesion and coherence. Rearranging jumbled sentences. Email and Mobile etiquette.
Vocabulary & Grammar: Use of cohesive devices and correct punctuation.

UNIT-III Developing Writing Skills II:
Précis Writing; Techniques of writing precisely. Letter Writing – Structure, format of a formal letter; Letter of request and the response
Vocabulary and Grammar: Subject-verb agreement.
Use of prefixes and suffixes to form derivatives. Avoiding redundancies.

UNIT-IV Developing Writing Skills III:
Report writing – Importance, structure, elements of style of formal reports ; Writing a formal report.
Vocabulary and Grammar: Avoiding ambiguity - Misplaced modifiers. Use of synonyms and antonyms.

UNIT-V Developing Reading Skills:
The reading process, purpose, different kinds of texts; Reading comprehension; Techniques of comprehension – skimming, scanning, drawing inferences and conclusions.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Vocabulary and Grammar: Words often confused; Use of standard abbreviations.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Text Books:

1. Language and Life: A Skills Approach, Board of Editors, Orient Black Swan, 2017.
2. Swan Michael, Practical English Usage.OUP. 1995.

Suggested Readings:

1. Wood F.T, Remedial English Grammar,Macmillan, 2007
2. Zinsser William, On Writing Well, Harper Resource Book, 2001
3. Sanjay Kumar and PushpLata, Communication Skills. Oxford University Press, 2011.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20PY C06

ELECTROMAGNETIC THEORY AND QUANTUM MECHANICS
(Common to ECE & EEE)

Instruction	3L / Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

The objectives of the course is to make the student

1. Understand the fundamentals of wave nature of light
2. Familiar with static and dynamic nature of electric and magnetic fields
3. Acquire knowledge of lasers and fiber optics
4. Learn basics of quantum mechanics and properties of solids

Course Outcomes:

At the end of the course, the student will be able to

1. Interpret the wave nature of the light
2. Extend the laws of electric and magnetic fields for wireless communication
3. Explain the principles of lasers and fiber optic communication
4. Find the applications of quantum mechanics
5. Identify semiconductors for engineering applications

UNIT-I

Wave Optics: Huygens' principle – Superposition of waves – Interference of light by wavefront splitting and amplitude splitting –Interference in thin films (reflected light) – Newton's rings – Fraunhofer diffraction from a single slit – Double slit diffraction–Concept of N-slits–Diffraction grating. Polarization: Introduction–Malus's law –Double refraction –Nicol's prism–Quarter-wave plate and half-wave plate– Optical activity– Laurent's half shade polarimeter.

UNIT-II

Electrostatics: Calculation of electric field and electrostatic potential for a charge distribution–Divergence and curl of electrostatic field– Laplace's and Poisson's equations for electrostatic potential–Uniqueness theorem.

Magnetostatics: Bio-Savart law–Divergence and curl of static magnetic field –Equation for magnetic vector potential and its solution for given current densities – Feromagnetic, paramagnetic and diamagnetic materials– B-H curve.

Electromagnetic Theory: Review of steady and varying fields – Conduction current and displacement current–Maxwell's equations in differential and integral forms–Electromagnetic wave propagation in free space, dielectric and conducting media – Poynting theorem – Skindepth.

UNIT-III

Lasers: Characteristics of lasers – Einstein's coefficients –Amplification of light by population inversion – Ruby laser – He-Ne laser – Semiconductor laser –Applications of lasers in engineering and medicine.

Fiber Optics: Introduction –Construction –Principle –Propagation of light through an optical fiber – Numerical aperture and acceptance angle – Step-index and graded-index fibers –Pulse dispersion –Fiber losses –Fiber optic communication system –Applications.

UNIT-IV

Quantum Mechanics: Introduction –Wave nature of particles – de-Broglie hypothesis –Physical significance of ψ –Time-dependent and time-independent Schrodinger equations – Born interpretation – Probability current –Wave-packets –Uncertainty principle –Particle in infinite square well potential.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

UNIT-V

Physics of Solids and Semiconductors: Salient features of free electron theory of metals (Classical and Quantum) – Fermi level – Bloch's theorem for particles in a periodic potential –Kronig-Penney model – Origin of energy bands –Classification of solids: metals, semiconductors and insulators –Intrinsic and extrinsicsemiconductors–Carriergenerationandrecombination–Carriertransport:diffusionanddrift–P-N junction – Thermistor – Hall effect – LED – Solarcell.

Text Books:

1. B.K. Pandey and S. Chaturvedi, *Engineering Physics*, Cengage Publications, 2012.
2. M.N. Avadhanulu and P.G. Kshirsagar, *A Text Book of Engineering Physics*, S. Chand Publications, 2014.
3. M. Arumugam, *Materials Science*, Anuradha Publications, 2015.
4. S.L. Gupta and Sanjeev Gupta, *Modern Engineering Physics*, Dhanpat Rai Publications, 2011.

Suggested Reading:

1. R. Murugeshan and Kiruthiga Sivaprasath, *Modern Physics*, S. Chand Publications S. Chand Publications, 2014.
2. V. Rajendran, *Engineering Physics*, McGraw-Hill Education Publications, 2013.
3. P.K. Palanisamy, *Engineering Physics*, Scitech Publications, 2012.
4. V. Raghavan, *Materials Science and Engineering*, Prentice Hall India Learning Private Limited; 6th Revised edition, 2015.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEC01

BASIC ELECTRICALENGINEERING

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To understand the behaviour of different circuit elements R, L & C, and the basic concepts of electrical AC circuit analysis
2. To understand the basic principle of operation of AC and DC machines
3. To know about different types of electrical wires and cables, domestic and industrial wiring. safety rules and methods of earthing

Course Outcomes: After the completion of this course, the student will be able to

1. Understand the concepts of Kirchhoff's laws and to apply them in superposition, Thevenin's and Norton's theorems to get the solution of simple dc circuits
2. Obtain the steady state response of RLC circuits with AC input and to acquire the basics, relationship between voltage and current in three phase circuits.
3. Understand the principle of operation, the EMF and torque equations and classification of AC and DC machines
4. Explain various tests and speed control methods to determine the characteristic of DC and AC machines.
5. Acquire the knowledge of electrical wiring, types of wires, cables used and Electrical safety precautions to be followed in electrical installations.
6. Recognize importance of earthing, methods of earthing and various low-tension switchgear used in electrical installations

UNIT-I

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation, Superposition, Thevenin and Norton Theorems, Time-domain analysis of first-order RL and RC circuits.

UNIT-II

AC Circuits: Representation of sinusoidal waveforms, peak and RMS values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III

Transformers: Construction, Working principle, EMF Equation, Ideal and Practical transformer, Equivalent circuit of Transformer, OC and SC tests on a transformer, Efficiency and Regulation

UNIT-IV

DC and AC Machines: DC Generators: Construction, Principle of operation, EMF equation, Classification, Characteristics of shunt, series and compound generators.
DC Motors: Classification, Torque equation, Characteristics, Efficiency, Speed Control of Series and Shunt Motors.
Three - Phase Induction Motors: Principle of operation, Applications,

UNIT-V

Electrical Installations: Electrical Wiring: Types of wires and cables, Electrical Safety precautions in handling electrical appliances, electric shock, first aid for electric shock, safety rules.
Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Earthing (Elementary Treatment only), Elementary calculations for energy consumption

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Text Books:

1. L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011.
2. E. Hughes, Electrical and Electronics Technology, Pearson, 2010.

Suggested Reading:

1. D. P. Kothari & I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989
3. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
4. P.V. Prasad, S. Sivanagaraju, R. Prasad, "Basic Electrical and Electronics Engineering" Cengage Learning, 1st Edition, 2013

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EG C02

ENGLISH LAB
(Common to all branches)

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives: This course will introduce the students:

1. To nuances of Phonetics and give them sufficient practice in correct pronunciation.
2. To word stress and intonation.
3. To IELTS and TOEFL material for honing their listening skills.
4. To activities enabling them overcome their inhibitions while speaking in English with the focus being on fluency rather than accuracy.
5. To team work, role behavior while developing their ability to discuss in groups and making oral presentations.

Course Outcomes: After successful completion of the course the students will be able to:

1. Define the speech sounds in English and understand the nuances of pronunciation in English
2. Apply stress correctly and speak with the proper tone, intonation and rhythm.
3. Analyze IELTS and TOEFL listening comprehension texts to enhance their listening skills.
4. Determine the context and speak appropriately in various situations.
5. Design and present effective posters while working in teams, and discuss and participate in Group discussions.

Exercises

1. **Introduction to English Phonetics**: Introduction to auditory, acoustic and articulatory phonetics, organs of speech: the respiratory, articulatory and phonatory systems.
2. **Sound system of English**: Phonetic sounds and phonemic sounds, introduction to international phonetic alphabet, classification and description of English phonemic sounds, minimal pairs . The syllable: types of syllables, consonant clusters.
3. **Word stress**: Primary stress, secondary stress, functional stress, rules of word stress.
4. **Rhythm & Intonation** : Introduction to Rhythm and Intonation. Major patterns, intonation of English with the semantic implications.
5. **Listening skills** – Practice with IELTS and TOEFL material
6. **Public speaking –** Speaking with confidence and clarity in different contexts on various issues.
7. **Group Discussions -** Dynamics of a group discussion, group discussion techniques, body language.
8. **Pictionary –** weaving an imaginative story around a given picture.
9. **Information Gap Activity –** Writing a brief report on a newspaper headline by building on the hints given
10. **Poster presentation –** Theme, poster preparation, team work and presentation.

Suggested Reading

1. T Balasubramanian. A Textbook of English Phonetics for Indian Students, Macmillan, 2008.
2. J Sethi et al. A Practical Course in English Pronunciation (with CD), Prentice Hall India, 2005.
3. Priyadarshi Patnaik. Group Discussions and Interviews, Cambridge University Press Pvt Ltd., 2011
4. Aruna Koneru, Professional Speaking Skills, Oxford University Press, 2016

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20PY C09

ELECTROMAGNETIC THEORY AND QUANTUM MECHANICS LAB
(Common to ECE & EEE)

Instruction	4 Periods / Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2

Course Objectives:

The objectives of the course is to make the student

1. Apply the concepts of physics while doing experiments
2. Understand the nature of the light experimentally
3. Analyze the behaviour of semiconductor materials and optoelectronic devices

Course Outcomes:

At the end of the course, the student will be able to

1. Experiment with the concept of errors and find the ways to minimize the errors
2. Demonstrate properties of light experimentally
3. Find the applications of lasers and optical fibers in engineering applications
4. Make use of semiconductor devices for practical applications
5. Illustrate the working of optoelectronic devices

Experiments

1.	Error Analysis	:	Estimation of errors in the determination of time period of a torsional pendulum
2.	Newton's Rings	:	Determination of wavelength of given monochromatic source
3.	Single Slit Diffraction	:	Determination of wavelength of given monochromatic source
4.	Diffraction Grating	:	Determination of wavelengths of two yellow lines of light of mercury lamp
5.	Malus's Law	:	Verification of Malus's law
6.	Double Refraction	:	Determination of refractive indices of O-ray and E-ray of given calcite crystal
7.	Polarimeter	:	Determination of specific rotation of glucose
8.	Laser	:	Determination of wavelength of given semiconductor laser
9.	Optical Fiber	:	Determination of numerical aperture and power losses of given optical fiber
10.	Energy Gap	:	Determination of energy gap of given semiconductor
11.	P-N Junction Diode	:	Study of V-I characteristics and calculation of resistance of given diode in forward bias and reverse bias
12.	Thermistor	:	Determination of temperature coefficient of resistance of given thermistor
13.	Hall Effect	:	Determination of Hall coefficient, carrier concentration and mobility of charge carriers of given semiconductor specimen
14.	LED	:	Study of I-V characteristics of given LED
15.	Solar Cell	:	Study of I-V characteristics of given solar cell and calculation of fill factor, efficiency and series resistance

NOTE: A minimum of TWELVE experiments should be conducted.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEC02

BASIC ELECTRICAL ENGINEERING LAB

Instruction	2 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To acquire the knowledge of different types of electrical elements and to verify the basic electrical circuit laws and theorems.
2. To determine the parameters and power factor of a coil, calculate the time and frequency responses of RLC circuits and to familiarize with measurement of electric power & energy.
3. To determine the characteristics of Transformers, dc, ac machines and switch gear components

Course Outcomes: At the end of the course, the students are expected to

1. Get an exposure to common electrical components, their ratings and basic electrical measuring equipment.
2. Make electrical connections by wires of appropriate ratings and able to measure electric power and energy.
3. Comprehend the circuit analysis techniques using various circuital laws and theorems.
4. Determine the parameters of the given coil and calculate the time response of RL & RC series circuits.
5. Recognize the basic characteristics of transformer and components of switch gear.
6. Understand the basic characteristics of dc and ac machine by conducting different types of tests on them.

List of Laboratory Experiments/Demonstrations:

1. Demonstration of Measuring Instruments and Electrical Lab components.
2. Verification of KCL and KVL.
3. Time response of RL and RC series circuits.
4. Determination of parameters of a choke or coil by Wattmeter Method
5. Verification of Thevenin's and Norton's theorems
6. Turns ratio /voltage ratio verification of single phase Transformers
7. Open Circuit and Short Circuit tests on a given single phase Transformer
8. Observation of Excitation Phenomenon in Transformer
9. Measurement of three phase power in a balanced system using two Wattmeter method.
10. Measurement of 3-Ph Energy by an Energy Meter (Demonstration of Principle)
11. Load test on DC Shunt motor
12. Speed control of DC Shunt motor
13. Demonstration of Low Tension Switchgear Equipment/Components
14. Demonstration of cut - out section of Machines like DC Machine, Induction Machine etc.

Note: TEN experiments to be conducted from the above list.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20ME C01

CAD AND DRAFTING

Instruction	1 T + 3 D Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2.5

Course Objectives:
1. To get exposure to a cad package and its utility.
2. Understanding orthographic projections.
3. To visualize different solids and their sections in orthographic projection
4. To prepare the student to communicate effectively by using isometric projection.
5. To prepare the student to use the techniques, skills, and modern tools necessary for practice.

Outcomes: At the end of the course, the Students are able to
1. Become conversant with appropriate use of CAD software for drafting.
2. Recognize BIS, ISO Standards and conventions in Engineering Drafting.
3. Construct the projections of points, lines, planes, solids
4. Analyse the internal details of solids through sectional views
5. Create an isometric projections and views

List of Exercises:
1. Introduction to CAD package: Settings, draw, modify tools, dimensioning and documentation
2. Construction of Conic Sections by General method
3. Orthographic projection: Principles, conventions, Projection of points
4. Projection of straight lines: Simple position, inclined to one plane
5. Projection of straight lines inclined to both the planes (without traces and mid-point)
6. Projection of planes: Perpendicular planes
7. Projection of planes: Oblique planes
8. Projection of solids: Simple position
9. Projection of solids: Inclined to one plane
10. Sections of solids: Prism, pyramid in simple position
11. Sections of solids: Cone and cylinder in simple position
12. Isometric projections and views
13. Conversion of isometric views to orthographic projections and vice versa.

Text Books:

1. N.D.Bhatt, “Elementary Engineering Drawing”, Charotar Publishers, 2012.
2. K.Venugopal, “Engineering Drawing and Graphics + AutoCAD”, New Age International Pvt. Ltd, 2011.
3. Basanth Agrawal and C M Agrawal, “Engineering Drawing”, 2/e, McGraw-Hill Education (India) Pvt. Ltd.

Suggested Reading:

1. Shaw M.B and Rana B.C., “Engineering Drawing”, 2/e, Pearson, 2009.
2. K.L. Narayana and P.K. Kannaiah, “Text Book of Engineering Drawing”, Scitech Publications, 2011.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20MBC02

COMMUNITY ENGAGEMENT

Instruction	3 Hours per week (30 hours field work & 2 hours per week)
SEE	Nil
CIE	50 Marks
Credits	1.5 Credits

Course Objectives: The main Objectives of this Course are to:
1. Develop an appreciation of Rural culture, life-style and wisdom among the Students.
2. Learn about the various livelihood activities that contribute to Rural economy.
3. Familiarize the Rural Institutions and the Rural Development Programmes in India.

Course Outcomes: After the completion of this Course, Student will be able to:
2. Gain an understanding of Rural life, Culture and Social realities.
3. Develop a sense of empathy and bonds of mutuality with Local Communities.
4. Appreciate significant contributions of Local communities to Indian Society and Economy.
5. Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economic improvements.
6. Utilise the opportunities provided by Rural Development Programmes.

Module I Appreciation of Rural Society
Rural life style, Rural society, Caste and Gender relations, Rural values with respect to Community, Nature and Resources, elaboration of 'soul of India lies in villages' (Gandhi), Rural Infrastructure.

Module II Understanding Rural Economy and Livelihood
Agriculture, Farming, Landownership, Water management, Animal Husbandry, Non-farm Livelihood and Artisans, Rural Entrepreneurs, Rural markets, Rural Credit Societies, Farmer Production Organization/Company.

Module III Rural Institutions
Traditional Rural organizations, Self-Help Groups, Panchayati Raj Institutions (Gram Sabha), Gram Panchayat, Standing Committees, Local Civil Society, Local Administration.

Module IV Rural Development Programmes
History of Rural Development in India, Current National Programmes: Sarva Shiksha Abhiyan, Beti Bhachao, Beti Padhao, Ayushman, Bharat, Swachh Bharat, PM Awas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA etc.

Text Books:

1. Singh, Katar, Rural Development: Principles, Policies and Management, Sage Publications, New Delhi, 2015.
2. A Hand book on Village Panchayat Administration, Rajiv Gandhi Chair for Panchayati Raj Studies, 2002.
3. United Nations, Sustainable Development Goals, 2015, un.org/sdgs
4. M.P Boraia, Best Practices in Rural Development, Shanlax Publishers, 2016.

Journals:

1. Journal of Rural development (published by NIRD & PR, Hyderabad).
2. Indian Journal of Social Work, (by TISS, Bombay).
3. Indian Journal of Extension Educations (by Indian Society of Extension Education).
4. Journal of Extension Education (by Extension Education Society).
5. Kurukshetra (Ministry of Rural Development, GOI).
6. Yojana (Ministry of Information & Broadcasting, GOI).

Name of the Department : **Electrical & Electronics Engineering**

Name of the Programme : **B.E. - Electrical & Electronics Engineering**

Board of Studies Meeting held on : **17.04.2021**

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CONTENTS

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

<u>Minutes of the 10th Board of Studies (B.E. Electrical & Electronics Engineering) meeting held on 17-04-2021 through online mode from 11:00AM onwards:</u>

<u>Members Present:</u>

1. Dr.Vaskar Sarkar,	Assoc. Prof., IIT, Hyderabad,
2. Dr V.T.Soma Sekhar,	Professor, NIT Warangal
3. Dr. P.Sathish,	Associate Professor, EE-OUCE
4. Sri Vipul Agarwaal,	General Manager (Electrical Machines), RC Puram, BHEL Hyderabad
5. Dr. Bhaskar Pariti –	Development Engineer AVL list GmBH, Austria
6. Dr P.Sudhir Agarwal	Senior General Manger-PGCIL
7. Sri T.Jagat Reddy,	Director – Transmission, TS Transco
8. Varunesh G.Kumar,	Chairman & MD -Veeral Controls
9. Dr R Nagaraja	M.D.-PRDC, Bengaluru
10. Dr. G.Suresh Babu	Professor & Head, Dept. of EEE
11. Dr. K. Krishnaveni,	Professor, Dept. of EEE
12. Dr. P.V.Prasad	Professor, Dept. of EEE
13. Dr. U.K.Choudhury	Professor, Dept. of EEE
14. Dr. M.Bala Subba Reddy,	Associate Professor, Dept. of EEE
15. Dr. B. Suresh Kumar ,	Associate Professor, Dept. of EEE
16. Dr. T.Murali Krishna,	Associate Professor, Dept. of EEE
17. Dr. P.Kowstubha,	Associate Professor, Dept. of EEE
18. Sri. Ch.V. Krishna Reddy,	Assistant Professor, Dept. of EEE
19. Dr. N Vasantha Gowri,	Assistant Professor, Dept. of EEE
20. Dr. N.V Phanendra Babu,	Assistant Professor, Dept. of EEE

<u>AGENDA</u>

- To approve minutes of 9th BoS meeting
- To Approve the Scheme of III to VIII Semesters under R-20 regulation
- To approve the syllabus of B.E 3rd & 4th Semesters (Electrical Electronics Engineering) under R-20 s regulation
- To approve the syllabus of all the other COURSES under this EEE board offered to the other departments [20 EE M 01 -Indian Traditional Knowledge]
- Any other item with the permission of the chair

<u>Minutes of the Meeting: -</u>

Dr. G.Suresh Babu, Chairperson, Board of Studies (EEE) welcomed the new members of the BoS and conducted the proceedings:

Item:1. Approval of minutes of 9th BoS meeting

Minutes of 9th BoS was approved.

Item:2. Approval of the Scheme for III to VIII Semesters of B.E. (EEE) Program as per

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

R20 Regulation

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Scheme of III rd to VIII th Semesters of R-20regulation were approved by all the BoS members

Item:3. Approval of the Syllabus for III & IV Semesters of B.E. (EEE) Program as per R20 Regulation

The proposed Syllabus for III & IV Semesters of B.E.(EEE) Program as per R20 Regulation is approved with the following recommendations:

- Inclusion of simulation experiments, Active filters to Analog electronics circuits lab
- Inclusion of topics impact of number of bits in ADC and state diagram and Moore and Mealy machines in the subject of Digital Electronics
- Inclusion of topics of data sheets of Transformer, motors, Standard electrical codes to Electrical Machines-1 syllabus.
- Removal topics of Thyristor based Inverters, series & Parallel Inverters, cyclo-converters from Power Electronics Course.
- Inclusion of topics of Voltage source converters, forward & fly back converters to Power electronics.
- Power Systems-I course, Unit-II name has to changed from Solar & Wind sources to Solar & Wind Generations.
  Action taken: Suggestions given by the BoS members are incorporated in the syllabus of above respective subjects.

- BoS suggested to have contact hours for evaluation of internships.
  Action taken: It is recommended to academic council

- BoS suggested that topics of HTLS conductor, polymer Insulator & its advantages, present day tariff system, New polices by regulated board, Graph meters, Net meters, Terms like ring main, radial in Distribution systems can be circulated in the form of handouts to keep the students updated to latest technologies of Power systems-I Syllabus.
  Action taken: Suggestions given by the BoS members are incorporated

- Inclusion of topics of Hall effect sensors, Digital meters and modern measurement devices to syllabus of Electrical measurement & Instrumentation
  Action taken: Suggestions given by the BoS members are incorporated in the syllabus of corresponding lab

Item:4. To approve the syllabus of all the other COURSES under this EEE board offered to the other departments [20 EE M 01 - Indian Traditional Knowledge]

Proposed syllabus of Indian Traditional Knowledge was approved.

Item:5. Any other item with the permission of the chair

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

- Scheme and syllabus of M.E. -PSPE 1^{st} to 4^{th} Semesters under R-20 regulation with the following modifications from R 18 syllabus was circulated through mail to honorable BoS members for the approval and the same was approved by members though mail.

List of Modifications

- Title of subject Artificial Intelligence Techniques is changed as Artificial Intelligence Techniques for Power Systems.
- COs of the subject Restructured Power Systems are modified
- COs of the subject Digital Protection of Power System were changed and content of unit - Vis modified
- COs of the subject Electric Power Distribution Systems were changed and content of Units I, II, and III are modified
- Title of the subject Power System Analysis is changed into Real Time Applications in Power Systems
- COs of the subject Power System Dynamics are changed and contents in unit-IV were rewritten
- In Power Electronics Simulation Lab, six new experiments are introduced in lieu of obsolete
- In Power Electronics Lab five new experiments are introduced in lieu of obsolete
- COs of the subject Power Semiconductor Devices and Modelling were changed

- The scheme and syllabus M.E. -PSPE 1^{st} to 4^{th} Semesters under R-20 regulation which were approved through mail were presented to members and same was confirmed by the BoS members.

- As there were no other points raised in the meeting, the meeting was concluded with vote of thanks by chair of BoS.

Dr. G. Suresh Babu
Chairperson, BoS (EEE)
Head, EEE, Dept., CBIT (A)

Copy to:
All the members of Board of Studies (EEE)
The chairman, Academic Council
Director, Academics
Joint Director, Academics-Informatics

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of I Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2020-21

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-I

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
THEORY									
1.	20MT C05	Calculus	3	1	-	3	40	60	4
2.	20CY C01	Chemistry	3	-	-	3	40	60	3
3.	20CE C01	Engineering Mechanics-I	3	-	-	3	40	60	3
4.	20CS C01	Programming for Problem Solving	3	-	-	3	40	60	3
PRACTICALS									
5.	20CY C02	Chemistry Lab	-	-	4	3	50	50	2
6.	20CS C02	Programming for Problem Solving Lab	-	-	4	3	50	50	2
7.	20ME C02	Workshop/ Manufacturing Practice	-	-	5	3	50	50	2.5
8.	20ME C03	Engineering Exploration	90 Hours / 4P			-	50	-	1.5
		Total	**12**	**1**	**13**	**-**	**360**	**390**	**21**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of II Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2020-21

B.E. – ELECTRICAL & ELECTRONICS ENGINEERING

SEMESTER -II

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20MT C06	Vector Calculus and Differential Equations	3	1	-	3	40	60	4
2	20EG C01	English	2	-	-	3	40	60	2
3	20PY C06	Electromagnetic Theory and Quantum Mechanics	3	-	-	3	40	60	3
4	20EE C01	Basic Electrical Engineering	3	-	-	3	40	60	3
PRACTICAL									
5	20EG C02	English lab	-	-	2	3	50	50	1
6	20PY C09	Electromagnetic Theory and Quantum Mechanics Lab	-	-	4	3	50	50	2
7	20EE C02	Basic Electrical Engineering Lab	-	-	2	3	50	50	1
8	20ME C01	CAD and Drafting	-	1	3	3	50	50	2.5
9	20MB C02	Community Engagement	30 field + 2P/W			-	50	-	1.5
TOTAL			**11**	**2**	**11**	**-**	**410**	**440**	**20**

L: Lecture **T: Tutorial** **D: Drawing** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

With effect from the Academic Year 2021-22

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of III Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2021-22

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-III

S.No	Course Code	Title of the Course	Scheme of Instruction: Hours per week			Scheme of Examination: Duration of SEE in Hours	Maximum Marks		Credits
			L	T	P		CIE	SEE	
THEORY									
1	20MTC07	Applied Mathematics	3	1	0	3	40	60	4
2	20 CS C06	Basic Data Structures	2	0	0	3	40	60	2
3	20 EE C03	**Core- 1** Electrical Circuit Analysis	3	0	0	3	40	60	3
4	20 EE C04	**Core- 2** Analog Electronic Circuits	3	1	0	3	40	60	4
5	20 EE C05	**Core- 3** Electrical Measurements and Instrumentation	3	0	0	3	40	60	3
6	20 EE C06	**Core- 4** Signals & System	3	0	0	3	40	60	3
7	20 CE M01	Environmental Science	2	0	0	2	----	50	NC
8	20 EE I01	MOOCs/Training/ Internship	2-3 weeks/90 hours				**40**	**60**	2
PRACTICALS									
9	20 EE C 07	Analog Electronic Circuits Lab	0	0	2	3	50	50	1
10	20 EE C08	Electrical Circuits and Measurements Lab	0	0	2	3	50	50	1
11	20 CS C07	Basic Data Structures Lab	0	0	2	3	50	50	1
		Total	**19**	**2**	**6**	**-**	**430**	**620**	**24**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of IV Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2021-22

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-IV

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
THEORY									
1	20 EE C09	**Core -5** Digital Electronics	3	0	0	3	40	60	3
2	20 EE C10	**Core -6** Electrical Machines-1	3	0	0	3	40	60	3
3	20 EE C11	**Core -7** Electromagnetic Fields	3	0	0	3	40	60	3
4	20 EE C12	**Core -8** Power Electronics	3	0	0	3	40	60	3
5	20 EE C13	**Core -9** **Power systems I**	3	0	0	3	40	60	3
6	20EGM02	Indian Traditional Knowledge	2	0	0	-	----	-	NC
7	20EGM03	Universal Human Values-II: Understanding Harmony	3	0	0	3	40	60	3
PRACTICALS									
8	20 EE C14	Digital Electronics Lab	0	0	2	3	50	50	1
9	20 EE C 15	Electrical Machines-1 Lab	0	0	2	3	50	50	1
10	20 EE C 16	Power Electronics Lab	0	0	2	3	50	50	1
		Total	**20**	**0**	**6**	**-**	**390**	**510**	**21**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of V Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2022-23

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-V

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
THEORY									
1	20 EE C17	**Core – 10** Electrical Machines-II	3	0	0	3	40	60	3
2	20 EE C18	**Core -11** Switchgear and Protection	3	0	0	3	40	60	3
3	20 EE C19	**Core -12** Power Systems -II	3	0	0	3	40	60	3
4	20 EE C20	**Core -13** Control Systems	3	0	0	3	40	60	3
5	20 EE Exx	**PE- I**	3	0	0	3	40	60	3
6	20 EE Exx	**PE-2**	3	0	0	3	40	60	3
7		OE-1	3	0	0	3	40	60	3
8	20 EE I02	Industrial / Rural Internship	3-4 weeks/ **(90)** hours						2
PRACTICALS									
9	20 EE C21	Control Systems Lab	0	0	2	3	50	50	1
10	20 EE C22	Electrical Machines- II Lab	0	0	2	3	50	50	1
11	20 EE C23	Power Systems Lab	0	0	2	3	50	50	1
12	20EGCO3	Employability Skills	0	0	2	3	50	50	1
		Total	**21**	**0**	**8**	**-**	**480**	**620**	**27**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

Program Elective-1	
Course Code	**Title of the Course**
20 EE E11	Electrical Distribution Systems
20 EE E12	Advanced Power Converters
20 EE E13	Simulation Techniques in EE
20 EE E14	Industrial Instrumentation
20 EE E15	Electrical Machine Design
20EE E16	Digital Signal Processing

Program Elective-2	
Course Code	**Title of the Course**
20 EE E21	High Voltage Engineering
20 EE E22	Control design for Power Converters
20 EE E23	Optimization Techniques
20 EE E24	Electronic Instruments
20 EE E25	Special Electrical Machines
20EE E26	Basic VLSI Design

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of VI Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2022-23

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-VI

S.No	Course Code	Title of the Course	Scheme of Instruction: Hours per week			Scheme of Examination			Credits
			L	T	P	Duration of SEE in Hours	Maximum Marks: CIE	Maximum Marks: SEE	
THEORY									
1	20 EE C24	**Core -13** Microprocessors and Microcontrollers	3	0	0	3	40	60	3
2	20 EE C25	**Core -14** Power System Operation and Control	3	0	0	3	40	60	3
3	20 EE C26	**Core -15** Electrical Drives	3	0	0	3	40	60	3
4	20 EE C27	**Core -16** IoT for Electrical Engineering	3	0	0	3	40	60	3
5	20 EE Exx	**PE- 3**	3	0	0	3	40	60	3
6	20 EG M01	Indian Constitution & fundamental Principles	2	0	0	-	--	-	NC
PRACTICALS									
7	20 EE C28	Microprocessors and Microcontrollers Lab	0	0	2	3	50	50	1
8	20 EE C29	**Electrical Simulation Lab**	0	0	2	3	50	50	1
9	20 EE C30	Electrical Drives Lab	0	0	2	3	50	50	1
10	20 EE C31	IoT Lab	0	0	2	3	50	50	1
Total			**17**	**0**	**8**	**-**	**400**	**500**	**19**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

Program Elective-3	
Course Code	**Name of the subject**
20 EE E31	Advanced power System Protection
20 EE E32	Power Quality Engineering
20 EE E33	Utilization of Electrical Energy
20 EE E34	Renewable Energy Technologies

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20 EE E35	Advanced Electrical Drives
20EE E36	Computer Organization

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of VII Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2023-24

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-VII

S. No	Course Code	Title of the Course	Scheme of Instruction: Hours per week L	T	P	Scheme of Examination: Duration of SEE in Hours	Maximum Marks CIE	SEE	Credits
THEORY									
1	20EE Exx	PE-4	3	0	0	3	40	60	3
2		**OE-2**	3	0	0	3	40	60	3
3		**OE-3**	3	0	0	3	40	60	3
4	20 EG O02	**Gender Sensitization**	2	0	0	-	----	-	NC
5	20MB C01	**EE & A**	3	0	0	3	40	60	3
6	20 EE C31	Project –Part-1	0	0	4	--	50	--	2
7	20 EE C32	Internship	4-6 weeks/ upto180 Hours						3
			14	**0**	**4**	**-**	**210**	**240**	**17**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

Program Elective-4	
Course Code	**Name of the subject**
20 EE E41	Power system Dynamics & Control
20 EE E42	HVDC Transmission Systems
20 EE E43	Artificial Intelligence for Electrical Engineering
20 EE E44	Digital Control Systems
20 EE E45	Machine Modelling and Analysis
20EE E46	Advanced microprocessors and controllers

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of VIII Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2023-24

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-VIII

S.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
THEORY									
1	20 EE Exx	**PE-5**	3	0	0	3	40	60	3
2		OE-4	3	0	0	3	40	60	3
3	20 EE C33	**Technical Seminar**	0	0	3	-	50	-	1
4	20 EE C34	**Project Part-2**	0	0	12*	-	100	100	4
Total			**6**	**0**	**15**	**-**	**230**	**220**	**11**

*180 hrs for the students working on the paid internship during VIII SEM

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

Program Elective-5	
Course Code	**Name of the subject**
20 EE E51	Smart Grid Technologies
20 EE E52	FACTS
20 EE E53	Electrical Estimation and Costing
20 EE E54	Advanced Control Systems
20 EE E55	Electric Hybrid Vehicles
20EE E56	Embedded System Design

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

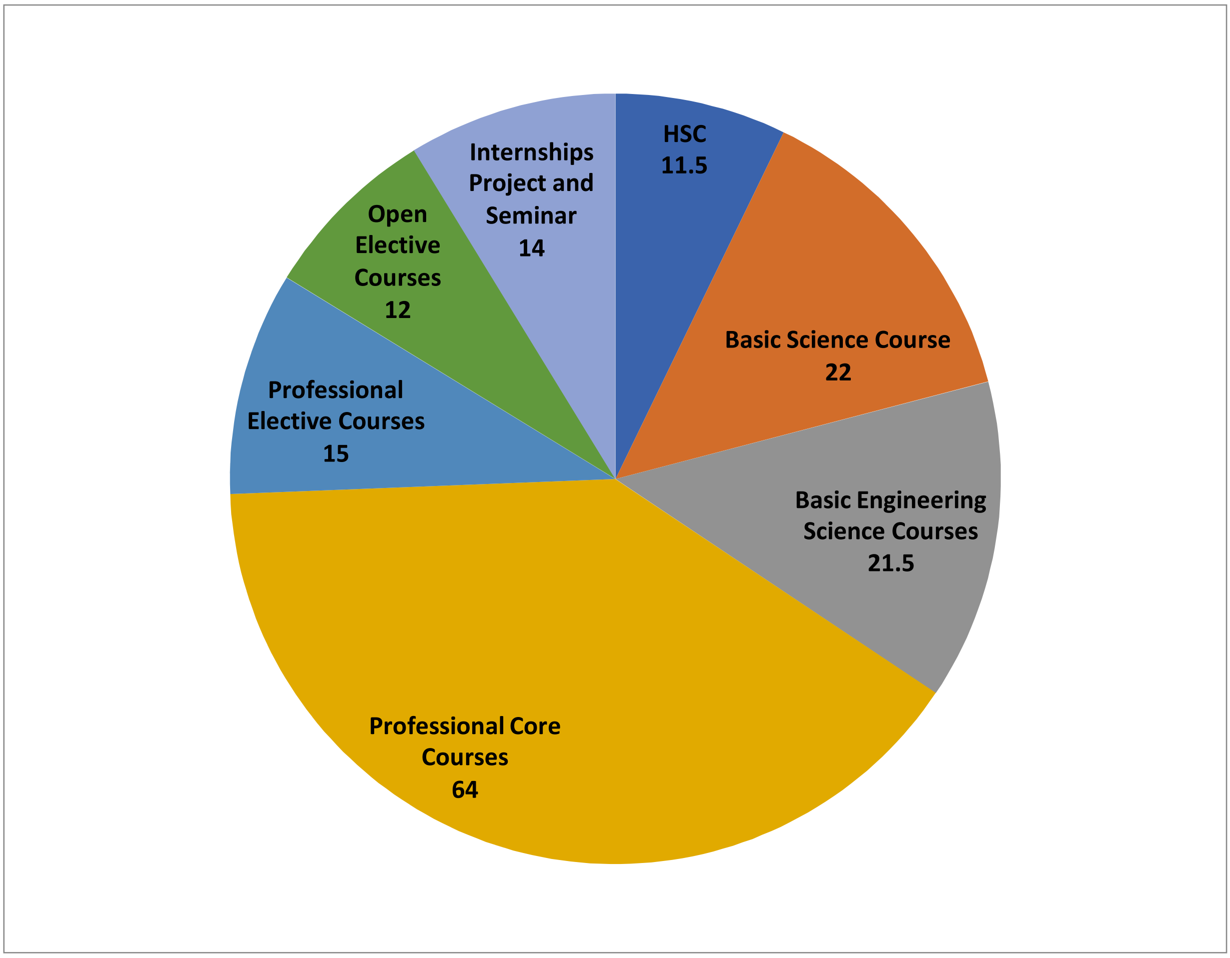
DISTRIBUTION OF CREDITS FROM I TO VIII SEMESTERS

ITEM		CREDITS ALLOTED	% OF CREDITS OUT OF TOTAL CREDITS
S	I	21	13.13
E	II	20	12.5
M	III	24	15
E	IV	21	13.13
S	V	27	16.88
T	VI	19	11.88
E	VII	17	10.63
R	VIII	11	6.88
Total		**160**	**100**
HSC		11.5	7.19
BSC		22	13.75
BESC		21.5	10
PCC		64	40
PEC		15	9.38
OEC		12	7.5
I+P+S		14	9.38

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Credit Distribution for the B.E. Electrical & Electronics Engineering Curriculum

	Credits
HSC	11.5
Basic Science Course	22
Basic Engineering Science Courses	21.5
Professional Core Courses	64
Professional Elective Courses	15
Open Elective Courses	12
Internships Project and Seminar	14
Total	**160**



HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

III – SEMESTER

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

AICTE MODEL CURRICULUM

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-III

S.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
THEORY									
1	20MTC07	Applied Mathematics	3	1	0	3	40	60	4
2	20 CS C06	Basic Data Structures	2	0	0	3	40	60	2
3	20 EE C03	**Core- 1** Electrical Circuit Analysis	3	0	0	3	40	60	3
4	20 EE C04	**Core- 2** Analog Electronic Circuits	3	1	0	3	40	60	4
5	20 EE C05	**Core- 3** Electrical Measurements and Instrumentation	3	0	0	3	40	60	3
6	20 EE C06	**Core- 4** Signals & System	3	0	0	3	40	60	3
7	20 CE M01	Environmental Science	2	0	0	2	----	50	NC
8	20 EE I01	MOOCs/Training/ Internship	2-3 weeks/90 hours				**40**	**60**	2
PRACTICALS									
9	20 EE C 07	Analog Electronic Circuits Lab	0	0	2	3	50	50	1
10	20 EE C08	Electrical Circuits and Measurements Lab	0	0	2	3	50	50	1
11	20 CS C07	Basic Data Structures Lab	0	0	2	3	50	50	1
		Total	**19**	**2**	**6**	**-**	**430**	**620**	**24**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20MTC07

APPLIED MATHEMATICS
(For ECE/EEE)

Instruction	3 L+1T Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives:
1. To learn the Laplace, Inverse Laplace Transform and Z-Transforms.
2. To learn the Z-Transform& inverse Z-Transform concepts
3. To form PDE and solve Linear and Non-Linear equations.
4. To find roots of equations, and Numerical solutions of Differential Equations.
5. To learn fitting of distribution and predicting the future values.

Course outcomes: On successful completion of this course the students shall be able to
1. Find Laplace, Inverse Laplace and solution of engineering problems.
2. Find the solution of Difference Equation
3. Understand the methods to find solution of linear and non-linear PDE and solution of wave equation.
4. Solve Non-Linear algebraic and transcendental equations and first order differential equations.
5. Understand the methods for analyzing the random fluctuations using probability distribution and also identify the importance of Principles of Least Squares approximations for predictions.

UNIT-I: Laplace Transforms
Laplace Transform of Elementary functions, Linearity property, First Shifting property, Change of scale property. Laplace Transform of Periodic functions, Transforms of derivatives, Transforms of integrals, Multiplication by t^n and division by t. Evaluation of Integrals by Laplace Transforms. Inverse Laplace transforms of elementary functions, Inverse Laplace Transform by Method of partial fractions and Convolution theorem, Solutions of Ordinary Differential Equations by Laplace Transform method. Laplace transform of Unit step and Unit Impulse function.

UNIT-II: Z-Transforms
Z-transforms of standard functions, linearity property, damping rule, shifting theorems, multiplication by 'n', Initial and Final value theorems. Inverse Z-transforms of standard functions, Inverse Z-transform by Convolution theorem and partial fractions method. Z-transform application to difference equations.

UNIT-III: Partial Differential Equations
Formation of Partial Differential Equations, Linear Equations ofFirst Order (Lagrange's Linear Equations), Solution of First Order Non-linear Partial Differential Equation (Standard forms) and Charpits Method. Solutions by method of separation of variables, solution of one dimensional wave equation and its applications.

UNIT-IV: Numerical Methods
Solution of Algebraic and transcendental equations by Bisection method, Regula-Falsi method Newton-Raphson method. Numerical Solutions of First Order Ordinary differential equations by Taylor's series method, Euler's method, Modified Euler's method and Runge-Kutta method of fourth order.

UNIT-V: Probability Distributions
Basic probability, Conditional probability, Bayes theorem. Random variable, discrete probability distribution and Continuous probability distribution. Expectation, properties of expectation, properties of variance. Poisson distribution, MGF and Cumulates of the Poisson distribution, Normal distribution, characteristics of Normal distribution MGF and CGF of Normal distribution, Areas under normal curve.

Textbooks:
1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2017.
2. S.C.Gupta, V.K.Kappoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Suggested Reading:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T, "Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2008.
3. S.S. Sastry, "Introductory methods of numerical analysis", PHI, 4th Edition, 2005

CO-PO & PSO Correlation Articulation Matrix: AM3

CO-1	3	3	2	2	-	1	-	-	-	-	-	-	2	2	2
CO-2	3	3	2	2	-	3	-	-	-	-	-	2	2	3	2
CO-3	3	3	3	2	-	2	-	-	-	-	-	1	2	2	2
CO-4	3	2	3	2	-	2	-	-	-	-	-	1	2	2	2
CO-5	3	2	2	2	-	1	-	-	-	-	-	-	2	2	2

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20CS C06

Basics of Data Structures
(Common for all Programmes except CSE & IT)

Instruction	2 Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

Prerequisites:
Basic knowledge of programming language such as C or C++ is preferred (but not mandatory) and some mathematical maturity also will be expected.

Course Objectives: To introduce
1. Basic linear and non-linear data structures.
2. Analyzing the performance of operations on data structures.
3. Different sorting and searching techniques and their complexities.

Course Outcomes: The students will be able to

1. Identify various data structures, searching & sorting techniques and their applications.
2. Describe the linear and non-linear data structures, searching and sorting techniques.
3. Apply suitable data structures to solve problems.
4. Analyze various searching and sorting techniques.
5. Evaluate the linear and non-linear data structures.

UNIT – 1
Introduction: Data Types, Data structures, Types of Data Structures, Operations, ADTs, Algorithms, Comparison of Algorithms- Complexity- Time and space tradeoff.
Recursion: Introduction, format of recursive functions, recursion Vs. Iteration, examples.

UNIT – 2
Linked Lists: Introduction, Linked lists and types, Representation of linked list, operations on linked list, Comparison of Linked Lists with Arrays and Dynamic Arrays.

UNIT – 3
Stacks and Queues: Introduction to stacks, applications of stacks, implementation and comparison of stack implementations. Introduction to queues, applications of queues and implementations, Priority Queues and applications
Searching and Sorting: Linear searching, binary Searching, sorting algorithms- bubble sort, selection sort, quick sort, heap sort

UNIT – 4
Trees: Definitions and Concepts, Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Representations of Trees, Tree Traversals, Binary search Tree.

Unit –5
Graphs: Introduction, Applications of graphs, Graph representations, graph traversals, Minimal Spanning Trees

Text Books:

1. Narasimha Karumanchi "**Data Structures and Algorithms Made Easy**", Career Monk Publications, 2017
2. E.Horowitz, S. Sahni and Susan Anderson-Freed, "**Fundamentals of Data structures in C**", Silicon Pr; 2 edition (1 August 2007)
3. ReemaThareja, "**Data Structures using C**", Oxford, 2014

Suggested Reading:

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

2. https://www.edx.org/course/foundations-of-data-structures

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

3. https://sites.google.com/site/merasemester/data-structures/data-structures-1#DS
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms
5. https://www.coursera.org/specializations/data-structures-algorithms

CO-PO & PSO Correlation Articulation Matrix-BDS

	PO 1	P O 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P0 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1	-	-	-	-	-	-	-	-	-	-			
CO 2	2	1	-	-	-	-	-	-	-	-	-	-			
CO 3	2	2	1	-	-	-	-	-	-	-	-	-			
CO 4	2	3	1	-	-	-	-	-	-	-	-	-			
CO 5	2	2	-	-	-	-	-	-	-	-	-	-			

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20 EE C03

ELECTRICAL CIRCUIT ANALYSIS

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	3

pre-requisite : Basics of Electrical Engineering

Course Objectives:

1. To study the nature of different circuit elements, laws and network theorems.
2. To study transient and steady state response of circuits with initial conditions & forcing functions
3. To learn the Laplace transforms and two-port networks.

Course Outcomes: After completion of this course, students will be able to:

1. Apply various network analysis techniques to find the responses in the circuits with dependent and independent sources.
2. Determine time constant, steady state and transient responses of RL, RC, RLC networks with initial conditions of network elements.
3. Evaluate the response of electrical circuits with Laplace transformation using initial & final value theorems and to obtain the pole-zero diagrams using network functions.
4. Calculate the response of RLC networks with sinusoidal input at steady state & resonance conditions and to analyze three-phase circuits with different loads
5. Find the impedance, admittance, ABCD, h and g- parameters of given two-port network and interconnected two-port networks.

UNIT I

Network Theorems: Node and Mesh Analysis, Analysis with dependent current and voltage sources, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation and Milliman's theorems.

UNIT II

Solution of First and Second order networks: Review of solution of first and second order differential equations for Series and parallel RL, RC, RLC circuits, initial and final conditions in network elements, forced and force-free responses, time constant, steady state and transient state responses.

UNIT III

Electrical Circuit Analysis Using Laplace Transforms: Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, inverse Laplace transform, transformed network with initial conditions. Transfer function representation. Poles and Zeros.

UNIT IV

Sinusoidal steady state analysis: Review of AC fundamentals, Steady state response of RLC networks with sinusoidal excitations, average power and complex power, series and parallel resonance, three phase circuits with balanced & unbalanced loads,

UNIT V

Two Port Networks: Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks.

Text Books:

1. M. E. Van Valkenburg, "Network Analysis", 3rd Edition, Prentice Hall, 2015.
2. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits",6th Edition, McGraw Hill Education, 2019.
3. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 8th Edition, 2013.
4. D. Roy Choudhury, "Networks and Systems", 2nd Edition, New Age International, 2010.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Suggested Reading:

1. Robert L. Boylestad, ", Introductory Circuit Analysis, Pearson Education , 13th Edition, 2011.
2. Sudhakar andSyammohan," Circuits& Networks", Tata McGraw Hill Education, 5th Edition, 2017.
3. Asfaq Hussain, "Networks and Systems", 2nd Edition, Khanna Publishing House, 2021

CO-PO & PSO Correlation Articulation Matrix-ECA

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	2	1	2	-	-	-	-	-	-	-	-	-	3	-
CO-2	3	3	1	2	-	-	-	-	-	-	-	-	-	3	-
CO-3	2	3	1	2	-	-	-	-	-	-	-	-	-	3	-
CO-4	3	3	1	2	-	-	-	-	-	-	-	-	-	3	-
CO-5	3	2	1	2	-	-	-	-	-	-	-	-	-	3	-

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEC04 **ANALOG ELECTRONIC CIRCUITS**

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Pre-Requisite: Students should have a prior knowledge of semiconductor Physics and basics of circuit theory.

Course Objectives:

1. To understand the V-I characteristics of diodes, BJTs, MOSFETs and also the biasing techniques of transistors and MOSFETs.
2. To understand the functioning, DC & AC characteristics of Operational Amplifiers (Op-Amps).
3. To Study the linear & non-linear applications of Op-Amps.

Course Outcomes: After completion of this course, students will be able to:

1. Comprehend the V-I characteristics of Diode and its applications.
2. Understand the V-I characteristics of BJT & MOSFET and to analyze the significance of operating point in the biasing techniques of BJT & MOSFET.
3. Apply the knowledge of differential amplifiers to understand the basic characteristics of Operational Amplifiers (Op-Amps) and their significance.
4. Design and Analyze linear application circuits of Op-Amp like amplifiers, Integrator, differentiator, filters and regulators .
5. Design and Analyze non-linear application circuits of Op-Amps and to design astable and monostable modes of 555 timer circuit.

UNIT-I

Diode Characteristics and Applications: P-N junction diode, I-V characteristics of a diode, Half-wave and Full-wave rectifiers- their operation, performance characteristics- ripple factor calculations and analysis; Filters (C filter). Zener diodes - Regulator.

UNIT-II

BJT and MOSFET Circuits:

BJTs: Structure and Operation of a BJT, Modes of transistor operation, Early effect, BJT input and output characteristics of CB, CE, CC configuration, BJT as a switch. BJT as an amplifier- common-emitter, small-signal model, biasing circuits.

MOSFET: Structure- Enhancement & Depletion mode MOSFETs and I-V characteristics, MOSFET as a switch, MOSFET as an amplifier- common-source, small-signal model and biasing circuits, gain, input and output impedances, trans-conductance -common source.

UNIT-III

Differential and Operational Amplifiers: Differential amplifier- analysis for dual input balanced output configuration, block diagram of an operational amplifier, ideal Op-Amp- characteristics, non-idealities in an Op-Amps (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product, common mode rejection ratio), Inverting and non-inverting amplifier with ideal Op-Amps, voltage follower.

UNIT-IV

Applications of Op-Amps -I: Summing amplifier, differential amplifier, logarithmic amplifiers, instrumentation amplifier, ideal and practical integrator and differentiators, Active filters- First order RC, Series voltage regulator, oscillators (Wein bridge).

UNIT-V

Applications of Op-Amps -II: Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier, Sample and Hold circuit, clamping and clipping circuits.
555 Timer : Functional diagram, Modes of operation- astable, monostable

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Text Books:

1. Robert L. Boylestad, "Electronic Devices and Circuit Theory", 11th Edition, PHI, 2015
2. Gayakwad R.A. Op-Amps and Linear Integrated Circuits, PHI, 4th Edition, 2015.
3. A.S.Sedra & K.C.Smith, "Microelectronic Circuits", New York, Oxford University Press, 7th Edition, 2017
4. J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 2nd Edition, 2013
5. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 2nd Edition, 2008.

Suggested Readings:

1. Analog Electronics, A.K. Maini, Varsha Agarwal, Khanna Publishing House, 2018
2. Millman and Halkias, "Electronic Devices and Circuits" 4th Edition, McGraw Hill Publication 2015.
3. Roy Choudhury, Linear Integrated Circuits, Shail B. Jain, New Age Intern. (P) Ltd., 4th Edition 2002.
4. David Bell, "Fundamentals of Electronic Devices and Circuits", 5th Edition, Oxford University Press 2008.

CO-PO & PSO Correlation Articulation Matrix-AEC

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO-1	2	2	2	1	2	-	-	-	-	-	-	-	1	2	1
CO-2	2	2	2	1	2	-	-	-	-	-	-	-	2	2	2
CO-3	2	1	2	1	2	-	-	-	-	-	-	-	1	1	2
CO-4	3	3	2	1	2	-	-	-	-	-	-	-	2	3	2
CO-5	3	3	3	2	2	-	-	-	-	-	-	-	2	3	2

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEC05 ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-Requisite: Students should have
1. Fundamental knowledge in calculus and complex algebra,
2. Electromagnetism and circuit theory concepts.

Course Objectives:
1. To understand the principle of operation of various electrical Instruments
2. To measure electrical and magnetic parameters by demonstrating experimental setups
3. To introduce transducers and digital instruments with their working principle

Course Outcomes: After the completion of this course, students will be able to
1. Identify a suitable instrument to measure a given electrical parameter.
2. Analyze the working principle by using suitable torque equations for DC and AC Instruments.
3. Design Bridge Circuits for measuring passive electrical parameters.
4. Distinguish between electrical and magnetic measurements and their instruments.
5. Select an Electrical transducer for a given physical quantity measurement.

UNIT- I

Introduction to Measurements: Objectives of measurement, static and dynamic characteristics, accuracy, precision, Significant figures, errors and their classification, Standard cell and standard resistance

Instruments-1: Types of instruments, classification of instruments based on type of measurement and principle of working (PMMC, MI, Dynamometer, Induction and Electrostatic), types of torques (torque equations for MC, MI and dynamometer type instruments).

UNIT- II

Instruments-2: Single phase Induction type energy meter, concepts of driving torque & braking torque equations, (no derivation) ; Errors and their Compensation, Single phase Dynamometer type Power factor meter, Weston type frequency meter. Construction & theory of Instrument Transformers, Equations for ratio and phase angle error of C.T & P.T (Elementary treatment only).

UNIT- III

Resistance, Inductance and Capacitance parameters: Classification of resistance measuring methods Kelvin's double bridge, Wheatstone bridge and meggar. Measurement of inductance using Maxwell's inductance bridge, Anderson's bridge, Measurement of capacitance using De-Sauty's bridge and Schering bridge, merits and demerits, Q-meter, measurement of relative permittivity, applications and related numerical problems.

UNIT- IV

Measurements of Magnetic and Electric Parameters: Ballistic galvanometer- Principle of operation, construction and applications of Ballistic galvanometer, flux meter its construction and principle of operation. Epstein square bridge for measuring Iron losses, Potentiometers, -Principle - Classification – Salient features related to Practical applicability

UNIT-V

Introduction to Digital Instruments (DVM and Transducers): Introduction to digital Instruments, Digital Voltmeters (DVM), Range extension of DVM, $\frac{1}{2}$ $\frac{3}{4}$ display, Resolution, related numerical problems on DVM. Digital Multi meters.

Transducers: Introduction, Role of Transducers in measurement system, Strain Gauge, Linear variable Differential transformer (LVDT), Piezo electric transducer, Temperature transducers, bimetallic strip, Thermocouples, Resistance Temperature Detectors (RTD), Thermostats, Radiation pyrometers.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Text Books:

1. F.W. Golding and Widdis, Electrical Measurements and measuring Instruments, A.H. Wheeler & Co., Jan-2011
2. A.K. Sawhney, A Course in Electrical and Electronics Measurements and Instrumentation, Dhanapat Rai & Sons, New Delhi, 22nd Edition, 2015.
3. CT. Baldwin, Fundamentals of Electrical measurements, Kalyani publications, 2001.

Suggested Readings:

1. Helfrick, Albert D., Cooper, William D., Modern Electronic Instrumentation and Measurement Techniques, PHI Publications, Jan-2015
2. Stanley Wold, Richard F.M. Smith, Student reference manual for Electronic Instrumentation Laboratories, 2nd Edition, PHI.
3. Alan. S. Morris, Essence of Measurement, PHI, Feb-1996

CO-PO & PSO Correlation Articulation Matrix-EMI

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO-1	2	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO-2	2	2	2	-	-	-	-	-	-	-	-	-	2	-	-
CO-3	2	1	2	1	2	-	-	-	-	-	-	-	3	-	-
CO-4	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO-5	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-

20 EEC 06

SIGNALS AND SYSTEMS

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisites: Mathematics -1 & Mathematics-3

Course Objectives:
1. To introduce the concepts of continuous time and discrete time systems and analyse systems in complex frequency domain.
2. To study sampling theorem and its applications.
3. To elucidate the techniques of Laplace and Z- transforms and their applications on various systems

Course Outcomes: After completion of this course, students will be able to:
1. Understand the basics of signals and systems, their classification and properties.
2. Determine the DTFT & DFT of given discrete signals.
3. Analyze the continuous time systems by using Laplace transform.
4. Apply the Z-transform techniques to discrete time systems
5. Analyze the effect of aliasing and reconstruction of signal using sampling theorem.

UNIT-I

Introduction to Signals and Systems: Signals and systems as seen in everyday life, in various branches of engineering and science, Signal properties: periodicity, absolute integrability, deterministic and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability and their examples.

UNIT-II

Behavior of continuous and discrete-time LTI systems: Impulse response and step response, convolution, input-output behaviour with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems, System representation through differential equations and difference equations.

UNIT-III

Fourier Transforms: Review of Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients, Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Property of duality in Fourier. The Discrete- Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem.

UNIT-IV

Laplace and z-Transforms: Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, **convolution integral** solution to differential equations and system behaviour. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis

UNIT-V

Sampling and Reconstruction: The Sampling Theorem and its implications, Spectra of sampled signals, Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects, Relation between continuous and discrete time systems,

Text Books:

1. A.V. Oppenheim, A. S. Willsky and S. H. Nawab, “Signals and systems”, Prentice Hall India, 1997
2. J. G. Proakis and D. G. Manolakis, “Digital Signal Processing: Principles, Algorithms and Applications”, Pearson, 2006.
3. Anand Kumar. A, “Signals & Systems”,3rd Edition, Prentice Hall India, 2017.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Suggested Reading:

1. H. P. Hsu, “Signals and systems”, Schaum’s series, McGraw Hill Education, 2010.
2. S. Haykin and B. V. Veen, “Signals and Systems”, John Wiley and Sons, 2007.
3. Anand Kumar. A, “Digital Signal Processing”, 2nd Edition, Prentice Hall India, 2017

CO-PO & PSO Correlation Articulation Matrix-SIGNALS & SYSTEMS

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO-1	2	1	1	-	-	-	-	-	-	-	-	-	-	1	-
CO-2	3	3	3	2	2	-	-	-	-	-	-	-	-	3	-
CO-3	2	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO-4	2	2	3	2	1	-	-	-	-	-	-	-	-	2	-

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20 CE M01

ENVIRONMENTAL SCIENCE

Instruction	2 L Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	0

Course Objectives: To enable the student

1. Identify environmental problems arising due to over utilization of natural resources and understand the importance of use of renewable energy sources
2. Become aware about the importance of eco system and interlinking of food chain.
3. Identify the importance of biodiversity in maintaining ecological balance.
4. Learn about various attributes of pollution management and waste management practices.
5. Contribute for capacity building of nation for arresting and/or managing environmental disasters.

Course Outcomes: At the end of the course, student is able to

1. Identify the natural resources and realise the importance of water, food, forest, mineral, energy, land resources and effects of over utilisation.
2. Understand the concept of ecosystems and realise the importance of interlinking of food chains.
3. Contribute for the conservation of bio-diversity.
4. Suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
5. Follow the environmental ethics and contribute to the mitigation and management of environmental disasters.

UNIT- I:

Environmental Studies: Definition, Scope and importance, need for public awareness.

Natural resources: Use and over utilization of Natural Resources - Water resources, Food resources, Forest resources, Mineral resources, Energy resources, Land resources.

UNIT – II:

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, role of producers, consumers and decomposers, energy flow in an ecosystem, food chains, food webs, ecological pyramids, Nutrient cycling, Bio-geo chemical cycles, Terrestrial and Aquatic ecosystems.

UNIT – III:

Biodiversity: Genetic, species and ecosystem biodiversity, Bio-geographical classification of India, India as a Mega diversity nation. Values of biodiversity, hot-spots of biodiversity, threats to biodiversity, endangered and endemic species of India, methods of conservation of biodiversity.

UNIT – IV:

Environmental Pollution: Cause, effects and control measures of air pollution, water pollution, marine pollution, soil pollution, noise pollution and Solid waste management, nuclear hazards

Environmental Legislations: Environment protection Act, Air, Water, Forest & Wild life Acts, issues involved in enforcement of environmental legislation, responsibilities of state and central pollution control boards

UNIT – V:

Social issues and the environment: Water conservation methods: Rain water harvesting and watershed management, Environmental ethics, Sustainable development and Climate change: Global warming, Ozone layer depletion, forest fires, and Contemporary issues.

Text Books:

1. Y. Anjaneyulu, "Introduction to Environmental Science", B S Publications, 2004.
2. Suresh K. Dhameja, "Environmental Studies", S. K. Kataria& Sons, 2009.

Suggested Reading:

1. C. S. Rao," Environmental Pollution Control Engineering", Wiley, 1991.
2. S. S. Dara, "A Text Book of Environmental Chemistry & Pollution Control", S. Chand Limited, 2006

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CO-PO PSO ARTICULATION MATRIX- ES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	3	-	-	-	-	1	-	-	1
CO2	1	-	-	-	-	-	2	1	-	-	-	1	-	-	1
CO3	1	-	-	-	-	-	2	1	-	-	-	1	-	-	1
CO4	1	-	-	-	-	1	2	1	-	-	-	1	-	1	1
CO5	1	-	-	-	-	1	2	1	-	-	-	1	-	1	1
AVG	1	-	-	-	-	1	2.2	1	-	-	-	1	-	1	1

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEC07 ANALOG ELECTRONICS CIRCUTS LAB

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
SEE	50 Marks
CIE	50Marks
Credits	1

Pre-Requisite: Students should have a prior knowledge of semiconductor Physics and basics of circuit theory.

Course objectives:

1. To understand the V-I Characteristics of diode, Transistor and MOSFET.
2. To understand the frequency response of BJT, FET amplifiers.
3. To design linear and non-linear applications of Op-Amp.

Course Outcomes: After the completion of this course, students will be able to:

1. Demonstrate the working principle of PN junction diode, transistor and MOSFET from their V-I characteristics.
2. Realize Half wave and Full wave rectifiers for C & π section filter combinations.
3. Analyze the significance of choosing a DC operating point for a transistor/MOSFET and to analyze the frequency response of CE amplifier.
4. Design of linear and non-applications of Op-Amps.
5. Design a 555 Timer in A stable mode to produce pulses for Pulse Width Modulation (PWM) Schemes.

LIST OF EXPERIMENTS

Part A

1. V-I characteristics of (Silicon and Germanium) diodes and measurement of static and dynamic resistance.
2. Zener diode characteristics and its application as a voltage regulator.
   (a) Design, realization and performance evaluation of rectifier circuits with and without filters (C & π section) Half wave rectifier.
   (b) Design, realization and performance evaluation of rectifier circuits with and without filters (C & π section) Full wave rectifier.
3. Plotting the characteristics of BJT and MOSFET.
4. Design of Biasing circuits for BJT
5. Design of Biasing Circuits for MOSFET
6. Design and Frequency response of Common Emitter BJT amplifier and measurement of Gain, Bandwidth, Input and Output impedances.

Part B

1. Measurements of Op-Amp parameters
2. Design of integrator and differentiator using Op-Amp.
3. Design of Active filters –LPF & HPF
4. Generation of triangular, sine and square wave using IC's.
5. Design of Clampers using Op-Amps.
6. Design of Clippers using Op-Amps.
7. Analysis of Hysteric comparator using Schmitt Trigger circuit.
8. Design of 555 Timer in A stable mode

Note: At least **FOUR** experiments from **Part-A** and **SIX from Part-B** should be conducted in the semester.

CO-PO & PSO Correlation Articulation Matrix-AEC -Lab

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO-1	2	2	2	1	2	-	-	-	-	-	-	-	2	2	2
CO-2	2	2	2	2	2	-	-	-	-	-	-	-	2	2	2
CO-3	1	2	2	1	2	-	-	-	-	-	-	-	1	2	2
CO-4	3	3	2	1	2	-	-	-	-	-	-	-	2	3	2
CO-5	1	2	2	1	2	-	-	-	-	-	-	-	1	2	2

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEC08 ELECTRICAL CIRCUITS AND MEASUREMENTS LAB

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
CIE	50 Marks
Credits	1

Pre-Requisite: Students should have

1. Fundamental knowledge in calculus and complex algebra.
2. Electromagnetism and circuit theory concepts.

Course Objectives:

1. To plot the frequency response & locus diagrams of first and second order circuits
2. To verify various circuit theorems and to determine different parameters of two-port network.
3. To measure the unknown values of different electrical elements.
4. To become familiar with different transducers.

Course Outcomes: After the completion of this course, students will be able to

1. Obtain and plot the frequency response, locus diagrams of RLC circuits.
2. Verify various circuit theorems.
3. Determine various two-port network parameters.
4. Design and validate DC and AC bridges for measuring unknown electrical parameters.
5. Demonstrate the principles of magnetic measurements.
6. Demonstrate the measurement of non-electrical quantity with an appropriate transducer.

PART-A

1. Frequency response of RLC series circuit.
2. Frequency response of RLC Parallel circuit.
3. Locus diagrams of RL & RC circuits.
4. Verification of Maximum power transfer theorem.
5. Verification of Milliman's theorem.
6. Verification of Compensation Theorem.
7. Determination of Z, Y, ABCD & h parameters of two-port network

PART-A

8. Measurement of unknown resistance using Kelvin's double bridge. Measurement of unknown Inductance using Maxwell's bridge and validating with LCR meter.
9. Measurement of unknown inductance using Anderson's bridge and validating with LCR meter.
10. Measurement of unknown capacitance using Schering bridge and validating with LCR meter.
11. Measurement of iron losses using Epstein's square bridge.
12. Measurement of strain using strain gauge.
13. Measurement of Displacement using LVDT.
14. Measurement of unknown voltage using D.C Crompton's potentiometer.
15. Study of measurements with digital current and potential transformers.

Note: Five experiments from **Part-A** and **Five** experiments from **Part-B** should be conducted in the semester.

CO-PO & PSO Correlation Articulation Matrix-EMI Lab

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO-1	2	2	1	-	-	-	-	-	-	-	-	1	-	3	-
CO-2	2	2	-	-	-	-	-	-	-	-	-	1	-	3	-
CO-3	2	2	-	-	-	-	-	-	-	-	-	1	-	3	-
CO-4	2	2	3	1	-	-	-	-	-	-	-	-	2	1	1
CO-5	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CO-6	2	2	-	-	-	-	-	-	-	-	-	-	2	-	2

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20CS C07

Basics of Data Structures Lab
(Common for all Programmes except CSE & IT)

Instruction	2 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	50 Marks
Credits	1

Pre-requisites: Any Programming Language

Course Objectives:

1. Design and construct simple programs by using the concepts of Data structures as abstract data type.
2. To have a broad idea about how efficiently pointers can be used in the implement of data structures.
3. To enhance programming skills while improving their practical knowledge in data structures.
4. To strengthen the practical ability to apply suitable data structure for real time applications.

Course Outcomes: The students will be able to

1. Implement the abstract data type.
2. Demonstrate the operations on stacks, queues using arrays and linked lists
3. Apply the suitable data structures including stacks, queues to solve problems
4. Analyze various searching and sorting techniques.
5. Choose proper data structures, sorting and searching techniques to solve real world problems

List of Experiments

1. Implementation of operations on arrays
2. Implementation of Stack.
3. Implementation of Queue.
4. Implementation of basic operations on Single Linked List.
5. Implementation of Searching techniques.
6. Implementation of Sorting Techniques
7. Case study like Banking System, Students Marks Management, Canteen Management, Library Management etc

Text Books

1. Brian W Kernighan, Dennis Ritchie, C Programming Language, PH PTR, 2nd Edition.
2. Richard M Reese, Understanding and Using C Pointers, O`Reily , 2013.

Web Links

1. https://nptel.ac.in/courses/106102064/
2. https://www.udemy.com/algorithms-and-data-structures-in-python/

CO-PO & PSO Correlation Articulation Matrix-BDS Lab

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P0 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	2	2	1	-	-	-	-	-	-	-	-	-			
CO-2	1	2	1	2	-	-	-	-	-	-	-	-			
CO-3	2	2	1	-	-	-	-	-	-	-	-	-			
CO-4	2	3	1	-	-	-	-	-	-	-	-	-			
CO-5	2	3	2	-	-	-	-	-	-	-	-	-			

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20 EE I01 **MOOCs/Training/ Internship**

Students have to undergo MOOCs / Training program / Internship of two to three weeks or 90 hours duration either at the end of the second semester or during III semester.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

IV SEMESTER

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of II Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2021-22

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-IV

S. No	Course Code	Title of the Course	Scheme of Instruction: Hours per week			Scheme of Examination			Credits
			L	T	P	Duration of SEE in Hours	Maximum Marks: CIE	Maximum Marks: SEE	
THEORY									
1	20 EE C09	**Core -5** Digital Electronics	3	0	0	3	40	60	3
2	20 EE C10	**Core -6** Electrical Machines-1	3	0	0	3	40	60	3
3	20 EE C11	**Core -7** Electromagnetic Fields	3	0	0	3	40	60	3
4	20 EE C12	**Core -8** Power Electronics	3	0	0	3	40	60	3
5	20 EE C13	**Core -9** **Power systems I**	3	0	0	3	40	60	3
6	20EGM02	Indian Traditional Knowledge	2	0	0	-	----	-	NC
7	20EGM03	Universal Human Values-II: Understanding Harmony	3	0	0	3	40	60	3
PRACTICALS									
8	20 EE C14	Digital Electronics Lab	0	0	2	3	50	50	1
9	20 EE C 15	Electrical Machines-1 Lab	0	0	2	3	50	50	1
10	20 EE C 16	Power Electronics Lab	0	0	2	3	50	50	1
		Total	**20**	**0**	**6**	**-**	**390**	**510**	**21**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20 EEC 09

DIGITAL ELECTRONICS

Instruction	Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-requisites: Basics of number systems, basics of transistors and MOSFETs

Course Objectives:
1. To demonstrate the working of logic families and logic gates
2. To present design and implementation of combinational and sequential logic circuits.
3. To illustrate the process of A/D and D/A conversions and PLD's in implementing the given logical problems.

Course Outcomes: After the completion of this course, students will be able to:
1. Understand the fundamental concepts and techniques used in logical operations.
2. Analyze and design various combinational circuits using k Maps and Q-M method
3. Design and implement Sequential logic circuits like counters shift register sand sequence generators
4. Understand the process of Analog to Digital conversion and Digital to Analog conversion.
5. Implement PLD's to solve the given logical problems

UNIT –I
Fundamentals of Digital Systems and Logic families: Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital ICs, digital logic families, TTL, and CMOS logic.

UNIT –II
Combinational Digital Circuits: Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, digital comparator, parity checker/generator, code converters, priority encoders, decoders/Seven segment display device, Q-M method of function realization.

UNIT –III
Sequential circuits and systems: A 1-bit memory, the circuit properties of bi-stable latch, the clocked SR flip-flop, J- K-T and D-types flip-flops, applications of flip-flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, **sequence detector,** ripple(Asynchronous) counters, synchronous counters, counters design using flip flops, applications of counters.

UNIT –IV
A/D and D/A Converters: Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, analog to digital converters: parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, specifications of A/D converters.- Significance of size of data on the accuracy of conversion

UNIT –V
Semiconductor memories and Programmable logic devices: Introduction to state diagram- Moore and Mealy machine Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory (RAM), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic.

Text Books:
1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Suggested Readings:

1. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
2. S. Salivahanan "Digital circuits and design", 4th edition, Vikas Publishing house, 2010

CO-PO & PSO Correlation Articulation Matrix-DE

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1	1	-	-	-	-	-	-	-	1	1	-
CO2	2	3	3	2	1	-	-	-	-	-	-	-	1	2	-
CO3	2	3	3	2	1	-	-	-	-	-	-	-	1	3	1
CO4	2	2	2	2	1	-	-	-	-	-	-	-	1	1	1
CO5	1	2	2	1	1	-	-	-	-	-	-	-	1	1	2

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EE C10 **ELECTRICAL MACHINES-I**

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisites: Basic Electrical Engineering.

Course Objectives: The objective of this course is to:

1. To inculcate the principles of Electromechanical Energy Conversions.
2. To determine the performance of DC Machines by conducting various tests.
3. To analyze and select a suitable DC Machine based on the application.
4. To impart the knowledge of transformers and evaluate its performance.

Course Outcomes: After completion of this course, students will able to:

1. Identify the various parts of electrical machines and distinguish the nomenclature of electric and magnetic circuits.
2. Elucidate the principle of operation and characteristics of electrical machines.
3. Analyze the starting methods and speed control of DC machine.
4. Determine the performance parameters of a machine for a given data.
5. Explain the parallel operation of DC generators and single-phase transformers.
6. Choose a suitable DC machine and auto transformer for a specific application.

UNIT-I

Electromechanical energy conversion: Introduction to Magnetic circuits, forces and torques in magnetic field system, energy balance, singly excited and multiple excited magnetic systems, co-energy.

UNIT-II

DC Generators: Review of Constructional features and Principle of operation of a DC machine, armature windings diagram (Lap and Wave winding), analysis of EMF equation of a DC generator, Armature reaction and its effects, process of commutation, methods of improving commutation, methods of excitation and classification of DC generators, voltage build-up in a shunt generator, critical field resistance and critical speed, generator characteristics, losses and efficiency, parallel operation and applications of DC generators.

UNIT-III

DC Motors: Review of Principle of operation**,** back EMF and significance of back EMF, electromagnetic torque, types of DC motors, characteristics, analysis of speed control methods, necessity of starter, three-point starter and four-point starter, soft starters (elementary treatment only) losses and efficiency, applications of DC motors.

Testing of DC machines: Swinburne's test, brake test, Hopkinson's test, fields test, retardation test and separation of losses.

UNIT-IV

Single Phase Transformer: Review of Constructional features, principle of operation, EMF equation and ideal transformer, transformer on no-load and on-load and its phasor diagrams. Detailed study of equivalent circuit, voltage regulation and efficiency. All day efficiency, parallel operation of transformer.

Testing of transformer: Polarity test, analysis of open circuit and short circuit test, Sumpner's test, separation of losses.

Auto transformer: - Construction, principle, applications and comparison with two-winding transformer.

UNIT-V

Three-Phase Transformers: Construction, types of connection and their comparative features, Scott connection. Tap-changing transformers: No-load and on-load tap-changing of transformers, Three-winding transformers, cooling of transformers.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Text Books:

1. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
2. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
3. H. Cotton, Advanced Electrical Technology, Wheeler & Co, CBS publishers, 7th Edition, 2005.
4. J.B Gupta, Theory and performance of electrical machines, S.K. Kataria & Sons, 14th Edition, 2014.

Suggested Readings:

6. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
7. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.
8. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
9. Ashfaq Hussain "Electrical Machines" Danpat Rai and sons, 3rd Edition 2012.

CO-PO & PSO Correlation Articulation Matrix- EM1

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	2	1	2	1	--	--	--	--	--	--	--	1	2	2
CO-2	3	3	2	2	1	--	--	--	--	--	--	--	1	2	2
CO-3	3	3	2	2	1	--	--	--	--	--	--	--	1	2	2
CO-4	3	3	2	2	1	--	--	--	--	--	--	--	1	2	2
CO-5	3	3	2	2	1	--	--	--	--	--	--	--	1	2	2
CO-6	3	3	2	2	1	--	--	--	--	--	--	--	1	2	2

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEC11 **ELECTROMAGNETIC FIELDS**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite : Mathematics 1 and mathematics 3

Course Objectives:

1. To understand coordinate systems, vector calculus and their applications to analyze electrostatic and magnetic fields.
2. To figure out Maxwell's equations, uniform plane wave and its propagation through different media.
3. To know the sources, effects & control techniques of EMI & EMC.

Course Outcomes: After the completion of this course, students will be able to

1. Understand the basic concepts of vector calculus, various coordinate systems and apply them appropriately for solving electromagnetic field problems.
2. Obtain the physical quantities like field intensity, flux density and potential due to various types of charge distributions in electric and magnetic fields using fundamental laws.
3. Differentiate between conduction & convections currents, and describe the behaviour of static electric & magnetic fields in different media, boundary conditions and acquire the knowledge about energy storing elements.
4. Illustrate Maxwell's equations and their application to time-harmonic fields, wave propagation in different media and Poynting's power-balance theorem.
5. Recognize what is EMI & EMC, sources & effects of Electromagnetic Interferences in inter and intra systems and various methods to control EMI

UNIT- I

Orthogonal Coordinate Systems: Review of Vector Calculus, Rectangular, Cylindrical, Spherical Coordinate systems; Line, Surface and Volume integrals; Operator Del, Gradient, Divergence, Curl & Laplacian of a field; Divergence and Stokes's theorems.

Electrostatic fields: Various charge configurations, Coulomb's law, Electric field intensity and flux density of different charge distributions, Gauss's law, Integral and Point form of Maxwell's Electrostatic Equation.

UNIT- II

Electrostatic Field in Materials: Electrical Potential, Capacitance of Parallel plate capacitor, Equipotential lines, Properties of materials, convection and conduction currents, conductors, dielectric constant, continuity equation and relaxation time, boundary conditions, Poisson's and Laplace's equations, Uniqueness theorem.

UNIT-III

Magneto Static Fields: Biot-Savart's law, Ampere's law, Displacement current, Magnetic Scalar and Vector Potentials, boundary conditions, Forces in Magnetic fields, Lorentz force equation, Force between parallel conductors, Inductance Calculations (Solenoid, Toroid), Mutual Inductance, Coefficient of Coupling.

UNIT- IV

Time Varying Electromagnetic Fields: Faraday's laws of electromagnetic induction, Final forms of Maxwell's Equations, Power and Poynting theorem, Time-Harmonic Electromagnetic fields, Wave equations (One dimension), Plane Wave, Propagation in perfect and lossy-dielectrics.

UNIT-V

Electromagnetic Interference and Compatibility (Theoretical Aspects only): Introduction to Electromagnetic Interference and Electromagnetic Compatibility (EMI & EMC)- Sources and Characteristics of EMI, Control Techniques of EMI, Grounding, Shielding, Filtering. Introduction to numerical electromagnetics.

Text Books:

1. Hayt, W.H and J.A Buck, Engineering Electromagnetics, Tata McGraw Hill, 8th Edition, 2018.
2. Sadiku, M.N.O, S.V. Kulkarni, Principles of Electromagnetics, Oxford University press, 7th Edition, 2018.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Suggested Readings:

1. S. P. Seth, Elements of Electromagnetic Fields, Danpat Rai& Co, 2011.
2. David K. Cheng, Field and Wave Electromagnetics, Pearson Education. 2nd Edition 2014.
3. Ashutosh Pramanik, Electromagnetism Theory and Applications, PHI Pvt. Ltd., 3rd Edition, 2015
4. R.L. Yadava, "Electromagnetic Fields & Waves", Khanna Publishing House,
5. R.K. Shevgaonkar, Electromagnetic Waves, , Tata McGraw Hill, India
6. Narayana Rao, Engineering Electromagnetics, PHI Pvt. Ltd

CO-PO & PSO Correlation Articulation Matrix: EMF

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	3	2	1	2	--	2	--	1	1	2	1	--	2	1
CO-2	3	3	2	1	2	--	2	--	1	1	2	1	--	2	1
CO-3	3	3	2	1	2	--	2	--	1	1	2	1	--	3	1
CO-4	3	3	2	1	2	--	2	--	1	1	2	1	--	3	1
CO-5	3	3	2	1	2	1	2	--	1	1	2	1	--	3	1

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEC12 **POWER ELECTRONICS**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite Analog Electronic Circuits

Course Objective:

1. To identify the characteristics of different static switches and their turn- ON & turn - OFF methods.
2. To know the principles of AC-DC, DC-DC, DC-AC and AC-AC energy conversions.
3. To study various methods of voltage control in power converters.

Course Outcomes: After the completion of this course, students will be able to:

1. Understand the construction, operation and characteristics of various power semiconducting devices and to identify their selection in appropriate application.
2. Comprehend the driver/trigger circuits for various devices & also protection circuit, different turn -OFF methods, series & parallel operation of SCRs.
3. Illustrate the principle of working of AC-DC, AC-AC, DC-DC & DC-AC converters.
4. Analyse the performance for various power converters with different loads and modes of working.
5. Describe various voltage control techniques in power electronic converters with their applications

UNIT-I

Power Switching Devices: Power diode, characteristics, Recovery characteristics, Types of power diodes, General purpose diodes, Fast recovery diodes, their applications. Bipolar Junction Transistors(BJT), Power MOSFET, IGBT Basic structure and working, Steady state and switching characteristics, Gate drive circuits for MOSFET and IGBT, Comparison of BJT, MOSFET and IGBT, Their applications.

UNIT-II

Silicon Controlled Rectifier (SCR): SCR-Static characteristics, Two transistor analogy, Protection of SCRs, Dynamic characteristics, Series and parallel operation of SCRs, SCR trigger circuits-R, RC and UJT triggering circuits, Commutation methods of SCR.

UNIT-III

Thyristors Rectifiers: Study of Single-phase and three-phase half wave and full wave-controlled rectifiers with R, RL, RLE loads, significance of freewheeling diode, Effect of source inductance, Dual converters - circulating and non-circulating current modes.

UNIT-IV

DC-DC Converters: Principles of Step-down, Step-up, Step UP/Down choppers, Time ratio control and current limit control, Types of choppers Type- A, B, C, D and E, Voltage commutated chopper, Introduction to Buck, Boost and Buck-Boost regulators, Basics of flyback and forward converters.

AC-AC Converters: AC Voltage Controller, integral cycle control, phase control, AC Voltage controllers with R and RL loads

UNIT-V

DC-AC Converters: Single-phase Bridge inverters, Voltage control methods, Single pulse width modulation, Multiple pulse width modulation, Sinusoidal pulse width modulation, Three-phase bridge Inverters, 180^0 & 120^0 modes of operation, switch states, instantaneous output voltages, average output voltages for single & three phase inverters, Current source inverters, Comparison of Voltage Source Inverters and Current Source Inverters,

Text Books:

1. Singh. M. D, Khanchandani. K. B, "Power Electronics", Tata McGraw Hill, 2nd Edition, 2017.
2. Rashid. M. H., "Power Electronics Circuits Devices and Applications", 4th Edition, Pearson India, 2017.
3. Bimbra. P. S, "Power Electronics", Khanna Publishers, 3rd Edition, 2013.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

4. Erickson and D. Maksimovic, “Fundamentals of Power Electronics”, Springer Science

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Suggested Reading:

1. N. Mohan, T.M. Undeland , "Power Electronics: Converters, Applications and Design", John Wiley & Sons,2007
2. P.C. Sen, "Power Electronics", Tata Mc-Graw Hill, 1^{st} Edition, 2001.
3. L.Umanand, "Power Electronics: Essentials and Applications", Wiley India, 2009.

<u>CO-PO & PSO Correlation Articulation Matrix</u>: PE

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	2	2	3	2	2	2	--	2	--	1	2	--	2	2
CO-2	2	2	2	2	1	--	1	--	1	--	1	--	--	2	2
CO-3	3	2	1	2	1	--	1	--	2	1	3	2	--	2	2
CO-4	3	1	1	2	1	--	--	--	1	1	--	--	--	2	2
CO-5	3	2	2	2	--	--	1	--	1	--	1	1	--	2	2

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20 EE C 13

POWER SYSTEMS –I

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-requisite: Knowledge of energy resources, Mathematics1

Course Objectives:

1. To introduce Generation of power through conventional sources such as: Thermal, Hydro, Nuclear and Renewable energy sources
2. To familiarize mechanical design of transmission lines and cables.
3. To familiarize present practices in tariff calculations and understand the classification and Connection schemes of distribution systems

Course Outcomes: After the completion of this course, students will be able to:

1. Discuss the construction and operation of conventional and non-conventional sources of energy along with financial management
2. Determine the line parameters such as inductance and capacitance for different configurations of transmission line
3. Calculate the sag and tension of given transmission line under different weather conditions
4. Discuss the operation of underground cables, insulators and calculate the capacitance of cables and string efficiency of insulators
5. Discuss the different tariff structures, types of costs and general aspects of distribution systems

UNIT-I

Basic Concepts: Evolution of Power Systems and Present-Day Scenario. Structure of a power system: Bulk Power Grids and Micro-grids.

Generation: Thermal- Hydro -Power Plants: Principles, Choice of site, layout and various parts of generating stations, Brief description of Hydro Power Plant Dam, Spillways, Head works, Surge tank, Penstocks, Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air, ash and flue gasses, Brief description of TPS components: Economizers, Boilers, Super heaters, Turbines, Condensers, Chimney and Cooling towers.

Nuclear Station: Schematic Arrangement of Nuclear Power Station, Advantages and disadvantages, Types of Nuclear reactors

UNIT- II

Solar and Wind Generation: Solar cell fundamentals, Solar Cell characteristics, solar cell classification, solar cell, Module, Panel and Array Construction, Maximizing the solar PV output and load matching, Solar PV Systems, Basic Principles of Wind Energy Conversion, The Nature of the Wind, The Power in the Wind, Forces on the Blades, Wind Energy Conversion, Wind Data and Energy Estimation, Site Selection Considerations

UNIT-III

Line Parameter Calculations: Inductance & Capacitance calculations of Transmission Line, single-phase and three-phase symmetrical composite conductors, GMD, GMR, Transposition of conductors, bundled conductors, effect of earth capacitance.

UNIT-IV

Overhead Transmission Lines and Cables: Overhead line materials, supports, types, Ground wires, **Sag**/Tension calculations, Equal / Unequal supports, Effects of wind, ice / Erection Conditions stringing charts. Insulators, Types, Material for construction, potential distribution over string of insulators, equalizing of potential, Methods.

Underground Cables: Construction of Cables, Insulating Materials for Cables, Classification of Cables, Insulation Resistance of a Single-Core Cable, Capacitance of a Single-Core Cable, Dielectric Stress in a Single-Core Cable, Most Economical Conductor Size in a Cable, Grading of Cables, Capacitance Grading, Inters heath Grading, Capacitance of 3-Core Cables, Measurements of Ce and Cc.

UNIT- V

Economics of Power Generation: Load curve, Load demand and diversified factors, Base load operation, Types of costs and depreciation calculations; Tariffs, different types of tariffs; Methods of power factor improvement.

General Aspects of Distribution Systems-Types of Distribution, Ring Main & Radial Distribution system, Calculations for Distributor fed at one end, distributor fed at both ends.

Text Books:

1. J. Grainger and W. D. Stevenson, “Power System Analysis”, McGraw Hill Education, 1994.
2. C.L. Wadhwa, “Electric Power Systems Theory”, New Academic Science Limited, 2012.
3. B.H. Khan, “Non-Conventional Energy Resources” Mc Graw Hill Education, 2015

Suggested Reading:

1. A.R. Bergen and V. Vittal, “Power System Analysis”, Pearson Education Inc., 1999.
2. D.P. Kothari and I. J. Nagrath, “Modern Power System Analysis”, McGraw Hill, 2003.
3. B.M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, “Electric Power Systems”, Wiley, 2012

CO-PO & PSO Correlation Articulation Matrix-PS1

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	1	2	2	1	-	-	2	-	-	-	-	-	1	-	2
CO-2	2	3	2	2	-	-	-	-	-	-	-	-	1	-	2
CO-3	2	3	2	2	-	-	-	-	-	-	-	-	1	-	2
CO-4	2	2	2	2	-	-	-	-	-	-	-	-	-	-	2
CO-5	1	2	2	1	-	-	-						-	-	2

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EGM02

INDIAN TRADITIONAL KNOWELDGE

Instruction	2L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	0

Prerequisite: Knowledge on Indian Culture

Course Objectives:
1. To get a knowledge in Indian Culture
2. To Know Indian Languages and Literature and the fine arts in India
3. To explore the Science and Scientists of Medieval and Modern India

Course Outcomes: After completion of this course, students will be able to:
1. Understand philosophy of Indian culture
2. Distinguish the Indian languages and literature
3. Learn the philosophy of ancient, medieval and modern India
4. Acquire the information about the fine arts in India
5. Know the contribution of scientists of different eras.

UNIT-I
Culture and Civilization: Culture, civilization and heritage, general characteristics of culture, importance of culture in human life, Cultural diversity, Aesthetics, Women seers, Indus culture, Indian cuisine, Martial arts

UNIT-II
Education System: Education in ancient, medieval and modern India, aims of education, subjects, Languages, Science and Scientists of ancient, medieval and modern India

UNIT-III
Linguistic Wealth: Indian Languages and Literature: the role of Sanskrit, Paleography, Significance of scriptures to current society, Indian semantics and lexicography, Bhakti literature, Darsanas

UNIT-IV
Art, Technology & Engineering: Sculpture, Painting and Handicrafts, Indian Music, Dance Drama and Theatre, Introduction to Mayamatam, Iron and steel technology, Use of metals in medicinal preparations

UNIT-V
Science and Logic: Helio-centic system, Sulbasutras, Katapayadi, Hindu calendar, 6 pramanas in Indian logic, Scientific method applied to therapeutics, Fallacies, Tarka – Induction &Deduction, Ayurvedic biology, Definition of health

Essential Readings:
1. Kapil Kapoor, **Text and Interpretation: The Indian Tradition,** ISBN: 81246033375, 2005
2. Samskrita Bharati, **Science in Samskrit**, ISBN 13: 978-8187276333, 2007
3. Satya Prakash, **Founders of sciences in Ancient Indi**a, Govindram Hasanand, ISBN-10: 8170770009, 1989
4. Brajendranath Seal, **The Positive Sciences of the Ancient Hindus**, Motilal Banarasidass, ISBN-10: 8120809254, 1915
5. Kancha Ilaiah, Turning the Pot, Tilling the Land: Dignity of Labour in Our Times

Suggested Readings:
- Swami Vivekananda, *Caste, Culture and Socialism*, Advaita Ashrama, Kolkata ISBN-9788175050280
- Swami Lokeswarananda, *Religion and Culture*, Advaita Ashrama, Kolkata ISBN-9788185843384
- Kapil Kapoor, *Language, Linguistics and Literature: The Indian Perspective*, ISBN-10: 8171880649, 1994.
- Karan Singh, *A Treasury of Indian Wisdom: An Anthology of Spiritual Learn*,ISBN: 978-0143426158, 2016

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

- Swami Vivekananda, *The East and the West*, Advaita Ashrama, Kolkata 9788185301860

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

- Srivastava R.N., *Studies in Languages and Linguistics*, Kalinga Publications ISBN-13: 978-8185163475
- Subhash Kak and T.R.N. Rao, Computation in Ancient India, Mount Meru Publishing ISBN-1988207126
- R.N Misra, *Outlines of Indian Arts Architecture, Painting, Sculpture, Dance and Drama,* IIAS, Shimla & Aryan Books International, ISBN 8173055149
- S. Narain, *Examinations in ancient India*, Arya Book Depot, 1993
- M. Hiriyanna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, ISBN-13: 978-8120810990, 2014
- Ravi Prakash Arya, Engineering and Technology in Ancient India, Indian Foundation for Vedic Science, ISBN-10: 1947593072020
- Shashi Tharoor, The Hindu Way
- Amartya Sen, Argumentative Indian

SWAYAM/Nptel:
History of Indian Science and Technology - https://onlinecourses.swayam2.ac.in/arp20_ap35/preview
Introduction to Ancient Indian Technology – https://onlinecourses.nptel.ac.in/noc19_ae07/preview
Indian Culture & Heritage - https://onlinecourses.swayam2.ac.in/nos21_sc11/preview
Language and Society - https://nptel.ac.in/courses/109/106/109106091/
Science, Technology & Society - https://nptel.ac.in/courses/109/103/109103024/
Introduction to Indian Philosophy - https://nptel.ac.in/courses/109/106/109106059/
Introduction to Indian Art - An appreciation - https://onlinecourses.nptel.ac.in/noc20_hs09/preview

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20 EE C 14

DIGITAL ELECTRONICS LAB

Instruction	2 Hours per week
Duration of Semester End Examination	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Pre-requisites: Basic knowledge on logical operations, basics of logic gates, basics of flip-flops

Course Objectives:

1. To explain Demorgan's Theorem, SOP, POS forms
2. To demonstrate implementation of Full/Parallel Adders, Subtractors and Magnitude Comparators, multiplexers, de-multiplexers and decoders using logic gates
3. To illustrate various flip-flops, shift registers and design different counters.

Course outcomes: After the completion of this course, the students will be able to:

1. Demonstrate the truth table of various expressions and combinational circuits using logic gates.
2. Design, test and implement various combinational circuits such as adders, subtractors, comparators.
3. Apply knowledge of logic gates to design complex logic circuits like multiplexers and demultiplexers.
4. Design, test and implement various sequential circuits using flip-flops
5. Design various logic circuits using shift registers

LIST OF EXPERIMENTS

1. Verify (a) Demorgan's Theorem for 2 variables.
2. The sum-of product and product-of-sum expressions using gates.
3. Design and implement (a) Full Adder using basic logic gates. (b) Full subtractor using basic logic gates
4. Design and implement 4-bit Parallel Adder/ subtractor using IC 7483.
5. Design and Implementation of 4-bit Magnitude Comparator using IC 7485.
6. Realize (a) 4:1 Multiplexer using gates.
   (b) 3-variable function using IC 74151(8:1MUX).
7. Realize 1:8 Demux and 3:8 Decoder using IC74138.
8. Realize the following flip-flops using NAND Gates. (a) Clocked SR Flip-Flop (b) JK Flip-Flop
9. Realize the following shift registers using IC7474 (a) SISO (b) SIPO (c) PISO (d) PIPO.
10. Realize the Ring Counter and Johnson Counter using IC7476.
11. Realize the Mod-N Counter using IC7490.
12. Design of synchronous counters using flip-flops.
13. Design of Asynchronous counters using flip-flops.

Note: At least **TEN** experiments should be conducted in the Semester

CO-PO & PSO Correlation Articulation Matrix-DE lab

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1	1	-	-	-	-	-	-	-	1	1	-
CO2	2	3	3	2	1	-	-	-	-	-	-	-	1	2	-
CO3	2	3	3	2	1	-	-	-	-	-	-	-	1	3	1
CO4	2	2	2	2	1	-	-	-	-	-	-	-	1	1	1
CO5	1	2	2	1	1	-	-	-	-	-	-	-	1	1	2

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEC15 **ELECTRICAL MACHINES-I LAB**

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course objectives:

1. To understand the practical connections of the machines.
2. To draw the characteristics of different types of DC generators.
3. To test the DC machines and single-phase transformer under different loading conditions for their performance.

Course Outcomes: After completion of this course, students will be able to:

1. Make the connections for DC machines and single-phase transformer for their applications.
2. Choose the meter ratings for various applications of DC machines and single-phase transformer.
3. Control the speed of the DC motor by different methods.
4. Obtain the characteristics of the given DC generator.
5. Determine the performance of DC machines and single-phase transformer.

LIST OF EXPERIMENTS

1. OCC and load characteristics of separately excited DC generator.
2. OCC and load characteristics of DC shunt generator.
3. Load characteristics of DC compound generator.
4. Swinburne's test on DC shunt machine to predetermine the efficiency at any given load.
5. Brake test on DC series motor.
6. Hopkinson's test on two identical DC shunt machines.
7. Separation of stray losses of DC shunt machine.
8. Load test on single phase transformers.
9. Sumpner's test on two identical single-phase transformers.
10. Separation of Magnetic losses of transformer.
11. Study of three-phase transformer connections.
12. Demonstration of three-point starter and four-point starter.
13. Study of excitation phenomenon of three-phase transformer.
14. Parallel operation of two single-phase transformers.

Note: At least **TEN** experiments should be conducted in the semester.

CO-PO & PSO Correlation Articulation Matrix: EM-I Lab

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	2	1	2	1	--	--	--	--	--	--	--	1	2	2
CO-2	3	3	2	2	1	--	--	--	--	--	--	--	1	2	2
CO-3	3	3	2	2	1	--	--	--	--	--	--	--	1	2	2
CO-4	3	3	2	2	1	--	--	--	--	--	--	--	1	2	2

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CO-5	3	3	2	2	1	--	--	--	--	--	--	--	1	2	2

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEC16 **POWER ELECTRONICS LAB**

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:
1. To obtain and plot the characteristics of different static switches.
2. To analyze the triggering and commutation circuits for SCR.
3. To familiarize and simulate the conversion principles of AC-DC, DC-DC, DC-AC and AC-AC conversion circuits.

Course Outcomes: After completion of the course, students will be able to:

1. Plot the characteristics of various controlled switches and identifies effect of variation of control signal on the regions of switching operation.
2. Demonstrate the effect of delay angle and nature of load on the performance of various power converters and able to plot the output voltage and current waveforms.
3. Simulate various types of power converters and discriminate between simulation models and practical models of various power converters.
4. Understand various voltage control techniques in different power converters.
5. Select proper equipment, precautions, implement connections keeping technical, safety and economic issues.

List of Experiments

PART-A

1. Study of static characteristics of S.C.R. and to measure latching & holding currents.
2. Study the characteristics of BJT, MOSFET and IGBT.
3. R, RC and UJT triggering circuits for SCR
4. Study of forced commutation techniques of SCR.
5. Single-phase half-controlled bridge rectifier with R and RL loads.
6. Single-phase fully controlled converter with R, RL & RLE loads and freewheeling diode
7. Three-phase half-controlled bridge rectifier with R and RL loads.
8. Three-phase fully controlled bridge rectifier with R and RL loads.
9. DC voltage control using Buck and Boost choppers.
10. Voltage and Current commutated choppers with R&RL loads.
11. Single-phase step down Cyclo-converter with Rand RL loads.
12. Single-phase A.C voltage controller with R and RL loads
13. Half and Full bridge inverters with R&RL loads.

PART-B

1. Simulation of Single-phase Full converter and Semi converter with R & RL loads and freewheeling diode.
2. Simulation of Three-phase Full converter and Semi converter with R & RL loads.
3. Simulation of Single-phase AC voltage controller with R & RL loads
4. Simulation of single-phase half-bridge & full-bridge inverters.
5. Simulation of three-phase bridge inverter in different modes.
6. Simulation of Single-phase Inverter with single, multiple and sinusoidal pulse width modulations.

Note: At least **SEVEN** experiments from PART-A and **THREE** from PART-B should be conducted in the semester.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

<u>CO-PO & PSO Correlation Articulation Matrix</u>: PE Lab

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	2	--	1	1	--	--	--	2	1	2	1	--	3	2
CO-2	3	3	1	2	2	--	1	--	2	1	2	1	2	3	3
CO-3	3	3	--	2	2	--	1	--	2	1	2	1	3	3	3
CO-4	3	1	1	2	1	--	--	--	1	1	2	1	--	2	2
CO-5	1	2	1	2	--	1	--	--	1	1	2	1	--	2	2

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Syllabus of the Courses offered to the other Departments

20 EE M01	Basic Electrical Engineering
20 EE M02	Basic Electrical Engineering Lab
20 EE O01	Engineering Materials
20 EE O02	Energy Management Systems
20 EE O03	Energy Auditing
20 EE O04	Energy Conservation
20 EE O05	Waste Management

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEC01 **BASIC ELECTRICAL ENGINEERING**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To understand the behaviour of different circuit elements R, L & C, and the basic concepts of electrical AC circuit analysis
2. To understand the basic principle of operation of AC and DC machines
3. To know about different types of electrical wires and cables, domestic and industrial wiring. safety rules and methods of earthing

Course Outcomes: After the completion of this course, the student will be able to
1. Understand the concepts of Kirchhoff's laws and to apply them in superposition, Thevenin's and Norton's theorems to get the solution of simple dc circuits
2. Obtain the steady state response of RLC circuits with AC input and to acquire the basics, relationship between voltage and current in three phase circuits.
3. Understand the principle of operation, the emf and torque equations and classification of AC and DC machines
4. Explain various tests and speed control methods to determine the characteristic of DC and AC machines.
5. Acquire the knowledge of electrical wiring, types of wires, cables used and Electrical safety precautions to be followed in electrical installations.
6. Recognize importance of earthing, methods of earthing and various low-tension switchgear used in electrical installations

UNIT-I
DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation, Superposition, Thevenin and Norton Theorems, Time-domain analysis of first-order RL and RC circuits.

UNIT-II
AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III
Transformers: Construction, Working principle, EMF Equation, Ideal and Practical transformer, Equivalent circuit of Transformer, OC and SC tests on a transformer, Efficiency and Regulation

UNIT-IV
DC and AC Machines: DC Generators: Construction, Principle of operation, EMF equation, Classification, Characteristics of shunt, series and compound generators.

DC Motors: Classification, Torque equation, Characteristics, Efficiency, Speed Control of Series and Shunt Motors.

Three - Phase Induction Motors: Principle of operation, Applications,

UNIT-V
Electrical Installations: Electrical Wiring: Types of wires and cables, Electrical Safety precautions in handling electrical appliances, electric shock, first aid for electric shock, safety rules.

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Earthing (Elementary Treatment only),

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Elementary calculations for energy consumption

Text Books:

1. L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011.
2. E. Hughes, Electrical and Electronics Technology, Pearson, 2010.

Suggested Reading:

1. D. P. Kothari & I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989
3. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill,2009
4. P.V. Prasad, S. sivanagaraju, R. Prasad, "Basic Electrical and Electronics Engineering" Cengage Learning, 1st Edition, 2013

CO-PO Mapping for BEE Theory

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO-1	PSO-2	PSO-3
C01	3	3	2	3	3	-	3	-	1	2	2	3	2	3	2
C02	3	3	2	3	2	-	3	-	1	2	2	3	2	3	2
C03	3	3	2	1	3	-	2	-	1	2	2	3	2	3	2
C04	2	3	-	1	3	-	2	-	1	2	1	3	2	3	2
C05	2	-	-	1	1	2	2	1	1	1	2	3	2	3	2
C06	2	-	-	1	3	1	2	1	1	1	2	3	2	3	2

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEC02

BASIC ELECTRICAL ENGINEERING LAB

Instruction	2 Hours per week
Duration of Semester End Examination	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:
1. To acquire the knowledge of different types of electrical elements and to verify the basic electrical circuit laws and theorems.
2. To determine the parameters and power factor of a coil, calculate the time and frequency responses of RLC circuits and to familiarize with measurement of electric power &energy.
3. To determine the characteristics of Transformers, dc, ac machines and switchgear components

Course Outcomes: At the end of the course, the students are expected to
1. Get an exposure to common electrical components, their ratings and basic electrical measuring equipment.
2. Make electrical connections by wires of appropriate ratings and able to measure electric power and energy.
3. Comprehend the circuit analysis techniques using various circuital laws and theorems.
4. Determine the parameters of the given coil and calculate the time response of RL & RC series circuits.
5. Recognize the basic characteristics of transformer and components of switchgear.
6. Understand the basic characteristics of dc and ac machine by conducting different types of tests on them.

List of Laboratory Experiments/Demonstrations:
1. Demonstration of Measuring Instruments and Electrical Lab components.
2. Verification of KCL and KVL.
3. Time response of RL and RC series circuits.
4. Determination of parameters of a choke or coil by Wattmeter Method
5. Verification of Thevenin's and Norton's theorems
6. Turns ratio /voltage ratio verification of single phase Transformers
7. Open Circuit and Short Circuit tests on a given single phase Transformer
8. Observation of Excitation Phenomenon in Transformer
9. Measurement of three phase power in a balanced system using two Wattmeter method.
10. Measurement of 3-Ph Energy by an Energy Meter (Demonstration of Principle)
11. Load test on DC Shunt motor
12. Speed control of DC Shunt motor
13. Demonstration of Low Tension Switchgear Equipment/Components
14. Demonstration of cut - out section of Machines like DC Machine, Induction Machine etc.

Note: TEN experiments to be conducted from the above list.

CO-PO Mapping for BEE Theory

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO-1	PSO-2	PSO-3
CO-1	2	2	1	1	-	-	1	1	2	1	-	1	1	3	2
CO-2	2	1	1	1	-	-	1	1	2	1	-	1	1	3	2
CO-3	3	3	2	1	-	-	1	-	2	1	-	1	1	3	2
CO-4	3	1	2	1	-	-	1	-	2	1	-	1	1	3	2
CO-5	3	3	2	3	-	-	1	-	2	1	-	1	1	3	2

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CO-6	3	3	2	2	-	-	1	-	2	1	-	1	1	3	2

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

With effect from the Academic Year 2021-2022

Code: 20EGMO3

UNIVERSAL HUMAN VALUES-II: UNDERSTANDING HARMONY
(**B.E/B.Tech II/III Year** -Common to all Branches)

Instruction	3L Hours per Week
Duration of SEE	3 Hours
SEE	60Marks
CIE	40 Marks
Credits	3

Introduction
This course discusses the role of human values in one's family, in society and in nature. In the Induction Program, students would get an initial exposure to human values through Universal Human Values–I. This exposure is to be augmented by this compulsory full semester foundation course.

Course Objectives

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in human being, family, society and nature/existence.
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Outcomes
By the end of the course,

1. Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
3. They would have better critical ability.
4. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
5. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

The course has 28 lectures and 14 practice sessions:

Unit 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current Scenario
- Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

Unit 2: Understanding Harmony in the Human Being - Harmony in Myself

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

- Understanding the characteristics and activities of ‘I’ and harmony in ‘I’

- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Unit 3: Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co -existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Unit 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment among the four orders of nature - recyclability and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all - pervasive space
- Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Unit 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order:
  a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
  b. At the level of society: as mutually enriching institutions and organizations

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Mode of Conduct (L-T-P-C 2-1-0-3)

- Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions.
- While analysing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the

important or critical elements.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

- In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self- exploration.
- Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.
- Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practicals are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignments and/or activities are included.
- The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

Assessment:

This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self- assessment, peer assessment etc. will be used in evaluation.

Example:

Assessment by faculty mentor: 10 marks

Self-assessment/Assessment by peers: 10
M

Socially relevant project/Group Activities/Assignments: 20 marks

Semester End Examination: 60 marks

The overall pass percentage is 40%. In case the student fails, he/she must repeat the course.

Text Books

The Text Book

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
   The teacher's manual
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. A Nagaraj Jeevan Vidya: Ek Parichaya, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. Cecile Andrews, Slow is Beautiful
4. Gandhi - Romain Rolland (English)
5. Dharampal, "Rediscovering India"
6. E. FSchumacher. "Small is Beautiful"
7. J. C. Kumarappa "Economy of Permanence"
8. Pandit Sunderlal "Bharat Mein Angreji Raj"
9. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
10. 10.Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
11. Maulana Abdul Kalam Azad, India Wins Freedom -
12. Vivekananda - Romain Rolland (English)
13. The Story of Stuff (Book)

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

With effect from the Academic Year 2021-2022

20EGM01

INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES

(BE/BTech III/IV Semester - Common to all branches)

Instruction	2L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	0

Course Objectives

The course will introduce the students to:

1. History of Indian Constitution and how it reflects the social, political and economic perspectives of the Indian society.
2. Growth of Indian opinion regarding modern Indian intellectuals constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. Various Organs of Governance and Local Administration.

Course Outcomes

After successful completion of the course the students will be able to:

1. Understand the making of the Indian Constitution and its features.
2. Identify the difference among Right To equality, Right To freedom and Right to Liberty.
3. Analyze the structuring of the Indian Union and differentiate the powers between Union and States.
4. Distinguish between the functioning of Lok Sabha and Rajya Sabha while appreciating the importance of Judiciary.
5. Differentiate between the functions underlying Municipalities, Panchayats and Co-operative Societies.

Unit-I

Constitution of India: Constitutional history-Govt of India Act 1909, 1919 and 1935, Constitution making and salient features. Directive Principles of State Policy - Its importance and implementation.

Unit-II

Scheme of the Fundamental Rights & Duties: The Fundamental Rights **-** To Equality, to certain Freedom under Article 19, to Life and Personal Liberty Under Article 21. Fundamental Duties - the legal status.

Unit III

Union Government and its Administration - Structure of the Indian Union: Federalism, distribution of legislative and financial powers between the Union and the States.
Parliamentary form of government in India: Executive-President's role, power and position.

Unit IV

Legislature and Judiciary: Central Legislature**-**Powers and Functions of Lok Sabha and Rajya Sabha.
Judiciary: Supreme Court-Functions, Judicial Review and Judicial Activism

Unit V

Local Self Government - District's Administration Head (Collector): Role and Importance.
Municipalities: Introduction, Mayor and Role of Elected Representative, CEO of Municipal Corporation.
Panchayati Raj: Introduction, Zilla Panchayat, Elected Officials and their roles, CEO Zilla Panchayat: Position and Role. Block level: Organizational Hierarchy (Different departments). Village level: Role of Elected and Officials.

Text Books:

1. **Indian Government & Politics**, Ed Prof V Ravindra Sastry, Telugu Akademy, 2nd edition, 2018.
2. **Indian Constitution at Work,** NCERT, First edition 2006, Reprinted- January 2020.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Suggested Reading:

1. **The Constitution of India**, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, **Framing of Indian Constitution**, 1st Edition, 2015.
3. M. P. Jain, **Indian Constitution Law**, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu**, Introduction to the Constitution of India**, Lexis Nexis, 2015.

Online Resources:

1. http://www.nptel.ac.in/courses/103107084/Script.pdf

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

AICTE MODEL CURRICULUM

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-V

Sl. No.	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			
			Hours per week			Duration in Hours	Maximum Marks		Credits
			L	T	P		CIE	SEE	
THEORY									
1	**18EEC14**	Electrical Machines-II	3	-	-	3	30	70	3
2	**18EEC15**	Power Systems-II	3	-	-	3	30	70	3
3	**18EEC16**	Power Electronics	3	-	-	3	30	70	3
4	**18EEEXX**	Core Elective -1	3	-	-	3	30	70	3
5	**18EEEXX**	Core Elective -2	3	-	-	3	30	70	3
6	**18MBC01**	Engineering Economics and Accountant	3	-	-	3	30	70	3
PRACTICALS									
7	**18EEC17**	Electrical Machines-II Lab	-	-	2	2	15	35	1
8	**18EEC18**	Power Systems-I Lab	-	-	2	2	15	35	1
9	**18EEC19**	Power Electronics Lab	-	-	2	2	15	35	1
		Total	**18**	**-**	**6**	**-**	**225**	**525**	**21**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Course Code	Core Elective-1
18EEE01	Wind and Solar Energy
18EEE02	Optimization Techniques
18EEE03	Electrical Engineering Materials
18EEE04	Electronic Instrumentation

Course Code	Core Elective-2
18EEE05	Simulation Techniques in Electrical Engineering
18EEE06	Energy Conservation & Auditing
18EEE07	Industrial Electrical Systems
18EEE08	Electrical Estimation & Costing

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

AICTE MODEL CURRICULUM

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-VI

Sl. No.	Course Code	Title of the Course	Scheme of Instruction: Hours per week			Scheme of Examination: Duration in Hours	Maximum Marks		Credits
			L	T	P		CIE	SEE	
THEORY									
1	**18EEC20**	Control Systems	3	-	-	3	30	70	3
2	**18EEC21**	Microprocessors and Microcontrollers	3	-	-	3	30	70	3
3	**18EEC22**	Power Systems Operation and Control	3	-	-	3	30	70	3
4	**18EEEXX**	Core Elective-3	3	-	-	3	30	70	3
5	**18EEEXX**	Core Elective-4	3	-	-	3	30	70	3
6	**18XXOYY**	Open Elective-1	3	-	-	3	30	70	3
PRACTICALS									
7	**18EEC23**	Control Systems Lab	-	-	2	2	15	35	1
8	**18EEC24**	Microprocessors Lab	-	-	2	2	15	35	1
		Total	**18**	**-**	**4**	**22**	**210**	**490**	**20**

L: Lecture T: Tutorial P: Practical

CIE - Continuous Internal Evaluation SEE - Semester End Examination

Course Code	Core Elective-3
18EEE09	Power Quality
18EEE10	Advanced Power Converters
18EEE11	Electrical Distribution Systems
18EEE12	HVDC Transmission Systems

Course Code	Core Elective-4
18EEE13	AI Techniques In Electrical Engineering
18EEE14	Electric Hybrid Vehicles
18EEE15	FACTS
18EEE16	Special Electrical Machines

Course Code	Open Elective-1
18ECO06	Principles of Embedded Systems (PES)
18CSO07	Basics of Cyber Security (BCS)
18BTO01	Basics of Biology
18PYO01	History of Science and Technology

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

V – SEMESTER

18EEC14 **ELECTRICAL MACHINES-II**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objective of this course is to:
1. To understand the construction and operational features of ac Machines.
2. To familiarize with performance aspects of Induction Motor, Synchronous Machine.
3. To impart the knowledge of various starting methods and selecting a suitable method based on the application.

Course Outcomes: The student will be able to:
1. Identify the various parts and nomenclature related to ac Machine windings
2. Classify various ac Machines based on constructional and operational features.
3. Associate the concepts with characteristics of ac Machines.
4. Analyze various starting and speed control methods of ac Machine.
5. Sketch and analyze the Characteristics of ac Machine based on application.
6. Determine the performance parameters of ac machines.

UNIT-I
Fundamentals of AC machine windings : Slots for windings, Harmonics (slot and teeth Harmonics), Suppression of Harmonics, full-pitch and short pitch coils, concentrated winding, distributed winding, pitch factor, distribution factor, Integral and fractional slot windings, Air-gap MMF distribution with fixed current through winding - concentrated and distributed, advantages of star connected winding.

UNIT-II
Three phase Induction Machines: Constructional features, types of rotors, production of rotating magnetic field, operation, slip, rotor current and frequency, equivalent circuit, torque expression, starting torque, maximum torque, torque-slip characteristics, parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency), cogging and crawling, power flow, losses and efficiency, no load and blocked rotor test, predetermination of performance characteristics using circle diagram, double cage induction motor, induction generator.
Starting methods: Primary resistors, auto-transformer, star-delta and DOL starting. Speed control methods from stator and rotor side.

UNIT-III
Single-phase Induction Motors: Constructional features double revolving field theory, split phase, shaded pole and capacitor type motors, equivalent circuit, applications.

UNIT-IV
Synchronous Generators: Constructional features, cylindrical and salient pole rotor synchronous machine - generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, open circuit, short circuit and zero power factor characteristics, voltage regulation by EMF, MMF and ZPF method, Salient pole alternators two reaction theory, Phasor diagram, power angle characteristics. Parallel operation of alternators, synchronization and load division.

UNIT-V
Synchronous Motor: Theory of Operation, methods of starting, variation of current and power factor with excitation on no-load and on-load, Hunting and its prevention, synchronizing power, synchronous condenser.

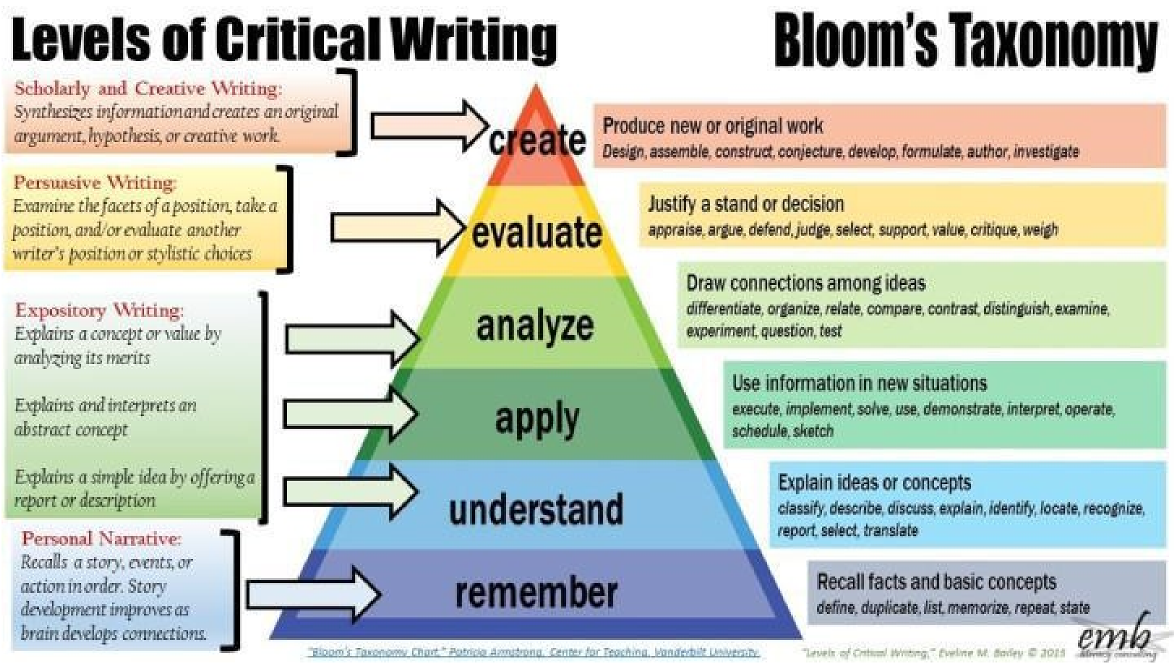
Text Books:

1. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
2. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
3. J.B Gupta, S.K. Kataria & Sons, "Theory and performance of electrical machines", 14th Edition, 2014.
4. Ashfaq Hussain "Electrical Machines" Dhanapat Rai and sons, 3rd Edition 2012.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Suggested Readings:

1. A.E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.
2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
3. A. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984.
4. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2007.
5. Juha Pyrhonen, Tapani Jokinen, Valeria Hrabovcova, "Design of Rotating Electrical Machines", John Wiley &Sons, Ltd. 2008.



18EEC15 **POWER SYSTEMS -II**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objective of this course is to:

1. To understand the modelling of transmission lines and their performance calculations
2. To understand per unit system representation and calculation of fault currents.
3. To understand the generation of over voltages and power flow analysis of given power system.

Course Outcomes: After completion of this course, students will be able to:

1. Analyse the performance of different types of transmission lines and evaluate the effect of corona on transmission lines
2. Understand the per unit quantities of the given power system
3. Classify different types of faults and apply symmetrical components to solve the power system problem when subjected to different fault conditions
4. Describe the causes of over voltages and analyse reflection and refraction coefficients of overhead lines and cables
5. Apply Gauss Seidel method and Newton-Raphson method to find power flows and voltages of the given power system.

UNIT-I

Modelling of Transmission Lines: Short, medium, long lines, Line calculations, Tuned Lines, Surge impedance loading, Travelling wave equations, series and shunt compensation of Transmission lines
Corona: Causes, Disruptive and Visual Critical Voltages, Power loss, minimization of Corona effects.

UNIT-II

Per Unit System of Representation: Use of per unit quantities in power systems, Advantages of per unitsystem.
Symmetrical Faults: Typical waveform under balanced terminal short circuit conditions: steady state, transientand sub transient equivalent circuits, Reactance of Synchronous Machines, fault calculations, Short circuit capacity of a bus.

UNIT-III

Unsymmetrical Faults: Symmetrical components of unsymmetrical Phasors, Power in terms of symmetricalcomponents, sequence impedance and sequence networks. Sequence networks of unloaded generators, Sequence impedances of circuit elements, Single line to ground, line-to-line and double line to ground faults on unloaded generator, Unsymmetrical faults of power systems.

UNIT-IV

Transients in Power systems: Generation of Over-voltages: Causes of over voltages, lightning and SwitchingSurges, Travelling Wave Theory, Wave equation, Reflection and refraction coefficients, Junction of cable andoverhead lines, Junction of three lines of different natural impedances, Bewley Lattice diagram, Introduction to EMTP.

UNIT-V

Power Flow Analysis: Formation of Bus Admittance Matrix. Real and reactive power balance equations at anode. Load and Generator Specifications. Application of numerical methods for solution of non-linear algebraic equations- Gauss Seidel and Newton-Raphson methods for the solution of the power flow equation.

Text Books:

1. J.J Grainger and W. D. Stevenson, “Power System Analysis”, McGraw Hill Education, 1994.
2. O. I. Elgerd, “Electric Energy Systems Theory”, McGraw Hill Education, 1995.
3. C.L. Wadhwa, “Electric Power Systems Theory”, New Academic Science Limited, 2012

Suggested Reading:

1. A.R. Bergen and V. Vittal, “Power System Analysis”, Pearson Education Inc., 1999.
2. D.P. Kothari and I. J. Nagrath, “Modern Power System Analysis”, McGraw Hill Education, 2003.
3. B.M. Weedy, B.J. Cory, N. Jenkins, J. Ekanayake & G. Strbac, “Electric Power Systems”, Wiley, 2012

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEC16 **POWER ELECTRONICS**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objective:

1. To identify the characteristics of different static switches and their turn-ON & turn-OFF methods.
2. To know the principles of AC-DC, DC-DC, DC-AC and AC-AC energy conversions.
3. To study various methods of voltage control in power converters.

Course Outcomes: After the completion of this course, students will be able to:

1. Understand the construction, operation and characteristics of various power semiconducting devices and to identify their selection in appropriate application.
2. Comprehend the driver/trigger circuits for various devices & also protection circuit, different turn-OFF methods, series & parallel operation of SCRs.
3. Illustrate the principle of working of AC-DC, AC-AC, DC-DC & DC-AC converters.
4. Analyse the performance for various power converters with different loads and modes of working.
5. Describe various voltage control techniques in power electronic converters with their applications

UNIT-I

Power Switching Devices: Power diode, characteristics, Recovery characteristics, Types of power diodes, General purpose diodes, Fast recovery diodes, their applications. Bipolar Junction Transistors(BJT), Power MOSFET, IGBT Basic structure and working, Steady state and switching characteristics, Gate drive circuits for MOSFET and IGBT, Comparison of BJT, MOSFET and IGBT, Their applications.

UNIT-II

Silicon Controlled Rectifier (SCR): SCR-Static characteristics, Two transistor analogy, Protection of SCRs, Dynamic characteristics, Series and parallel operation of SCRs, SCR trigger circuits-R, RC and UJT triggering circuits, Commutation methods of SCR.

UNIT-III

Thyristors Rectifiers: Study of Single-phase and three phase half wave and full wave controlled rectifiers with R, RL, RLE loads, significance of freewheeling diode, Effect of source inductance, Dual converters - circulating and non circulating current modes.

UNIT-IV

DC-DC Converters: Principles of Step-down, Step-up, Step UP/Down choppers, Time ratio control and current limit control, Types of choppers Type- A, B, C, D and E, Voltage commutated chopper, Introduction to Buck, Boost and Buck-Boost regulators.

AC-AC Converters: Principle of operation of Single phase step-up and step-down Cyclo-converters and their applications. Single-phase AC Voltage Controllers with R and RL loads

UNIT-V

DC-AC Converters: Principle of operation of Single-phase Bridge inverters, Voltage control methods, Single pulse width modulation, Multiple pulse width modulation, Sinusoidal pulse width modulation, Three-phase bridge Inverters, 180^0 & 120^0 modes of operation, switch states, instantaneous output voltages, average output voltages for single & three phase inverters, Current source inverters, Comparison of Voltage Source Inverters and Current Source Inverters,

Text Books:

1. Singh. M. D, Khanchandani.K. B, "Power Electronics", Tata McGraw Hill, 2nd Edition, 2017.
2. Rashid. M. H., "Power Electronics Circuits Devices and Applications", 4th Edition, Pearson India, 2017.
3. Bimbra. P. S, "Power Electronics", Khanna Publishers, 3rd Edition, 2013.
4. R. W. Erickson and D. Maksimovic, "Fundamentals of Power Electronics", Springer Science & Business Media, 2013

Suggested Reading:

1. N. Mohan, T.M. Undeland , "Power Electronics: Converters, Applications and Design", John Wiley & Sons,2007
2. P.C. Sen, "Power Electronics", Tata Mc-Graw Hill, 1st Edition, 2001.
3. L.Umanand, "Power Electronics: Essentials and Applications", Wiley India, 2009

There are only two mistakes one can make along the road to truth; not going all the way, or not starting at all; not doing anything can be worse than doing the wrong thing.

Vikasa Mantras- Vivekananda Institute of Human Excellence

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEC17 **ELECTRICAL MACHINES-II LAB**

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course objectives:
1. To understand the practical connections of the machines.
2. To calculate the various parameters of induction motor and synchronous machine by performing the experiment.
3. To analyze the performance of the induction motor and synchronous machine by conducting suitable experiments.

Course Outcomes: After the completion of this course, students will be able to:
1. Identify the connections for Induction and synchronous machines for their applications.
2. Control the speed of the induction motor using different methods.
3. Estimate the voltage regulation of alternator by various regulation methods.
4. Illustrate the synchronization of alternator to bus bar.
5. Determine the performance characteristics of induction machines by conducting suitable tests.
6. Analyze the conversion principle employed in Scott connection of transformer.

LIST OF EXPERIMENTS

1. Three-phase to two phase conversion of transformer (Scott connection)
2. Performance characteristics of single-phase induction motor.
3. Speed control of 3 phase induction motor by rotor resistance control and by V/f control method.
4. No- load test of slip ring induction motor to determine the relationship between
   i) Applied voltage and speed, ii) Applied voltage and rotor current, iii) Applied voltage and stator current,
   iv) Applied voltage and power factor, v) Applied voltage and power input.
5. No-load test, blocked rotor test and load test on 3-phase squirrel cage Induction motor.
6. Power factor improvement of induction motor using capacitors.
7. Line excited induction generator characteristics.
8. Voltage regulation of alternator by i) Synchronous impedance method ii) Ampere-turn method.
9. Voltage regulation of alternator by zero power factor method.
10. Measurement of Xd and Xq of 3 phase salient pole synchronous machine by conducting slip test.
11. Synchronization of three-phase alternator to bus bar using dark lamp method.
12. Variation in the active and reactive power of an alternator connected to an infinite bus by
    i) Varying excitation, ii) Varying mechanical-power input.
13. Separation of core losses in a single-phase transformer.

Note: At least **TEN** experiments should be conducted in the semester.

18EEC18 **POWER SYSTEMS-I LAB**

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:
1. To understand the working of Generating Stations and calculations of line parameters
2. To determine regulation & efficiency of short, medium and long transmission lines and to calculate A, B, C, D constants and study Ferranti effect in long lines.
3. To calculate the sequence impedance of alternator and transformer

Course Outcomes: After completion of the course, students will be able to:
1. Analyze the working of various parts of Generating Station.
2. Experiment with string of insulators and 3 core cables.
3. Determine the dielectric strength of oil.
4. Evaluate the Line Constants, ABCD constants, regulation and efficiency of a transmission line.
5. Calculate the sequence parameters of the transformer and alternator.

LIST OF EXPERIMENTS

1. Visiting nearby Generating Plant and submitting the report.
2. Line Constants determination of 3-Phase Transmission Line.
3. Determination of Voltage distribution and String efficiency of string of Insulators.
4. Measurement of capacitance of 3-core cables.
5. Determination of dielectric strength of transformer oil & Study of Megger.
6. Evaluate the Power Factor Improvement methods in 3-Phase Transmission Line.
7. Determination of A, B, C, D constants of 1-Phase transmission line.
8. Determination of regulation & efficiency of 3-Phase transmission line.
9. Study of Series- shunt compensation of a long transmission line.
10. Design of Static excitation system of Synchronous Generator.
11. Determination of Synchronous machine reactance and time constant from 3-Phase S.C test.
12. Determination of Sequence impedance of 3-Phase Alternators by fault Analysis.
13. Determination of positive, negative and zero-sequence impedance of 3 -Phase transformers.

Note: At least **TEN** experiments should be completed in the semester

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEC19 **POWER ELECTRONICS LAB**

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:
1. To obtain and plot the characteristics of different static switches.
2. To analyze the triggering and commutation circuits for SCR.
3. To familiarize and simulate the conversion principles of AC-DC, DC-DC, DC-AC and AC-AC conversion circuits.

Course Outcomes: After completion of the course, students will be able to:
1. Plot the characteristics of various controlled switches and identifies effect of variation of control signal on the regions of switching operation.
2. Demonstrate the effect of delay angle and nature of load on the performance of various power converters and able to plot the output voltage and current waveforms.
3. Simulate various types of power converters and discriminate between simulation models and practical models of various power converters.
4. Understand various voltage control techniques in different power converters.
5. Select proper equipment, precautions, implement connections keeping technical, safety and economic issues.

List of Experiments

PART-A

1. Study of static characteristics of S.C.R. and to measure latching & holding currents.
2. Study the characteristics of BJT, MOSFET and IGBT.
3. R, RC and UJT triggering circuits for SCR
4. Study of forced commutation techniques of SCR.
5. Single phase half-controlled bridge rectifier with R and RL loads.
6. Single phase fully controlled converter with R and RL loads and freewheeling diode
7. Single phase full converter as a controlled rectifier and inverter.
8. Three phase half-controlled bridge rectifier with R and RL loads.
9. Three phase fully controlled bridge rectifier with R and RL loads.
10. DC voltage control using Buck and Boost choppers.
11. Voltage commutated chopper with R&RL loads
12. Current commutated chopper with R&RL loads.
13. Single phase step down Cyclo converter with Rand RL loads.
14. Single phase A.C voltage controller with R and RL loads
15. Half and Full bridge inverters with R&RL loads.

PART-B
1. Simulation of Single-Phase Full converter and Semi converter with R & RL loads and freewheeling diode.
2. Simulation of Three Phase Full converter and Semi converter with R & RL loads.
3. Simulation of Single-phase AC voltage controller with R & RL loads
4. Simulation of single phase Cyclo converter with R & RL loads.
5. Simulation of single-phase half-bridge & full-bridge inverters.
6. Simulation of three phase bridge inverter in different modes.
7. Simulation of Single Phase Inverter with single, multiple and sinusoidal pulse width modulations.

Note: At least **SEVEN** experiments from PART-A and **THREE** from PART-B should be conducted in the semester.

18EEE01 **WIND AND SOLAR ENERGY SYSTEMS (Core Elective - 1)**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives:
1. To familiarize Non-Conventional energy sources for sustainable energy conversion.
2. To understand working of wind power generation and wind energy conversion systems.
3. To understand the working of solar energy systems and Explore the issues with integration of renewable energy sources.

Course Outcomes: After the completion of this course, students will be able to:
1. Understanding the significance of non-conventional energy sources
2. Apply the knowledge of physical requirement of wind power energy systems
3. Analyze the required parameters for generator, turbine and converter suitable for a specific wind-generation topology.
4. Understand solar thermal systems
5. Analyze the network integration issues

UNIT-I:
Fundamentals of Energy: Introduction, Classification of energy resources, importance of Non Conventional Energy Sources, Common forms of energy, Merits and Demerits of non-conventional energy sources over conventional energy sources.

UNIT-II
Physics of Wind Power: History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power-cumulative distribution functions. Review of modern wind turbine technologies, Fixed and Variable speed wind turbines.

UNIT-III
Wind generator topologies: Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent-Magnet Synchronous Generators, Power electronics converters, Generator-Converter configurations, Converter Control, Wind farm behavior during grid disturbances, Power quality issues, Power system interconnection experiences in the world, Hybrid and isolated operations of wind systems.

UNIT-IV
The Solar Resource: Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability. Peak Sun Hours (PSH) at a location
Solar photovoltaic: Technologies-Amorphous, mono crystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Maximum Power Point Tracking (MPPT) algorithms, Balance of System Components, Solar PV Systems, Solar PV Applications
Solar Thermal Systems: Introduction, Solar Collectors, Solar Water Heater, Solar Passive Space Heating and Cooling Systems, Solar Industrial Heating Systems, Solar Refrigeration and Air Conditioning Systems, Solar Cookers

UNIT-V
Network Integration Issues: Overview of grid code technical requirements, Fault ride-through for wind farms -real and reactive power regulation, voltage and frequency operating limits.

Text Books:

1. T. Ackermann, “Wind Power in Power Systems”, John Wiley and Sons Ltd., 2005
2. G. M. Masters, “Renewable and Efficient Electric Power Systems”, John Wiley and Sons, 2004.
3. S. P. Sukhatme, “Solar Energy: Principles of Thermal Collection and Storage”, McGraw Hill, 1984.

Suggested Reading:

1. H. Siegfried and R. Waddington, “Grid integration of wind energy conversion systems” John Wiley and Sons Ltd., 2006
2. G. N. Tiwari and M. K. Ghosal, “Renewable Energy Applications”, Narosa Publications, 2004
3. J. A. Duffie & W.A. Beckman, “Solar Engineering of Thermal Processes”, John Wiley & Son

18EEE02 **OPTIMIZATION TECHNIQUES (Core Elective - 1)**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To study about classical optimization techniques which include single variable and multi-variable optimization with equality constraints
2. To study about linear programming and non-linear programming methods
3. To study about Genetic algorithms.

Course Outcomes: After completion of the course, students will be able to:
1. Solve the single variable and multi variable problems with and without constraints using classical optimization techniques
2. Determine the solution of linear programming problem using graphical method, simplex algorithm and revised simplex algorithm
3. Calculate the optimum of a nonlinear function using various elimination and search methods
4. Analyze Steepest Descent, Conjugate Gradient, Newton method, David-Fletcher-Powell methods in finding the optimum of given non linear function
5. Discuss the operators, selection techniques in genetic algorithm and apply the genetic algorithm to economic load dispatch problem

UNIT- I
Introduction: Classical optimization techniques: Statement of optimization problem, Objective function, Classification of optimization problems, Single-variable & Multi-variable Optimization without constraints. Multi-variable optimization with equality Constraints, Lagrange multiplier method, Multi-variable optimization with inequality constraints, Kuhn- Tucker conditions

UNIT- II
Linear Programming: Standard form, Formulation of the LPP, Solution of simultaneous equations by Pivotalcondensation, Graphical method, Simplex algorithm, Revised simplex method

UNIT- III
Non-Linear Programming-I: Unimodal function, Elimination methods: Fibonacci method, Golden Sectionmethod.
Direct Search methods: Univariate Search method, Hook and Jeeve's method, Powell's method.

UNIT- IV
Non-Linear Programming-II:
Gradient methods: Steepest Descent, Conjugate Gradient, Newton method, David-Fletcher-Powell method

UNIT-V
Genetic Algorithms: Introduction, Encoding, Fitness Function, Basic Operators, Single Point cross over, two-**point** cross over, uniforms cross over, mutation operator, Selection Techniques, Tournament Selection, Roulette wheel selection.

Text Books:

1. S.S.Rao, "Engineering Optimization Theory and Applications", New Age International, 3rd Enlarged Edition(in two colour), 2013
2. Jasbir S. Arora, "Introduction to Optimum Design", Academic Press, 4th Edition, 2016

Suggested Reading:

1. Kalyamoy, Deb, "Multi Objective Optimization using Evolutionary Algorithms", Wiley publications, 2013.
2. S. Rajasekharam, G.A. Vijaya Lakshmi, "Neural networks, Fuzzy logic and Genetic Algorithms Synthesis and Applications", PHI publications, 2010

18EEE03 **ELECTRICAL ENGINEERING MATERIALS (Core Elective -1)**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To study the conducting, insulating and magnetic properties of different materials
2. To know the optical properties for materials.
3. To categorize the materials used for Direct Energy Conversion

Course Outcomes: After the completion of this course, students will be able to
1. Classify the given conducting material based on its properties
2. Understand and select proper insulating material in the field of Electrical engineering
3. Investigate the suitability of material for the latest technological requirement
4. Select a suitable material for optical applications.
5. Illustrate the materials used in Direct Energy Conversion Devices.

UNIT- I

Conducting Materials: Electrical conducting Materials, High conductivity materials, Materials of High Resistivity, Materials used for precision work, rheostats, heating devices, Super conductivity, Special types of alloys, Applications &Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale integration techniques (VLSI).

UNIT -II

Insulating Materials: Classification of Insulting materials, temperature rise, electrical properties of insulating materials used for wires-laminations- machines and their applications, Ceramics, Plastics, DC electrical properties, AC electrical properties, Dielectric properties of insulators, Dielectric materials used for various electrical applications, suitability.

UNIT- III

Magnetic Materials: Magnetic parameters, the three types of magnetic material, measuring of magnetic parameters, Application of soft magnetic materials, Magnetic recording media, Hard (permanent) magnets, Ferrites, Samarium, Cobalt alloys, Neodymium Iron Boron (Nd Fe B).

UNIT- IV

Optical Properties of Materials: EM Radiation Spectrum, Optical properties in materials, Photo electric emission, Photo conductivity, Lasers, Optical fibres, fibre cables.

UNIT –V

Materials for Direct Energy Conversion Devices: Solar cells, equivalent circuit of a solar cell, fuel cell, MHD generators, storage of hydrogen, thermoelectric generators, Nano applications in Electrical Engineering.

Text Books:
1. G.K Benarjee, "Electrical and Electronic Engineering Materials", PHI, 2015
2. Ian P. Jones, "Material Science for Electrical and Electronic Engineers", Oxford University Press, 2008.
3. R. K Sukhla, "Electrical Engineering Materials", McGraw Hill Education, 2013.

Suggested Reading:
1. Dhir, "Electronic Components & Materials", McGraw Hill Education,2012.
2. "Electrical Engineering Materials", McGraw Hill Education, TTTI Madras, 2004.

18EEE04 ELECTRONIC INSTRUMENTATION (Core Elective - 1)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To impart basic knowledge of International Standards for various physical quantities and understanding of measurement systems.
2. To familiarize with many varieties of transducers, measuring instruments, their construction and operating principles.
3. To introduce various types of spectrum analyzers, digital instrumentation with design and also an exposure to some of the prominent bio-medical Instrumentation systems.

Course Outcomes: After the completion of this course, students will be able to:
1. Understand the various standards available for the measurement process.
2. Acquire knowledge on various transducers with the analysis in their working principles.
3. Select an electrical transducer for a given physical quantity measurement.
4. Identify instruments like spectrum analyzer, DSO and other virtual instrumentation techniques such as SCADA for appropriate measurements.
5. Illustrate the applications of various Bio-medical instruments used in healthcare.

UNIT– I

Introduction to Instrumentation: Accuracy and Precision - Conformity and Significant figures, Resolution and Sensitivity, Types of Errors, Loading effect, Absolute errors and Relative errors, Measurement of error combinations, Statistical analysis, Probable error and Limiting errors, Calibration, IEEE standards, Elements of ISO 9001, Quality management standards.

UNIT–II

Transducers-I: Classification of transducers, factors for selection of a transducer, Passive electrical transducers: Strain gauges - gauge factor, types of strain gauges - bonded and un-bonded, rosettes, LVDT-construction and displacement measurement, Capacitive transducer and thickness measurement. Active electrical transducers: Piezo-electric transducer and different modes of operation, photo-conductive, photo-voltaic and photo - emissive transducers, semiconductor stain gauges.

UNIT–III

Transducers-II: Characteristics of sound, pressure, power and intensity levels. Microphones and their types. Temperature measurement, resistance wire thermometers, semiconductor thermometers and thermocouples. Introduction to Micro-Electro-Mechanical Systems (MEMS)

UNIT – IV

Digital Instruments: Block diagram, specification and design considerations of different types of DVMs. Spectrum analyzers. Delayed time base oscilloscope, Digital storage oscilloscope. Introduction to Virtual Instrumentation, SCADA. Data Acquisition System- block diagram

UNIT–V

Applications of Instrumentation: Human physiological systems and related concepts. Bio-potential electrodes Bio-potential recorders - ECG, EEG, EMG and CT scanners, magnetic resonance and imaging systems, Ultrasonic Imaging systems.

Text Books:

1. Albert D. Helfric, and William D. Cooper, “Modern Electronic Instrumentation and Measurement Techniques”, PHI, Jan-2015
2. H S Kalsi, “Electronic Instrumentation”, 3/e, TMH, July-2017
3. Nakra B.C, and Chaudhry K.K., “Instrumentation, Measurement and Analysis”, TMH, Dec-2017

Suggested Readings:

1. David A. Bell, “Electronic Instrumentation & Measurements” PHI, 2nd Edition, 2003.
2. Khandpur. R.S., “Handbook of Bio-Medical Instrumentation”, TMH, 2003.
3. Leslie Cromwell and F.J. Weibell, E.A. Pfeiffer, “Biomedical Instrumentation and Measurements”, PHI, 2nd Ed, 1980.

18EEE05 SIMULATION TECHNIQUES FOR ELECTRICAL ENGINEERING (Core Elective-2)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To introduce basics of MATLAB and PSpice
2. To build knowledge about matrices and plots
3. To introduce various simulation techniques and computational methods using MATLAB and PSpice

Course Outcomes: After completion of the course, students will be able to:
1. Understand basic syntax of MATLAB and PSpice programming
2. Apply matrix mathematics, plots and functions for solving and visualization of the numerical solution
3. Determine DC, AC and transient analysis in PSpice environment
4. Design modelling parameters of Diode, BJT, MOSFET, IGBT and SCR
5. Analyse the response of uncontrolled and controlled rectifiers with different controlled parameters and loads

UNIT-I

Basics: MATLAB environment, variables, Basic data types, Relational and Logic operators, Conditional statements, Input and Output, Loops and bracing.

UNIT-II

Matrices: Creating and Manipulating matrices, Matrix mathematics and Matrix functions, Colon operator, Line space, Cross product, Dot product, Logical functions, Logical indexing, 3 – dimensional arrays, Cell arrays, Structures, Plotting: 2-D and 3-D plots: Basic plots, subplots, Histograms, Bar graphs, Pie charts.

UNIT-III

M –file Scripts: Creating saving and running an M–file, creating and running of a function, function definition line, H1 and help text lines, Function body, Sub – functions, File I/O handling

UNIT-IV

PSpice for Circuit Analysis: Introduction to PSpice, Description of circuit elements, nodes and sources, input and output variables, modelling of the above elements, types of DC analysis, types of AC analysis and Transient Analysis.

UNIT-V

PSpice for Electronic Devices and Circuits: Diode model, BJT model, MOSFET model, IGBT model, SCR model, Sub routines, diode rectifiers, controlled rectifiers.

Text Books:

1. Muhammad H. Rashid, "Power Electronics: Circuits, Devices, and Applications", Pearson Education India. 3rd Edition, 2009.
2. D Hanselman and B little field, "Mastering MATLAB 7", Pearson Education, 2005.
3. Y Kirani Singh and B B Chaudhari, "MATLAB Programming", Prentice Hall of India, 2007.

Suggested Reading:

1. Muhammad H. Rashid, "Spice for Power Electronics and Electric Power", CRC Press 3rd Edition, 2012.
2. A Gilat, "MATLAB: An Introduction with Applications", John Wiley and Sons, 2004

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEE06 ENERGY CONSERVATION AND AUDITING (Core Elective-2)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives:

1. To know the concept of energy conservation and auditing
2. To understand the formulation of efficiency for various electrical systems
3. To explore the different ways to design various technologies for efficient electrical systems.

Course Outcomes: After the completion of this course, students will be able to:

1. Understand about current energy scenario and importance of energy conservation
2. Apply the concepts of energy management
3. Analyze the performance of existing electrical and industrial systems
4. Understand different energy efficient systems in electrical and industrial systems
5. Apply the energy efficiency techniques in electrical systems

UNIT-I:

Energy Management & Audit: Definition, energy audit, need, types of energy audit. Energy management (audit) approach understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments. Material and Energy balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, restructuring of the energy supply sector, energy strategy for the future.

UNIT-II:

Basics of Energy and its various forms: Electricity tariff, load management and maximum demand control, power factor improvement, selection & location of capacitors, Thermal Basics-fuels, thermal energy contents of fuel, temperature & pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer, units and conversion.

UNIT-III

Energy Efficiency in Electrical Systems: Electrical system: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors.

UNIT-IV

Energy Efficiency in Industrial Systems: Compressed Air System: Types of air compressors, compressor efficiency, efficient compressor operation, Compressed air system components, capacity assessment, leakage test, factors affecting the performance and savings opportunities in HVAC, Fans and blowers: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. Pumps and Pumping System: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. Cooling Tower: Types and performance evaluation, efficient system operation, flow control strategies and energy saving opportunities, assessment of cooling towers (elementary treatment)

UNIT-V

Energy Efficient Technologies in Electrical Systems: controllers, energy efficient motors, soft starters with Maximum demand controllers, automatic power factor energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy efficient lighting controls, energy saving potential of each technology.

Text Books:

1. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects (available online)
2. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-3, Electrical Utilities (available online)

Suggested Reading:

1. S. C. Tripathy, "Utilization of Electrical Energy and Conservation", McGraw Hill, 1991
2. Y. P. Abbi, Energy Audit: Thermal Power, Combined Cycle, and Cogeneration Plants, The Energy and Resources Institute, 2012, ISBN 978-81-7993-311-4
3. Tarik Al-Shemmeri, "Energy Audits: A Workbook for Energy Management in Buildings", August 2011.
4. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)

If we have built castles in the air, our work need not be lost; that is where they should be. Now lay the foundation under them. But a fool is one who, having no goal, redoubles his efforts.

Vikasa Mantras- Vivekananda Institute of Human Excellence

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEE07 INDUSTRIAL ELECTRICAL SYSTEMS (Core Elective-2)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. Understand various components of industrial electrical systems and analyze and select the proper size of various electrical system components.
2. Understand the electrical wiring systems for residential and commercial consumers and analyze and select the proper size of various electrical system components.
3. Understand necessity of illumination for specified requirement

Course Outcomes: After completion of this course, students will able to:
1. Understand various components of industrial electrical systems
2. Apply residential and commercial electrical wiring rules and guidelines for installation of electrical systems
3. Design various Illumination schemes and lighting systems
4. Understand HT connection, Industrial loads and LT panel components
5. Select the proper size of various electrical system components

UNIT-I
Electrical System Components: LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, single line diagram (SLD) of a wiring system, Electric shock and Electrical safety practices (Elementary treatment only)

UNIT-II
Residential and Commercial Electrical Systems: Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components. (Elementary treatment only)

UNIT-III
Illumination Systems: Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting. (Elementary treatment only)

UNIT-IV
Industrial Electrical Systems I: HT connection, industrial substation, Transformer selection, Industrial loads, Earthing design, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components. (Elementary treatment only)

UNIT-V
Industrial Electrical Systems II: DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS & Battery Banks. (Elementary treatment only)

Text Books:
1. S. L. Uppal and G. C. Garg, “Electrical Wiring, Estimating & Costing”, Khanna publishers, 2008.
2. K. B. Raina, “Electrical Design, Estimating & Costing”, New age International, 2007.

Suggested Readings:
1. S. Singh and R. D. Singh, “Electrical estimating and costing”, Dhanpat Rai and Co., 1997.
2. H. Joshi, “Residential Commercial and Industrial Systems”, McGraw Hill Education, 2008.
3. Hemant Joshi "Residential, Commercial and Industrial Electrical Systems: Equipment and selection Volume 1 of Residential, Commercial and Industrial Electrical Systems", Tata McGraw-Hill Education, 2008

18EEE08 ELECTRICAL ESTIMATION AND COSTING (Core Elective-2)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To emphasize the estimation and costing aspects of all electrical equipment, installation and designs on the cost viability.
2. To Estimate the Bill of Materials for Residential and commercial installations
3. To design overhead transmission and distribution lines, substations and illumination schemes

Course Outcomes: After completion of this course, student will be able to:
1. Define the principles related to electrical wiring and costing.
2. Summarize the electrical specifications of residential building and electrification requirements.
3. Distinguish between Residential and Commercial Installations.
4. Estimate the materials required to Design Electrical Installation of Substation, Transmission and Distribution Systems.
5. Identify and Design the various types of light sources for different applications.

UNIT-I
Electrical Wiring: Different types of wires, wiring system and wiring methods, Comparison of different types of wirings. Specifications of Different types of wiring materials, Accessories Different types of wiring appliances and tools. Domestic and industrial panel wiring. Different types of wiring circuits. I.E. rules for wiring, Electricity supply act-1948.
Principles of Costing: Purpose of Estimating and Costing, Recording of Estimates, Determination of Cost Material and Labour, Over Head Charges, Profit, Purchase System, Payment of Bills, Tender Forms

UNIT-II
Residential Building Electrification: General Rules, guidelines for wiring of residential installation and positioning of equipment**,** Principles of circuit design in lighting and power circuits Procedures for designing the circuits and deciding the number of circuits, Method of drawing single line diagram. Selection of type of wiring and rating of wires and cables Load calculations and selection of size of conductor, Selection of rating of main switch Distribution board, protective switchgear ELCB,MCCB and MCB and wiring accessories, Earthing of residential Installation.

UNIT-III
Electrification of Commercial Installation: Concept of commercial Installation, Differentiate between electrification of residential and commercial installation, Fundamental and Design considerations of electrical Installation system for commercial Building Load calculation and selection of size of service connection and nature of supply, Deciding the size of the cables, bus bar and bus bar chambers, Mounting arrangements and positioning of switchboards, distribution boards main switch etc, Earthing of the electrical installation, Selection of Earth wire, wiring system and layout.

UNIT-IV
Design and Estimation Of Overhead Transmission & Distribution Lines: Introduction, Typical AC electrical power system, Main components of overhead lines, Factors governing height of pole, Conductor materials, Determination of size of conductor for overhead transmission line, Cross arms, Guys and Stays, Conductors configuration spacing and clearances, Span lengths, Overhead line insulators, Lightning Arrestors, Phase plates, Danger plates, Anti climbing devices, Bird guards, Beads of jumpers. Points to be considered at the time of erection of overhead lines, Erection of supports, setting of stays, fixing of cross arms, fixing of insulators, Conductor erection, Repairing and jointing of conductor, Dead end clamps, Positioning of conductors and attachment to insulators Jumpers, Tee-offs, Earthing of transmission lines. Guarding of overhead lines, Clearances of conductor from ground Spacing between conductors, Testing and commissioning of overhead distribution lines.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

UNIT-V

Design and Estimation of Substations: Introduction, Types of substations, Outdoor substation – Pole mounted type, Indoor substations – Floor mounted type.

Design and Estimation of Illumination Schemes: Introduction, Terminology in illumination, laws of illumination, various types of light sources, estimation and costing of lighting schemes.

Text Books:

1. "K. B. Raina, S. K. Bhattacharya", "Electrical Design Estimating and Costing", New Age International Publisher, 2010
2. "Gupta J. B., Katson, Ludhiana", "Electrical Installation, estimating and costing", S. K. Kataria and sons, 2013
3. "Surjit Singh", "Electrical Estimation and Costing". Dhanpatrai & Co. second edition, 2001.

Suggested Readings:

1. Code of practice for Electrical wiring installations (System voltage not exceeding 650 volts), Indian Standard Institution, IS: 732-1983.
2. Guide for Electrical layout in residential buildings, Indian Standard Institution, IS: 4648-1968.
3. Electrical Installation buildings Indian Standard Institution, IS: 2032

VI – SEMESTER

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEC20 **CONTROL SYSTEMS**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To understand different types of linear control systems and their mathematical modeling.
2. To study the stability analysis both in time and frequency domains.
3. To study the concepts of State space representation of Linear Time invariant systems (LTI).

Course Outcomes: After the completion of this course, students will be able to:

1. Understand different mathematical models for any electromechanical LTI systems.
2. Analyze the given first and second order systems based on their performance parameters.
3. Analyze absolute and relative stability of an LTI system using time and frequency domain techniques.
4. Analyze the effects of controller on a given system and to understand the concepts of compensators.
5. Develop various state space models for LTI systems and to check the concepts of Controllability and Observability.

UNIT-I

Introduction to control Systems: Open loop, closed loop System with illustrations and other classification of control systems, Impulse response and Transfer Function, Mathematical modeling of Mechanical and Electrical Systems, Analogous systems, Feedback control characteristics - effects of feedback, D.C & A.C servo motors, Synchro pair as an error detector, Block diagram algebra, Signal flow graphs and problems on conversion from block diagram to signal flow graph.

UNIT-II

Time Response Analysis: Standard test signals, Time response of first and second order systems for standard test inputs, Application of initial and final value theorem, Static error coefficients and steady state error (for standard test input signals) Design specifications for second-order systems based on the time-response.
Concept of Stability, Routh-Hurwitz Criteria, Relative Stability analysis, Root-Locus technique, Construction of Root-loci.

UNIT-III

Frequency-response analysis: Design specifications in frequency-domain, Relationship between time and frequency response, bode plots, Polar plots, Nyquist stability criterion, Relative stability using Nyquist criterion . Stability analysis of plots based on gain and phase margin.

UNIT-IV

Introduction to Controllers and Compensators:
Introduction to Proportional, Integral and Derivative, Proportional plus derivative, Proportional plus integral, Proportional plus integral plus derivative controllers, Introduction to Lead, Lag, Lead-lag and Lag-lead compensators.

UNIT-V

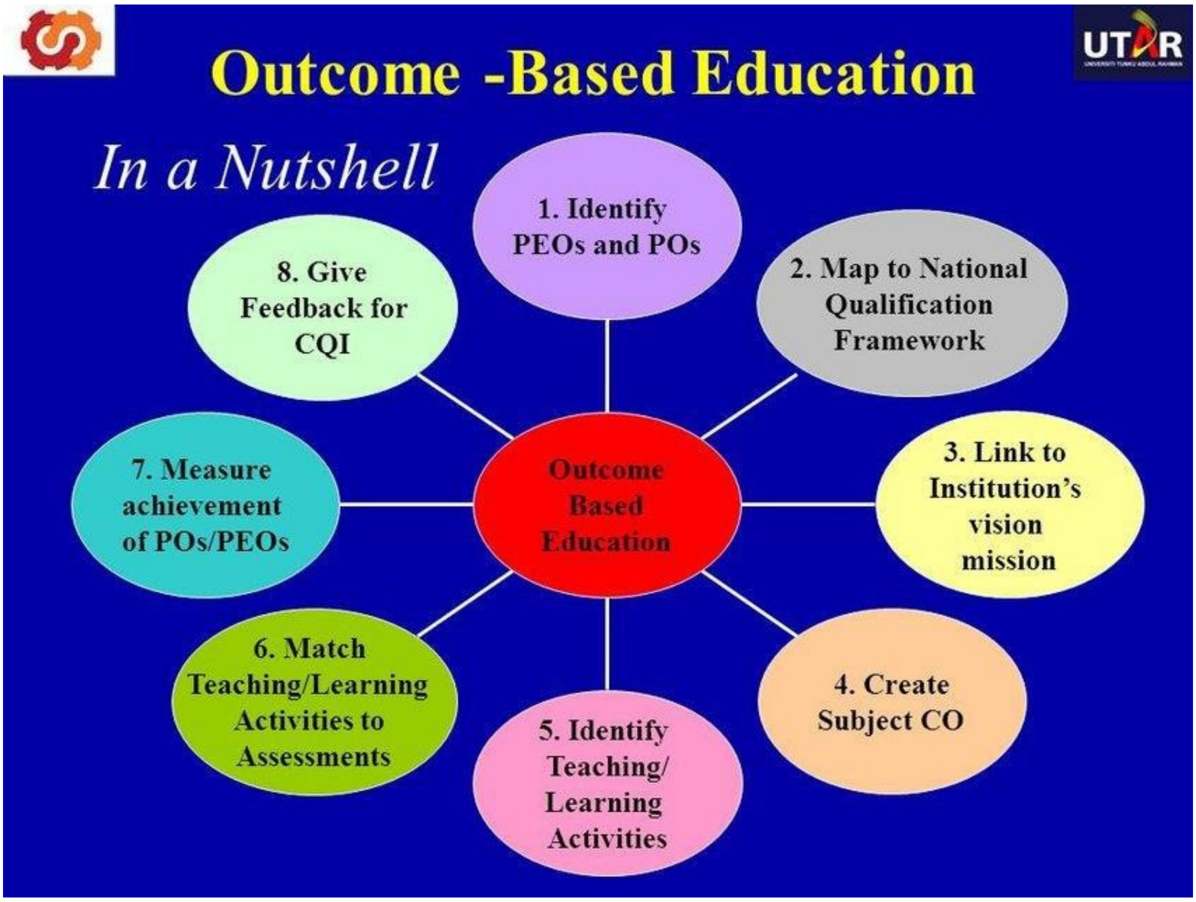
State variable Analysis and Nonlinear systems: Concepts of state variables, State space model, Diagonalization of State Matrix, State transition matrix and its properties, Solution of state equations, Eigenvalues and Stability Analysis, Concept of controllability and observability. Introduction to non-linear systems with suitable examples.

Text Books:

1. I.J. Nagrath, M. Gopal, Control System Engineering, New Age International (P) Limited Publishers, 5th Edition, 2008.
2. B.C. Kuo, Automatic Control Systems, John Wiley and son’s Publishers, 9th edition, 2009
3. K. Ogata, Modern Control Systems, 5th Edition.PHI publication, 2010.
4. A. Anand Kumar, Control Systems, 2nd Edition, PHI publications, 2014.

Suggested Readings:

1. M.Gopal, Control Systems Principles and Design- Tata McGraw Hill, 2nd Edition, 2003.
2. N.C Jagan-control Systems, 2nd Edition, BS Publications, 2008
3. N. Nise, Control Systems Engineering, 6th edition, Willey Publications, 2011



HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEC21 **MICROPROCESSORS AND MICROCONTROLLERS**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To familiarise the fundamental concepts and Internal functions of microcontrollers & Embedded Systems
2. To demonstrate Programming using 8051 Microcontroller.
3. To illustrate interfacing of 8051 Microcontroller to external devices and various communication protocols.

Course Outcomes: After the completion of this course, students will be able to:

1. Understand the basic concepts of Microcontrollers and Embedded Systems
2. describe the architecture and different modes of operations of 8051 Microcontroller
3. Apply knowledge of instruction set and addressing modes for writing Assembly Language Programming using 8051 Microcontroller.
4. Develop application circuits by interfacing peripherals like A/D, D/A, display and motors to 8051 Microcontroller.
5. Develop Systems using 8051 Microcontroller with the help of Communication Protocols like blue-tooth.

UNIT- I

Fundamentals of Microprocessors: Fundamentals of Microprocessor, Basic Block Diagrams of Microprocessor and Microcontroller, Comparison of 8-bit Microcontrollers, 16-bit and 32-bit Microcontrollers. Role of Microcontrollers in IoT.

UNIT- II

The 8051 Architecture: Internal Block Diagram, Pin diagram CPU, ALU, address, data and control bus, working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, timers, counters Memory Structures, Data and Program Memory.

UNIT-III

Instruction Set and Programming: Introduction, Instruction syntax, Data types, Subroutines Addressing Modes. 8051 Instruction set, Instruction timings.. Assembly language programs, C language programs. Assemblers and compilers. Programming and debugging tools.

UNIT-IV

Memory and I/O Interfacing 6 Hours): Memory and I/O expansion. Interfacing of peripheral devices such as General Purpose I/O, ADC, DAC, memory devices. LED, LCD and keyboard interfacing. Stepper motor interfacing, DC Motor interfacing, sensor interfacing

UNIT-V

External Communication and Introduction to embedded systems: Synchronous and Asynchronous Communication. RS232, SPI, I2C. Introduction and interfacing to protocols like Blue-tooth and Zig-bee. Definition of embedded system and its characteristics, Role of Microcontrollers in embedded Systems. Functional building block of embedded system, Characteristics of embedded system applications.

Text Books:

1. M. A. Mazidi, J. G. Mazidi and R. D. McKinlay, “The8051Microcontroller and Embedded Systems: Using Assembly and C”, Pearson Education, 2007.
2. K. J. Ayala, “8051 Microcontroller”, Delmar Cengage Learning,2004.
3. D. V. Hall, “Microprocessors & Interfacing”, McGraw Hill Higher Education, 1991.

Suggested Readings:

1. R. Kamal, “Embedded System”, McGraw Hill Education,2009.
2. R. Kamal, “Embedded System”, McGraw Hill Education,2009.
3. R. S. Gaonkar, “Microprocessor Architecture: Programming and Applications with the 8085”, Penram International Publishing, 1996.

18EEC22 POWER SYSTEM OPERATION AND CONTROL

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To understand the importance of Economic Operation and load frequency control of Power Systems
2. To understand the power system stability concepts
3. To get the knowledge of power system security and State Estimation

Course Outcomes: After completion of the course, students will be able to:
1. Determine the equal incremental cost with and without transmission losses and Bmn coefficients
2. Analyze the performance of primary Load frequency control loop and automatic voltage regulator loop
3. Calculate the steady state stability limit and transient stability when the synchronous machine connected to infinite bus is subjected to three-phase fault using Equal area criterion and step by step method.
4. Perform Security Analysis and Contingency Analysis for different Outage Conditions.
5. Elaborate different State Estimation techniques in Power Systems.

UNIT-I

Economic Operation of Power System: Input-Output curves, Heat rates and incremental cost curves, Equal Incremental cost criterion Neglecting transmission losses with and without generator limits, Bmn Coefficients, Economic operation including transmission losses.

UNIT-II

Control of Frequency and Voltage: Speed governor characteristics, turbine model, Frequency dependence of loads, Droop Control and Power Sharing. Automatic Generation Control, single area, two area, Generation and absorption of reactive power by various components of a Power System. Automatic Voltage Regulators.

UNIT-III

Stability Constraints in Synchronous Grids: Power System Stability: Definitions Steady state stability and Transient stability, Steady state stability of a synchronous machine connected to infinite bus, calculation of steady state stability limit, Swing Equations of a synchronous machine connected to an infinite bus. Power angle curve. Description of the phenomena of loss of synchronism in a single-machine infinite bus system following a disturbance like a three phase fault. Analysis using numerical integration of swing equations as well as the Equal Area Criterion.

UNIT-IV

Power System Security: Introduction, Factors Affecting Power System Security, Contingency Analysis: Detection of Network Problems, An overview of Security Analysis, Linear Sensitivity Factors, AC Power Flow Methods, Contingency Selection, Concentric Relaxation, Bounding

UNIT-V

State Estimation in Power System: Power System State Estimation, Weighted Least Square State Estimation: maximum likelihood concepts, matrix formulation, State Estimation of an AC Network, State Estimation by Orthogonal Decomposition, detection and identification of bad measurements, Network Observability and pseudo-measurements

Text Books:

1. I. J. Nagrath& D.P. Kothari, Modern Power System Analysis,4th Edition TMH Publication,2011
2. Allen J. Wood, Bruce.F.Woolenberg,Power Generation, Operation & Control, Wiley Publishers, 2006

Suggested Reading:

1. O. Elgard, Electric Energy Systems Theory, 2nd Edition. TMH Publication,2001
2. A. R. Bergen and V. Vittal, “Power System Analysis”, Pearson Education Inc., 1999.
3. CL Wadhwa, Electrical Power Systems, 3rd Edition New Age International Publications, 2014

18EEC23 **CONTROL SYSTEMS LAB**

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:

1. To understand the characteristics of DC, AC Servo Motors, synchro pair and the frequency response of compensating networks.
2. To study the closed loop performance for given plant using i) P, PI and PID controllers, ii) ON/OFF controller.
3. To perform Simulation studies on for linear time invariant systems

Course Outcomes: After the completion of this course, students will be able to:

1. Demonstrate the characteristics of DC, AC Servo motors and Synchro pair.
2. Analyze the performance parameters for a given second order plant both in time and frequency domain.
3. Analyze the performance of different compensators through frequency response .
4. Design P, PI, PID and ON/OFF controller for a given system and to distinguish the merits and demerits of these controllers.
5. Apply different stability techniques for linear time invariant systems using simulation and then verify with the theoretical calculations

LIST OF EXPERIMENTS

Part A

1. Characteristics of D.C Servo motor.
2. Characteristics of A.C. Servo motor.
3. Characteristics of Synchro Pair.
4. Performance parameters of a second order system excited with step input for different damping ratios.
5. Frequency response of lag and lead compensating networks.
6. Performance of a temperature control system using P, PI and PID Controllers.
7. Temperature control of a system using relay (ON/OFF Control).
8. a) Characteristics of magnetic amplifier for series and parallel connections with different values of resistive load.
   b) Measurement of Step angle for Stepper motor.
9. Find the response of different components of a control system using Linear System Simulator.
10. Demonstration of damping effect on the plant using DC Position Control system.

Part B

1. Stability Analysis (Root locus, Bode and Nyquist) for Linear Time Invariant systems.
2. a) Time Domain specifications for a second order system.
   b) Frequency Domain specifications for a second order system.
3. State space model for a given classical transfer function and its verification.
4. Design and analyze different compensators (lag, lead and lag-lead).

Note: At least **EIGHT** Experiments from **Part A** and **TWO** from **Part B** should be conducted in the semester.

18EEC24 **MICROCONTROLLERS AND ITS APPLICATIONS LAB**

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:
1. To explain instruction set of 8051 microcontroller
2. To demonstrate assembly language programming using 8051 microcontroller
3. To illustrate programming 8051 microcontroller with 'embedded C' Language.

Course Outcomes: After completion of the course, students will be able to:
1. Use instruction set of 8051 microcontroller to develop ALPs.
2. To write and execute simple programs using 8051 microcontroller.
3. Demonstrate the functioning of different instructions and subroutines using 8051 programming.
4. Create small application models by interfacing devices to 8051 programming through Keil/ Ride software.
5. Apply the knowledge of experiments done in the laboratory for doing mini projects and academic projects.

List of Experiments

PART-A

Using 8051 Microcontroller Kit:
1. Programs using Data Transfer Instructions- Block move, Exchange, Sorting, Finding Largest Element in an Array.
2. Programs using Arithmetic Instructions: Multi byte operations
3. Programs using Boolean and Logical Instruction (Bit manipulations).
4. Programs using JUMP and CALL Instructions
5. Programs to generate delay, programs using serial port and on chip timer/counter.
6. Programs using Look-up Table
7. Programs using interrupts.

PART-B

Program Development using 'c' cross compiler for 8051 Microcontroller
(Any 3 of the below mentioned experiments are to be Conducted)
1. DAC interfacing for Generation of Sinusoidal Waveform.
2. Stepper Motor control (clockwise and anticlockwise directions)
3. Interfacing of Keyboard and 7-segment Display Module
4. ADC interfacing for temperature monitoring
5. Traffic signal light controller

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEE09 **POWER QUALITY (Core Elective -3)**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. Understand the theoretical concepts and standards of Power Quality (PQ), and methods to calculate and analyze voltage sag in distribution systems.
2. Understand PQ issues and sources of harmonics in Industrial systems and its mitigation.
3. Understand the problems and solutions to wiring and Grounding

Course Outcomes: After completion of this course, students will be able to:
1. Illustrate the basic concepts of power quality issues and power quality monitoring, standards and measuring instruments.
2. Determine the voltage sag magnitude in radial, Non-radial and Meshed systems
3. Analyze voltage sags effect on three-phase AC-ASD, DC-ASD for industrial applications.
4. Identify the sources of harmonics and its mitigation techniques in industrial systems.
5. Discuss the protection devices for transient over voltages and solutions for Wiring and Grounding problems

UNIT-I
Power Quality problems in distribution systems: Sag, Swells, Interruptions, and Wave-form Distortions: harmonics, noise, notching, dc-offsets, fluctuations, flicker and its measurement. Tolerance of Equipment: CBEMA curve. Power quality monitoring, standards and measuring instruments.

UNIT-II
Voltage Sags-Characterization: Voltage Sag Magnitude, Sag Magnitude in Radial and Non-Radial Systems, Voltage sag Calculations in Meshed Systems.

UNIT-III
PQ Consideration in Industrial Power Systems: Adjustable speed drive (ASD) systems and applications, Characterization of voltage sags experienced by three-phase AC-ASD, DC-ASD systems, Effects of momentary voltage dips on the operation of induction and synchronous motors.

UNIT-IV
Harmonics: Sources of power system harmonics, Harmonic distortion, Harmonic Indices, Odd and Even Order Harmonics, Causes of Voltage and Current Harmonics, Locating Harmonic sources, Effect of Harmonics on Power System Devices, Mitigation of harmonics.

UNIT-V
Transient Over-voltages & Wiring and Grounding: Sources of Transient Overvoltage's, Principles of Overvoltage Protection Devices, Definitions, Reasons for Grounding and wiring, Typical Wiring and Grounding Problems, Solutions to Wiring and Grounding Problems.

Text Books:
1. C.Sankaran, 'Power Quality', CRC Press, 2001.
2. R. Sastry Vedam, M. Sarma, "Power Quality- Var Compensation in Power Systems ", CRC Press, 2009.

Suggested Reading:
1. Math H.J. Bollen, 'Understanding Power Quality Problems', IEEE Press, 2000.
2. Roger C. Dugan, Mark F. McGranaghan, Surya Santoso, H. Wayne Beaty, 'Electrical Power Systems Quality', 3rd Edition, Tata McGraw-Hill, 2012

18EEE10 **ADVANCED POWER CONVERTERS (Core Elective -3)**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To study various modern power electronic devices and different power factor improvement techniques in converters.
2. To study the concepts of Multi pulse and Multilevel power electronic circuits.
3. To understand different applications of power converters.

Course Outcomes: After completion of the course, students will be able to:
1. Outline various features and electrical specifications for a chosen modern power electronic device.
2. Understand different power factor improvement techniques in converters.
3. Comprehend the operation of Multi-Pulse converters and design its performance parameters.
4. Apply the concepts of different Multilevel Inverters that suits for industrial applications.
5. Recognize the applications of power converters.

UNIT-I
Modern Power Semiconductor Devices: Gate Turn Off- SCR(GTO-SCR), MOS Turn off Thyristor(MTO), Emitter Turn Off Thyristor (ETO), Integrated Gate Commutated Thyristor(IGCTs), MOS-controlled Thyristors(MCTs), symbol, structure and equivalent circuit, comparison of their features.

UNIT-II
Power factor Improvement Techniques: Power factor improvements – extinction angle control- symmetrical angle control- PWM control- SPWM control.

UNIT-III
Multi-Pulse converters: Review of transformer phase shifting, generation of 6-phase ac voltage from 3-phase ac, 6-pulse converter and 12-pulse converters with inductive loads, steady state analysis, commutation overlap, notches during commutation

UNIT-IV
Multilevel Inverters: Multilevel concept, Classification of multilevel inverters, Diode clamped Multilevel inverter, principle of operation, main features, improved diode Clamped inverter, principle of operation, flying capacitors multilevel inverter, principle of operation, main features, cascaded multilevel inverter, principle of operation, main features, Multilevel inverter applications.

UNIT-V
Applications of Power converters: AC power supplies, classification, switched mode AC power supplies, online and offline Uninterruptible Power supplies applications. DC circuit breakers

Text Books:

1. Mohammed H. Rashid, "Power Electronics, Devices, circuits and applications", Pearson Education, 4th Edition, 2017.
2. Ned Mohan Tore M. Undeland, "Power Electronics: Converters, Applications and Design", John Wiley & Sons, 3rd Edition, 2007.

Suggested Reading:

1. H. W. Whittington, B. W. Flynn and D. E. MacPherson, "Switched Mode Power Supplies, Design and Construction", Universities Press, 2009 Edition.
2. Umanand L., Bhat S.R., "Design of Magnetic Components for Switched Mode Power Converters", Wiley Eastern Ltd., 1992
3. Robert. W. Erickson, D. Maksimovic, "Fundamentals of Power Electronics", Springer International Edition,2013

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEE11 **ELECTRICAL DISTRIBUTION SYSTEMS (Core Elective -3)**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To study the load characteristics of distribution systems and understand the substation schemes, voltage drop calculation of different service areas.
2. To know about primary and secondary distribution systems and their characteristics.
3. To study different voltage control methods and applications of capacitors in distribution systems

Course Outcomes: After completion of this course, students will be able to:

1. Solve the problems on load factor, loss factor, coincidence factor and discuss the characteristics of loads along with load growth
2. Illustrate the substation bus schemes and determine the rating, voltage drop of substations
3. Determine the voltage drop and power losses of primary and secondary distribution systems
4. Analyze the distribution costs and voltage control methods in the distribution system
5. Calculate the reactive power requirements of the distribution system and summarize the functions and communications used in distribution systems

UNIT-I:

Load Characteristics: Demand, demand curve, load duration curve, Diversified demand, Non-coincident Demand, Coincidence factor, Contribution factor problems, Relationship between load and loss factors load growth, Rate structure, Customer billing, Classification of loads (residential, commercial, agricultural, and industrial) and their characteristics.

UNIT-II

Sub-Transmission Lines and Substations: Types of sub-transmission lines, Distribution substations, Substation bus schemes, Rating of distribution substation, Service area with multiple feeders, Percent voltage drop calculations.

UNIT-III

Primary and Secondary Feeders: Types of primary systems, Radial type, Loop type and Primary network, Primary feeder loading, Radial feeder with uniformly distributed load, Secondary voltage levels, Secondary banking, Secondary networks.

UNIT-IV

Voltage Drop and Power Loss Calculations: Voltage drop and power loss calculations, 3-phase, Non 3-phase primary lines, Single phase two-wire laterals with ungrounded neutral, Single phase two wire ungrounded laterals, two phase plus neutral lateral, Method to analyze distribution costs, Voltage control methods, Feeder voltage regulators.

UNIT-V

Application of Capacitors to Distribution Systems: Effects of series and shunt capacitors, Power factor correction, Economic justification for capacitors, Location and sizing of capacitors in distribution system.
Distribution System Automation: Definitions, control functions, Level of penetration of DA, Types of communication systems, Supervisory control and data acquisition.

Text Books:

1. Turan Gonen, Electric Power Distribution Engineering, TMH, 3rd Edition, 2016.
2. A.S.Pabla, Electric Power Distribution, TMH, 6th Edition, 2012.

Suggested Reading:

1. M. K. Khed Kar, G.M. Dhole, Electric Power Distribution automation, Laxmi Publications, 2010.
2. William Kersting, Distribution System Modelling and Analysis, 3rd Edition CRC Press, 2015.
3. S. Sivanagaraju, and V. Sankar, Electric Power Distribution and Automation, Dhanpat Rai & Co, 2012

18EEE12 **HVDC TRANSMISSION (Core Elective -3)**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To study the basics of HVDC and comparison between HVDC and HVAC and multi-terminal DC systems and their control methods.
2. To comprehend different converter circuits used in HVDC.
3. To familiarize with the control methods and protection methods of HVDC and its filter design techniques.

Course Outcomes: After completion of this course, students will be able to:

1. Understand the basics of HVDC and compare between HVDC and HVAC.
2. Analyze the converter circuits used in HVDC.
3. Understand the HVDC control methods and able to draw the control characteristics.
4. Understand the HVDC filter design technique and protection methods.
5. List out different MTDC links and their control.

UNIT-I

General consideration of DC and AC transmission systems: Comparison of AC and DC transmission systems, Application of DC transmission, Economic Consideration, Kinds of DC links, planning for HVDC transmission, Modem trends in DC transmission, Corona loss in AC & DC systems.

UNIT-II

Converter Circuits: Properties of Converter circuits, Different kinds of arrangements, Analysis of Bridge converters with grid control, with and without overlap angle, Equivalent circuit of rectifier. Inversion: Operation as Inverter, Equivalent circuit of Inverter.

UNIT-III

Control: Basic means of control, Limitations of manual control, Desired features of control, Combined characteristics of rectifier and inverter, Power reversal, constant minimum angle, Ignition angle control, Constant current control, Constant Extinction angle control.

UNIT-IV

Protection: Short circuit current, Arc-back, Commutation failure, Bypass valves, DC reactors, DC circuit breakers, Protection against over voltages, Harmonic filters.

UNIT-V Multi-terminal DC Systems: Application of MTDC systems, Types of MTDC systems, Comparison of series and parallel MTDC systems, Control of MTDC system (Basics).

Text Books:

1. Padiyar KR., “HVDC Power Transmission Systems”, New age, 2017
2. S.Kamakshaiah and V.Kamaraju., “HVDC transmission”, McGraw Hill 2017.

Suggested Reading:

1. Kimbark E.W., “Direct Current Transmission” Vol-I, JohnWtley, 1971. 1990.
2. Arrillaga J., “High Voltage Direct Current Transmission”, Peter Peregrinus Ltd., London, Pergamon Press, 1983

18EEE13 AI TECHNIQUES IN ELECTRICAL ENGINEERING (Core Elective -4)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To locate soft computing methodologies, such as artificial neural networks and Fuzzy logic algorithms
2. To expose students to the basic ideas, challenges, techniques and learning algorithms in ANN and fuzzy logic techniques
3. To know the applications of AI Techniques in electrical engineering and to analyse the metaheuristic techniques in real-world problems.

Course Outcomes: After the completion of this course, students will be able to:
1. Understand the concepts of ANNs, Fuzzy logic and metaheuristic Techniques
2. Identify and describe Artificial Neural Network and Fuzzy Logic techniques in building intelligent machines
3. Apply Artificial Neural Network & Fuzzy Logic models to handle uncertainty and solve engineering problems
4. Understand how metaheuristics can be used to find good enough solutions for computationally hard optimization problems
5. Apply metaheuristic techniques to the optimization problems related to electrical Engineering
6. Develop fuzzy logic control and metaheuristic technique for applications in electrical engineering

UNIT – I

Artificial Neural Networks: Introduction, Models of Neural Network, Architectures, Knowledge representation, Artificial Intelligence and Neural networks, Learning process, Error correction learning, Hebbian learning, learning tasks.

UNIT II

ANN Paradigms: Multilayer perception using Back Propagation Algorithm, Self organizing Map, Radial Basis Function Network, Functional link network, Hopfield Network, speed control of DC and AC motors using Neural Network.

UNIT- III

Fuzzy Logic: Introduction, Fuzzy versus crisp, Fuzzy sets, Membership function, Basic Fuzzy set operations, Properties of Fuzzy sets, Fuzzy Cartesian Product, Operations on Fuzzy relations, Fuzzy Quantifiers, Fuzzy Inference, Fuzzy Rule based system, De-fuzzification methods, Speed control of DC and AC motors using Fuzzy logic controller.

UNIT-IV

Metaheuristic Techniques-1: Introduction, Particle Swarm Optimization (PSO), Ant Colony Optimization (ACO), Harmony Search (HS) algorithms, Implementation of algorithms with test functions for optimization, Economic load dispatch using PSO, ACO, HS algorithms

UNIT- V

Metaheuristic Techniques-2: Teaching Learning Based Optimization Algorithm, differential evolution algorithm, Artificial bee colony algorithm, Implementation of algorithms with test functions for optimization, Single area system and two area system, Reactive power control

Text Books:

1. S. Rajasekaran and G.A.V. Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms"- PHI, New Delhi, 2010.
2. Xin-She Yang, "Engineering Optimization: An Introduction with Metaheuristic Applications"- Wiley publication, 2010.

Suggested Reading:

1. P.D. Wasserman, VanNostrandReinhold," Neural Computing Theory & Practice"- New York,1989.
2. Bart Kosko," Neural Network & Fuzzy System" Prentice Hall, 1992.
3. Yagna Narayana, " Artificial Nueral Networks" -PHI, New Delhi,2012

18EEE14 ELECTRIC AND HYBRID VEHICLES (Core Elective -4)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives:

1. To Know the Electric and Hybrid vehicles, and their advantages and disadvantages
2. To Understand the concept hybrid electric vehicles and energy management
3. To Develop and Optimize the design of propulsion motors for EV applications

Course Outcomes: After the completion of this course, students will be able to:

1. Be familiar to the models of describing hybrid vehicles and their performance.
2. Model the electric vehicles with different acceleration and range
3. Design Electric power train for Electric Vehicles
4. Analyze the different possible ways of energy storage
5. Illustrate the principle of Hybrid Electric Vehicle and Battery Electric Vehicle

UNIT-I

Introduction: Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, Air pollution and global warming, EV System – EV Advantages – Vehicle Mechanics – Performance of EVs, Introduction to Battery Electric Vehicle (BEV), Components and systems of Electric Vehicle, Policies and guidelines for electric mobility, Trends and challenges of implementation of mobility and start up opportunities.

UNIT-II

Hybrid Electric Vehicles: Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Electric Vehicle Modelling– Consideration of Rolling Resistance – Transmission Efficiency – Consideration of Vehicle Mass – Tractive Effort – Vehicle Acceleration – Modelling Electric Vehicle Range, Sizing of drive system, Plug-in electric vehicles, Hybrid electric drive for ship propulsion and military application,

UNIT-III

Electric Power Trains: Hybrid Electric Drive-trains: Basic concept of hybrid traction, introduction to various hybriddrive train topologies, different modes of operation, Power flow control in hybrid drive-train topologies, fuel efficiency analysis, Basic concept of electric traction, Components and systems of HEV, Selection and Sizingof the propulsion motor, Regenerative braking fundamentals, drive system efficiency

UNIT-IV

Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage**,** High Energy (Nickel, Sodium and Lithium based) batteries, Metal Air batteries, battery sizing, Fuel Cell based energy storage system, Super Capacitor based energy storage and its analysis, Hybridization of different energy storage devices, Introduction to energy management strategies used in hybrid and electric vehicles.

UNIT-V

Design, Analysis, Testing & Qualification of Propulsion Motor: PM Materials, Basic concepts of Design and analysis of water cooled PM Motor for EV and HEV, Outer rotor PM Motor drive, Basic Design Aspects of Induction for EV and HEV, Testing methods and standards, Different types of EV charging stations, Wireless charging technology, Vehicle to grid (V2G) fundamentals, EMI & EMC mitigation

Text Books:

1. C. Mi, M. A. Masrur, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies", Springer, 2015.
3. Mehrdad Ehsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.

Suggested Reading:

1. James Larminie, “Electric Vehicle Technology Explained”, John Wiley & Sons, 2003
2. T. Denton, “Electric and Hybrid Vehicles”, Routledge, 2016
3. Hybrid Vehicles and the future of personal transportation, Allen Fuhs, CRC Press, 2011.
4. Vehicle Power Management: Modeling, Control and Optimization, Xi Zhang, Chris Mi, Springer, 2011.
5. National Electric Mobility Mission Plan 2020 Released by DHI, Govt. of India
6. Zero Emission Vehicles (ZEV) Towards a Policy Framework, NITI Aayog
7. IEC and different IS and Eclectic Mobility Standards.

Time is what we need most, but what we use worst; Most of the misfortunes in our life are due to misused time.

Vikasa Mantras- Vivekananda Institute of Human Excellence

18EEE15 FLEXIBLE AC TRANSMISSION SYSTEMS (Core Elective -4)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To understand concepts of various FACTS devices and controllers
2. To study the various converter topologies used in FACTS
3. To study the principles of operation and control of shunt series and combined FACTS controllers

Course Outcomes: After completion of this course, students will be able to:
1. Choose the appropriate FACTS device/controller based on the needs of inter connected power transmission systems.
2. Analyze various converter circuits used in FACTS for harmonic reduction.
3. Illustrate the operation of shunt compensators (i.e. SVC, STATCOM) for the end of line voltage support and transient stability problems
4. Analyze the operation and control of GCSC, TCSC and SSSC.
5. Explain the principles, operation and control aspects of UPFC for P and Q control

UNIT-I
General System Considerations and FACTS: Transmission Interconnections, Flow of Power in an AC System, Power Flow and Dynamic Stability Considerations of a Transmission Interconnection, principles of series and shunt compensation, Basic Types of FACTS Controllers, Benefits from FACTS, Application of FACTS.

UNIT-II
Voltage-Source Converters: Review of Voltage-Sourced Converters basics, single-Phase Full-wave Bridge converter operation, single phase-leg operation, Square-Wave Voltage Harmonics for a single-phase bridge, Three-phase full-wave bride converter, sequence of valve conduction process in each phase-leg, three-level voltage-sourced converter, Pulse-Width Modulation (PWM) converter, Generalized Technique of Harmonic Elimination and voltage control.

UNIT-III
Shunt Compensators: Objectives of Shunt Compensation, Midpoint Voltage Regulation for Line Segmentation, End of Line Voltage Support to Prevent Voltage Instability, improvement of Transient Stability, Power Oscillation Damping, Static Var Compensators, SVC and STATCOM, The Regulation Slope, Transfer Function and dynamic Performance, Transient Stability Enhancement and Power Oscillation Damping

UNIT-IV
Series Compensators: Objectives of Series Compensation, concept of series capacitive compensation, voltage stability, improvement of transient stability, power oscillation damping, GTO thyristor controlled series capacitor, Thyristor controlled series capacitor, SSSC.

UNIT-V
Combined Compensators: Introduction, Unified Power Flow Controller (UPFC), basic operating principles, independent real and reactive power flow control, control structure, basic control system for P and Q control.

Text Books:

1. Narain G. Hingorani, Laszlo Gyugyi, ‘Understanding FACTS’, IEEE press, 1999.
2. Y.H.Song, A.T.Johns, ‘Flexible A.C.Transmission System’, IEE, London, 1999

Suggested Reading:

1. KR Padiyar, ‘Facts Controllers In Power Transmission and Distribution’, 2nd edition, New Age Publications, 2016.
2. R. Mohan Mathur, Rajiv K. Varma, ‘Thyristor-Based FACTS Controllers for Electrical Transmission Systems’, Wiley Publications IEEE Press, 2002
3. Timothy J.E. Miller, ‘Reactive Power Control in Electric Systems’, 1982

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEE16 **SPECIAL ELECTRICAL MACHINES (Core Elective -4)**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To study the operating principles different special machines
2. To make the learner to be aware of latest special machines which are in vogue.
3. To be familiar with salient features of special electrical machines

Course Outcomes: After the completion of this course, students will be able to:
1. Recognize application specific special electrical machines
2. Explain the working principle of various special electrical machines.
3. Develop equivalent circuit of a given special electrical machine.
4. Classify the special electrical machine based on construction
5. Choose the type of armature winding suitable for a given SEM.
6. Analyse the various control methods of a given Special Electric machine.

UNIT-I

Stepper Motors: Introduction, classification, single phase, Disc Magnet and Claw-tooth stepper motors, inference from Torque equation, (no derivation) static and dynamic characteristics, open loop and closed loop control, concepts of Microprocessor based control, comparison of conventional stepper motors with permanent magnet stepper motor, VR Stepper motor and Hybrid stepper motor and applications

UNIT-II

Switched Reluctance Motor (SRM):
Construction, Principle of working, constraints on pole arc and tooth arc, Inference from torque equation and Characteristics, Control of SRM, features of Microprocessor based control of SRM, Introduction to Synchronous Reluctance Motor (Sy R M)

UNIT-III

PMDC and BLDC motor: PMDC Motor: Construction, Principle of working Minor hysteresis loops and recoil line, Equivalent circuit of PM, Inference from Torque equation, performance Characteristics, moving coil motors Printed Circuit Motor

BLDC Motor: Construction, principle of working, types, and control types and differences among various controls such as Microprocessor based, DSP- based control and sensor less control,

UNIT-IV

Linear Electric Machines: Construction, equivalent circuit, characteristics, design aspects and control, Types such as – linear synchronous motor, DC Linear motor, Linear Reluctance motor and Linear Levitation Machines (elementary treatment only)

UNIT-V

Permanent Magnet Axial Flux (PMAF) Machines: Construction, Armature windings – Toroidal stator, Trapezoidal stator, Rhomboidal Stator winding, salient features of torque equation, EMF equations and Output equation [No derivations], Phasor diagram, Applications; **Introduction to Permanent Magnet Synchronous Motor,**

Textbooks:

1. E.G. Janardhan, "Special Electrical Machines", Prentice Hall India, 2014.
2. K. Venkatarathnam, "Special Electrical Machines", Universities Press (India) Pvt. Ltd., 2013

Suggested Reading:

1. H. Bülent Ertan, M. Yildirim Üçtug, Ron Colyer, Alfio Consoli, "Modern Electrical Drives" Springer Science+Bussiness Media, 2000

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

AICTE MODEL CURRICULUM

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-VII

Sl. No.	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			
			Hours per week			Duration in Hours	Maximum Marks		Credits
			L	T	P		CIE	SEE	
THEORY									
1	**18EEC25**	Power System Protection	3	-	-	3	30	70	3
2	**18EEC26**	Electrical Drives	3	-	-	3	30	70	3
3	**18EEC27**	Signals & Systems	3	-	-	3	30	70	3
4	**18EEEXX**	Core Elective-5	3	-	-	3	30	70	3
5	**18XXOYY**	Open Elective-2	3	-	-	3	30	70	3
PRACTICALS									
6	**18EEC28**	Power Systems-II Lab	-	-	3	3	25	35	1.5
7	**18EEC29**	Electrical Drives Lab	-	-	3	3	25	35	1.5
8	**18EEC30**	Project: Part-1	-	-	4	-	50		2
		Total	**15**	**-**	**10**	**21**	**250**	**420**	**20**

L: Lecture **T: Tutorial** **P: Practical**
CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

Course Code	Core Elective-5
18EEE17	Power System Dynamics and Control
18EEE18	Switch Mode Power Converters
18EEE19	Electrical Machine Design
18EEE20	High Voltage Engineering

Course Code	Open Elective-2
18MEO03	Research Methodologies
18MEO04	Entrepreneurship
18EGO01	Technical Writing Skills
18CSO04	Basics of Data Science using R
18CSO07	Basics of Cyber Security

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
AICTE MODEL CURRICULUM
B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-VIII

Sl. No	Course Code	Title of the Course	Scheme of Instruction Hours per week			Scheme of Examination			
						Duration In Hours	Maximum Marks		Credits
			L	T	P		CIE	SEE	
THEORY									
1.	**18EEEXX**	Core Elective-6	3	-	-	3	30	70	3
2.		Open Elective-3	3	-	-	3	30	70	3
PRACTICALS									
3.	**18EEC31**	Technical Seminar	-	-	2	-	50	-	1
4.	**18EEC32**	Project: Part-2	-	-	20	Viva voce	100	100	10
		Total	**6**		**22**		**210**	**240**	**17**

L: Lecture T: Tutorial P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

Course Code	Core Elective-6
18EEE21	Advanced Electric Drives
18EEE22	Digital Signal Processing
18EEE23	Smart Grid
18EEE24	Digital Control System

Course Code	Open Elective-3
18MEO07	Intellectual Property Rights (IPR)
18CEO02	Disaster Mitigation and Management (DMM)
18ITO02	Python Programming
18EGO02	Gender Sensitization
18PY O01	History of Science and Technology

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

VII – SEMESTER

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEC25 **POWER SYSTEM PROTECTION**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To analyze principles of operation of the different Protection Devices.
2. To understand the different protection schemes employed in the protection of power system
3. To acquire knowledge of Numerical Protection Algorithm

Course Outcomes: After completion of this course, students will be able to
1. Understand basic terminology of relays and types of over current protection of power system.
2. Distinguish the type of distance protection with principle & their application to three phase transmission lines.
3. Choose suitable differential scheme for the protection of various equipment in electrical power system.
4. Describe the principle of operation, and able to calculate the ratings of circuit breakers.
5. Familiarize with different protection methods against over-voltages.
6. Identify various elements of numerical relays, their functions and different techniques used in their design.

UNIT-I

Introduction to Protection Schemes: Need for protection, Backup protection, Zones of protection, Definitions of relay pickup, dropout and reset values, Classification of relays, Operating principles and construction of electromagnetic and induction relays.

Overcurrent Protection: Time-current characteristics, current settings, time settings, overcurrent protection schemes, direction relay, applications of Definite Time, IDMT and Directional relays distribution feeders, Earth fault and phase fault protection schemes, directional earth fault relay, static over current relay, fuse characteristics, types of fuses

UNIT-II

Distance Protection: Introduction, Impedance relay, reactance relay, MHO relay, effect of arc resistance and Power Swings on the performance of Distance Relaying, Selection of distance relays, Three-stepped Distance protection, Comparison of different distance protection schemes, Distance protection of three-phase lines.

UNIT-III

Differential protection: Introduction, simple differential protection, zone of differential protection, Percentage differential relay, Earth-leakage protection, Percentage Differential Protection of Transformers, Differential protection of transformer against Inrush phenomenon, Inter-turn faults in transformer. Differential protection of Bus-bars, Internal and External faults, Protection of Three-phase bus bars. Introduction to the Basic protection of Generator and Induction Motors

UNIT-IV

Circuit Breakers: Arc interruption, restriking voltage, recovery voltage, RRRV, current chopping, resistance switching, classification of circuit breakers, selection of circuit breakers

Over voltage protection: causes for over voltages, protection of transmission lies against direct lightning strokes, ground wires, arcing horns, lightning arrestors, surge absorbers, Peterson coils, insulation coordination

UNIT-V:

Basics of Numerical Protection: Block diagram of numerical relay, Sampling theorem, Least Error Square Technique, Digital Filtering, Numerical Relaying for overcurrent, Differential and distance protection (Elementary Treatment).

Text Books:

1. Badriram& Viswakarma, “Power System Protection and Switchgear”, Tata McGraw Hill, 2011
2. Y.G. Paithankar & S.R. Bhide, “Fundamentals of power system protection”, Prentice Hall, India, 2010.

Suggested Readings:

1. T.S.Madhava Raao, Power System Protection: Static Relays, Tata McGraw-Hill Education 1989

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

2. P.M.Anderson, Power System Protection, John Wiley, 2012
3. Electricity Training Association, Power System Protection. Vol.2.: Systems and Methods, Institute of engineering and Technology, 1995

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEC26 **ELECTRICAL DRIVES**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To Understand the characteristics of various Electric Drives and its control using different power electronic converter circuits
2. To apply and analyse the concept of speed control DC motor drives with single phase, three phase converters and choppers.
3. To apply and analyse the concept of speed control induction motor by using AC voltage controller, VSI, CSI and cyclo-converter.
4. To apply and analyse the concept of speed control of synchronous motors using VSI, CSI and cyclo-converter.

Course Outcomes: After completion of this course, students will be able to:
1. Analyze 1-Φ & 3-Φ converters fed DC motors as well as chopper fed DC motors.
2. Understand the operational variance between single and multi-quadrant operation of various Electric Drives.
3. Comprehend the speed control of an AC-AC & DC-AC converter fed induction motor on stator and rotor side.
4. Illustrate the principles of speed control of synchronous motor with VSI, CSI and cyclo-converter.
5. Differentiate the features of closed loop operation of DC and AC electric drive and their controllers

UNIT-I
Electric Drive: Introduction, Block diagram and parts of electric drive
Dynamics of Electrical Drives: Types of Load- Types and Characteristics of load torque – Dynamics of motor-load combination – steady state & transient stability of an electrical drive.
Phase control converters fed DC drivers: Review of speed control techniques of DC motors, Single Phase and Three-phase semi and fully controlled converters connected to DC separately excited and DC series motors– continuous current mode of operation, output voltage and current waveforms, Speed and Torque expressions, Speed- Torque Characteristics. Problems on Converter fed DC motors.

UNIT –II
Four quadrant operation of DC drive: Introduction to four quadrant operation, motoring operation, electric braking – Plugging, Dynamic and regenerative braking operations. Four quadrant operation of D.C motors by dual converters – Closed loop operation of DC motor

UNIT –III
Chopper fed DC drives: Single, two and four quadrant chopper fed dc separately excited and series excited motors– continuous current operation, output voltage and current wave forms, speed torque expressions, speed torque characteristics, Problems on Chopper fed DC Motors, closed loop operation.

UNIT-IV
Induction Motor Drives-1: Variable voltage characteristics–Control of Induction Motor by AC Voltage Controllers – Waveforms –Speed torque characteristics, Variable Voltage Variable Frequency control of induction motor by voltage source inverter (VSI), current source inverter (CSI) and cyclo-converters, Comparison of VSI and CSI, closed loop operation of induction motor drives.

UNIT-V
Induction Motor Drives-2: Static rotor resistance control, closed loop speed control with static rotor resistance control, Slip power recovery schemes–Static Scherbius drive, Static Kramer Drive and their performance, speed torque characteristics.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Text Books:

1. G. K. Dubey, “Power Semiconductor Controlled Drives”, Prentice Hall, 1989.
2. R. Krishnan, “Electric Motor Drives: Modeling, Analysis and Control”, Prentice Hall, 2001.
3. M.H.Rashid, “Power Electronic Circuits, Devices and applications”, PHI.

Suggested Reading:

1. G. K. Dubey, “Fundamentals of Electrical Drives”, CRC Press, 2002.
2. W. Leonhard, “Control of Electric Drives”, Springer Science & Business Media, 2001.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEC27 **SIGNALS AND SYSTEMS**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To introduce the concepts of continuous time and discrete time systems and analyse systems in complex frequency domain.
2. To demonstrate sampling theorem and its applications.
3. To elucidate the techniques of Laplace and Z- transforms and their applications on various systems

Course Outcomes: After completion of this course, students will be able to:
1. Understand the basics of signals and systems and classify them
2. Analyse systems in complex frequency domain.
3. Understand sampling theorem and its implications.
4. Explore the applications of Laplace transforms to continuous time systems
5. Apply the Z-transform techniques to discrete time systems

UNIT-I
Introduction to Signals and Systems: Signals and systems as seen in everyday life, in various branches of engineering and science, Signal properties: periodicity, absolute integrability, deterministic and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability and their examples.

UNIT-II
Behaviour of continuous and discrete-time LTI systems: Impulse response and step response, convolution, input-output behaviour with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems, System representation through differential equations and difference equations, State-space Representation of systems, State-Space Analysis, Multi-input, Multi-output representation, State Transition Matrix and its Role, Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

UNIT-III
Fourier Transforms: Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients, Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Property of duality in Fourier. The Discrete- Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem.

UNIT-IV
Laplace and z- Transforms: Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behaviour. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis

UNIT-V
Sampling and Reconstruction: The Sampling Theorem and its implications, Spectra of sampled signals, Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects, Relation between continuous and discrete time systems, Introduction to the applications of signal and system theory- Feedback control systems,

Text Books:

1. A.V. Oppenheim, A. S. Willsky and S. H. Nawab, “Signals and systems”, Prentice Hall India, 1997
2. J. G. Proakis and D. G. Manolakis, “Digital Signal Processing: Principles, Algorithms and Applications”, Pearson, 2006.

Suggested Reading:

1. H. P. Hsu, “Signals and systems”, Schaum’s series, McGraw Hill Education, 2010.
2. S. Haykin and B. V. Veen, “Signals and Systems”, John Wiley and Sons, 2007.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEC28 **POWER SYSTEMS-II LAB**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Course Objectives:
1. To simulate and understand the load flows, Fault Analysis of power system.
2. To understand the transient stability studies, Economic power scheduling and Load frequency control in power system.
3. To understand the importance of protective relay kits and also study the various components in substations

Course Outcomes: After completion of this course, students will be able to:
1. Apply the load flow studies for any given power system.
2. Analyze the fault in the real time power system.
3. Estimate the consequences of transient stability, economic power scheduling and load frequency control.
4. Examine function of different types of relays for different power system applications.
5. Illustrate the functionality of each component in the substation.

List of Experiments
1. Simulation of Load Flow Studies
2. Simulation of Fault Analysis.
3. Simulation of Transient stability studies.
4. Simulation of Economic power scheduling.
5. Simulation of Load Frequency control of one area system.
6. IDMT characteristics of Over-current relay.
7. Differential protection of 1-phase transformer.
8. Draw the Characteristics of Static relays.
9. Operation of relays in long transmission line.
10. Over Current & Earth Fault Relay Testing Kit (Static Type)
11. Study of Universal Relay Testing Kit
12. Generator Differential Protection Study Unit
13. Study of Distance Relay Testing Kit / Impedance Relay kit
14. Visiting nearby substation and submitting the report.

Note: At least **TEN** experiments should be conducted in the semester.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEC29 **ELECTRICAL DRIVES LAB**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Course Objectives:
1. To experiment and analyse the motor performance connected with power semiconductor source.
2. To be familiar with different speed control techniques of Drives.
3. To validate the experimental results with simulations.

Course Outcomes: After completion of this course, Students will be able to:
1. Analyse the control strategies to modify the output parameters of dc and ac drives.
2. Develop, testing and experimental procedures by applying basic knowledge in electrical and electronics.
3. Demonstrate the principle of energy efficient motors by load matching.
4. Interpret the performance of a given drive by suitable experimentation.
5. Investigate the performance of a given drive by using suitable simulation software.

List of experiments:

PART-A

1. Speed control of DC drive using Thyristor controlled rectifier.
2. Speed control of DC drive using DC-DC Chopper.
3. Four-Quadrant Operation of DC drive.
4. Closed loop speed control of dc motor using PID controller.
5. Speed control of single-phase induction motor speed using TRIAC.
6. Speed control of Three-Phase Induction Motor using V/f control.
7. Speed Control of Three-Phase Induction Motor using AC-AC converter.
8. Regenerative/ Dynamic braking operation for AC drive.

PART-B

1. Simulation of Speed control of DC Motor using BJT-H bridge.
2. Simulation of Regenerative/ Dynamic breaking operation of DC motor.
3. Simulation of Step/ Ramp speed response of DC motor.
4. Simulation of VSI-fed 3-Phase Induction Motor drive.
5. Simulation of CSI-fed 3-Phase Induction Motor drive.
6. Simulation of Permanent Magnet synchronous motor drive.

Note: Any **Six** experiments from **Part-A** and **Four** from **Part-B** should be performed.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEC30 **PROJECT: PART-1**

Instruction	4 Hours per week
Semester End Examination	50 Marks
Credits	2

Prerequisite: Knowledge of preparing slides by using power point presentations, Capable of searching for suitable literature and Presentation skills.

Course Objectives:
This course aims to:
1. The student takes up investigative study in the broad field of Engineering / Technology, either fully theoretical/practical or involving both theoretical and practical.
2. The work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor.
3. This is expected to provide a good initiation for the student(s) towards R&D.

Course Outcomes:
Upon completion of this course, students will be able to:
1. List the various approaches to the selected problem.
2. Interpret the advantages and disadvantages of various approaches.
3. Apply the selected approach for simulating / modelling / designing the problem.
4. Analyse and write a report on the results of the simulation / modelling of the problem selected.
5. Justify and present the results of the simulation / model / design before the departmental committee.

The objective of Project Part -1 is to enable the student take up investigative study in the broad field of Engineering Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) towards R&D.
The work shall include:

Survey and study of published literature on the assigned topic;
Working out a preliminary Approach to the Problem relating to the assigned topic;
Conducting preliminary Analysis/Modelling/Simulation/Experiment/Design/Feasibility;
Preparing a Written Report on the Study conducted for Presentation to the Department;
Final Seminar, as oral Presentation before a departmental Committee.

Guidelines for the award of Marks: (Max. Marks: 50)

Evaluation by	Max. Marks	Evaluation Criteria / Parameter
Supervisor	20	Project Status / Review
	5	Report
Department Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Preparation

If we have built castles in the air, our work need not be lost; that is where they should be. Now lay the foundation under them. But a fool is one who, having no goal, redoubles his efforts.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEE17 **POWER SYSTEM DYNAMICS AND CONTROL**
(Core Elective-5)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To understand the power system stability and its impact on the system.
2. To analyze linear dynamical systems and use of numerical integration methods
3. To model different power system components for the study of stability and methods to improve stability

Course Outcomes: At the end of the course, the student will able to
1. Acquire the concepts of various types of stability and its control
2. Apply different numerical techniques for stability studies
3. Understand the concepts of small and large disturbance stability
4. Acquire the concepts of different models of synchronous machines and its controllers
5. Recognize the importance of enhancing the power system stability

UNIT-I
Introduction to Power System Operations: Introduction to power system stability, Power System Operations and Control. Stability problems in Power System, Impact on Power System Operations and control

UNIT-II
Analysis of Linear Dynamical System and Numerical Methods: Analysis of dynamical System, Concept of Equilibrium, Small and Large Disturbance Stability, Modal Analysis of Linear System, Analysis using Numerical Integration Techniques, Issues in Modelling: Slow and Fast Transients, Stiff System.

UNIT-III
Modeling of Synchronous Machines: Physical Characteristics, Rotor position dependent model, d-q Transformation, Model with Standard Parameters. Steady State Analysis, Short Circuit Transient Analysis, Synchronization of Synchronous Machine to an Infinite Bus, Modeling of Excitation and Prime Mover Systems, Physical Characteristics and Models.

UNIT-IV
Stability Analysis: Angular stability analysis in Single Machine Infinite Bus System, Angular Stability in multi-machine systems–Intra-plant, Local and Inter-area modes, Frequency Stability, Centre of Inertia Motion, Load Sharing, Governor droop, Single Machine Load Bus System-Voltage Stability

UNIT-V
Enhancing System Stability: Planning Measures, Stabilizing Controllers (Power System Stabilizers), Operational Measures-Preventive Control, Emergency Control.

Text Books:
1. K.R. Padiyar, "Power System Dynamics, Stability and Control", B. S. Publications, 2002.
2. P. Sauer and M. A. Pai, "Power System Dynamics and Stability", Prentice Hall, 199

Suggested Reading:
1. P. Kundur, "Power System Stability and Control", McGraw Hill, 1995
2. P. M. Anderson & A. A. Fouad "Power System Control and Stability", Galgotia, New Delhi,1981

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEE18 **SWITCH MODE POWER CONVERTERS**

(Core Elective-5)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objective:
1. To study the design aspects of DC-DC converters and SMPS.
2. To comprehend the basic concepts of resonant converters.
3. To familiarize with the design of inductor, transformer for power converter circuits and to know various voltage control techniques in inverters.

Course Outcomes: After completion of the course, the student will be able to
1. Design different types of DC-DC converters.
2. Comprehend different types of SMPS for electrical applications.
3. Understand the operation of different resonant converters.
4. Design a suitable filter along with the suitable selection of transformer and switches that are used in power electronic converter circuits.
5. Compare different voltage control techniques in inverters.

UNIT-I

Basic Converter Circuits: Design of critical inductance and capacitance of Buck, Boost and Buck Boost Regulators, Cuk Converter Choice of Switching Frequency-Design Aspects

UNIT-II

Isolated SMPS: Fly back Converters, Forward Converters, Half Bridge and Full Bridge Converters, Push Pull Converters and SMPS with multiple outputs, Choice of Switching Frequency-Design Aspects

UNIT-III

Resonant Converters: Classification, Basic resonant circuit concepts, Load resonant, Resonant switch converters, Resonant D.C Link Inverters with Zero Voltage Switching, High frequency Link Integral Half-Cycle converters.

UNIT-IV

Design of Inductor and Transformer: Selection of Output Filter Capacitor, Selection of Energy Storage Inductor, Design of High Frequency Inductor and High Frequency Transformer, Selection of Switches, Snubber Circuit Design.

UNIT-V

Voltage Control in Inverters: Voltage control Techniques in inverters, Bipolar sinusoidal modulation and unipolar sinusoidal modulation, modulation index and output voltage, three-phase sinusoidal modulation

Text Books:

1. Mohan N. Undeland . T & Robbins W, Power Electronics Converters, Application and Design. John Wiley, 3rd edition, 2007.
2. Mohammed H. Rashid, "Power Electronics, Devices, circuits and applications", Pearson Education, 4th Edition, 2017
3. H. W. Whittington, B. W. Flynn and D. E. MacPherson, Switched Mode Power Supplies, Design and Construction, Universities Press, 2009.

Suggested Reading:

1. Umanand L., Bhat S.R., Design of magnetic components for switched Mode Power Converters. , Wiley Eastern Ltd.,1992
2. V. Ramanarayanan, Course Material on Switched Mode Power Conversion

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEE19 **ELECTRICAL MACHINE DESIGN**

(Core Elective-5)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To understand the design parameters of various electrical machines.
2. To analyze the electrical and mechanical characteristics of electrical machines.
3. To become familiar with CAD usage.

Course Outcomes: After completion of this course, students will be able to:

1. Recognize the various parameters required for machine design.
2. Interpret the electrical machines based on different design constraints.
3. Assess the size of a machine with the given data.
4. Describe the various computational methods applicable in machine design.
5. Design an electric machine with the given conditions.

UNIT-I

Basics of Machine design aspects: Major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings, thermal considerations, heat flow, temperature rise, rating of machines.

UNIT-II

Design of Transformers: Output equations of single and three-phase transformers, Sizing of a transformer, main dimensions, window space factor, overall dimensions, design of cooling tank, methods for cooling of transformers.

UNIT-III

Design of Induction Motors: Output equation, Sizing of an induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, magnetic leakage calculations, leakage reactance of poly phase machines, magnetizing current, short circuit current.

UNIT-IV

Design of Synchronous Machines: Output equation, Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, estimation of air gap length, design of rotor, design of damper winding, determination of full load field mmf, design of turbo alternators, Cooling of alternators.

UNIT-V

Computer aided Design (CAD): Limitations (assumptions) of traditional designs, need for CAD analysis, synthesis and hybrid methods, design optimization methods, variables, constraints and objective function, problem formulation. Introduction to FEM based machine design.

Text Books:

1. K. Sawhney, "A Course in Electrical Machine Design", Dhanpat Rai and Sons, 1970.
2. K. M. V. Murthy, "Computer Aided Design of Electrical Machines", B.S. Publications, 2008.

Suggested Reading:

1. S. K. Sen, "Principles of Electrical Machine Design with computer programmes", Oxford and IBH Publishing, 2006.
2. V. N. Mittal and Arvind Mittal "Design of Electrical Machines" Standard Publishers Distributors, New Delhi, 2009.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEE20 **HIGH VOLTAGE ENGINEERING**
(Core Elective-5)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To know the breakdown mechanism in gases, liquids and solid dielectrics.
2. To understand the methods of generation and measurement of high voltages and currents.
3. To know the testing of HV electrical equipment and High Voltage laboratories.

Course Outcomes: After completion of this course, students will demonstrate:
1. Define Townsend's first and second ionization coefficients
2. Illustrate various breakdown mechanisms in gas, liquid and solid insulating materials.
3. Analyze the generation of dc, ac and impulse voltage and currents.
4. Discuss the various measurement methods of dc, ac and impulse voltages and currents.
5. Explain the testing of high voltage equipment, HV laboratories and safety precautions in HV labs.

UNIT-I
Breakdown in Gases: Mechanism of breakdown, Types of collisions, Ionization processes, Townsend's First and second Ionization coefficients, Townsend's breakdown mechanism, Streamer theory of breakdown, Panchen's Law, Corona discharges.

UNIT-II
Breakdown in liquid and solid insulating materials: Pure liquids and commercial liquids, Breakdown in pure and commercial liquid, Solid dielectrics and Composite dielectrics, Intrinsic breakdown, Electro-mechanical breakdown, Thermal breakdown, Breakdown due to treeing and tracking, Breakdown due to internal discharges.

UNIT-III
Generation of High Voltages and Currents: Generation of high dc voltages, Generation of high ac voltages, Generation of Impulse voltages and currents, Tripping and control of impulse generators.

UNIT-IV
Measurement of High Voltage and Currents: Measurement of Peak voltage, Impulse voltages and high Direct current measurements, Cathode Ray Oscillographs for Impulse voltage and current measurements, Measurement of dielectric constant and loss factor, Partial discharge measurements.

UNIT-V
High Voltage testing of Electrical Apparatus: Testing of Insulators, bushings, isolators, circuit breakers, Cables, Power capacitors and Power transformers. High Voltage laboratory, Indoor and Outdoor laboratories, Safety precautions in HV labs

Text Books:

1. M.S. Naidu and V. Kamaraju, "High Voltage Engineering", McGraw Hill Education, 2013.
2. C.L. Wadhwa, "High Voltage Engineering", New Age International Publishers, 2007.

Suggested Reading:

1. E.Kuffel, W.S.Zaengl & J.Kuffel, "High Voltage Engineering Fundamentals", Newness Publication, 2000
2. M. Khalifa, "High Voltage Engineering: Theory and Practice", Dekker, 1990

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18ME O03 **RESEARCH METHODOLOGIES**

(Open Elective-2)

Instruction	3 Hours per week
Duration of SEE	3Hours
SEE	70Marks
CIE	30Marks
Credits	3

Objectives:

1. To make the students to formulate the research problem.
2. To identify various sources for literature review and data collection.
3. To prepare the research design.
4. To equip the students with good methods to analyze the collected data.
5. To explain how to interpret the results and report writing.

Outcomes: At the end of the course, the students are able to

1. Define research problem. (BL-1)
2. Review and assess the quality of literature from various sources. (BL-2)
3. Understand and develop various sresearch designs. (BL-2)
4. Analyze problem by statistical techniques: ANOVA,F-test,Chi-square. (BL-4)
5. Improve the style and format of writing a report for technical paper/Journal report. (BL-4)

UNIT – I

Research methodology: Objectives and motivation of research, types of research- descriptive vs. analytical, applied vs. fundamental, quantitative vs. qualitative, conceptual vs. empirical, research approaches, significance of research, research methods vs. methodology, research process, criteria of good research, problems encountered by researchers in India, technique involved in defining a problem.

UNIT–II

Literature survey: Importance of literature survey, sources of information-primary, secondary, tertiary, assessment of quality of journals and articles, information through internet.

UNIT – III

Research design: Meaning of research design, need of research design, feature of a good design important concepts related to research design, different research designs, basic principles of experimental design, steps in sample design.

UNIT – IV

Data collection: Collection of primary data, Secondary data, measures of central tendency-mean, mode, median, measures of dispersion- range, mean deviation, standard deviation, measures of asymmetry (skewness), important parametric tests -z, t, F, Chi-Square, ANOVA significance.

UNIT-V

Research report formulation and presentation: Synopsis, dissertation, technical paper and journal paper, writing research grant proposal, making presentation with the use of visual aids, writing a proposal for research grant.

Text Books:

1. C.R Kothari, "Research Methodology Methods & Technique", New Age International Publishers,2004.
2. R. Ganesan, "Research Methodology for Engineers", MJP Publishers,2011.
3. Vijay Upagade and AravindShende, "Research Methodology", S. Chand &Company Ltd., New Delhi,2009.

Suggested Reading:

1. G. NageswaraRao, "Research Methodology and Quantitative methods", BS Publications, Hyderabad,2012.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

2. Naval Bajjai, “Business Research Methods”, Pearson Education,2011.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18ME O04 **ENTREPRENEURSHIP**
(Open Elective-2)

Instruction	3 Hours per week
Duration of SEE	3Hours
SEE	70Marks
CIE	30Marks
Credits	3

Objectives:
1. Concept and procedure of idea generation.
2. The nature of industry and related opportunities and challenges.
3. Elements of business plan and it s procedure.
4. Project management and its techniques.
5. Behavioural issues and Time management.

Outcomes: At the end of the course, the students are able to
1. Understand the concept and essence of entrepreneurship. (BL-2)
2. Identify business opportunities and nature of enterprise. (BL-3)
3. Analyze the feasibility of new business plan. (BL-4)
4. Apply project management techniques like PERT and CPM for effective planning and execution of projects. (BL-3)
5. Use behavioral, leadership and time management aspects in entrepreneurial journey (BL-3)

UNIT-I
Entrepreneurship: Definition, functions of entrepreneurship, qualities of entrepreneurs, identification and characteristics of entrepreneurs, entrepreneur vs. intrapreneur, first generation entrepreneurs, women entrepreneurs, conception and evaluation of ideas and their sources.

UNIT-II
Indian industrial environment: Competence, opportunities and challenges, entrepreneurship and economic growth, small scale industry in India, objectives, linkage among small, medium and heavy industries, types of enterprises, corporate social responsibility.

UNIT-III
Business plan: Introduction, elements of business plan and its salient features, business model canvas, technical analysis, profitability and financial analysis, marketing analysis, feasibility studies, executive summary, selection of technology and collaborative interactions.

UNIT-IV
Project management: During construction phase, project organization, project planning and control using CPM, PERT techniques, human aspects of project management, assessment of tax burden.

UNIT-V
Behavioral aspects of entrepreneurs: Personality, determinants, attributes and models, leadership concepts and models, values and attitudes, motivation aspects, time management: approaches of time management, their strengths and weaknesses. time management matrix and the urgency addiction .

Text Books:

1. Vasant Desai, "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House, 1997.
2. Prasanna Chandra, "Project-Planning, Analysis, Selection, Implementation and Review", Tata Mcgraw-Hill Publishing Company Ltd.1995.
3. S.S. Khanka, "Entrepreneurial Development", S. Chand & Co. Pvt. Ltd., New Delhi,2015.

Suggested Reading:

1. Robert D. Hisrich, Michael P. Peters, "Entrepreneurship", 5/e, Tata Me Graw Hill Publishing Company Ltd., 2005.

2. Stephen R. Covey and A. Roger Merrill, “First Things First”, Simon and Schuster Publication,1994.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EGO01 **TECHNICAL WRITING SKILLS**

(Open Elective-2)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 marks
CIE	30 marks
Credits	3

Course Objectives: The course will introduce the students to:
1. Process of communication and channels of communication in general writing and technical writing in particular.
2. Learn Technical Writing including sentence structure and be able to understand and use technology specific words.
3. Write business letters and technical articles.
4. Write technical reports and technical proposals.
5. Learn to write agenda, record minutes of a meeting, draft memos. Understand how to make technical presentations.

Course Outcomes: After successful completion of the course students will be able to:
1. Communicate effectively, without barriers and understand aspects of technical communication.
2. Differentiate between general writing and technical writing and write error free sentences using technology specific words
3. Apply techniques of writing in business correspondence and in writing articles.
4. Draft technical reports and technical proposals.
5. Prepare agenda and minutes of a meeting and demonstrate effective technical presentation skills.

Unit I
Communication – Nature and process.
Channels of Communication – Downward, upward and horizontal communication. Barriers to communication.
Technical Communication – Definition, oral and written communication. Importance and need for Technical communication. Nature of Technical Communication. Aspects and forms of Technical communication. Technical communication Skills – Listening, Speaking, Reading & Writing.

Unit II
Technical Writing – Techniques of writing. Selection of words and phrases in technical writing. Differences between technical writing and general writing. Abstract and specific words. Sentence structure and requisites of sentence construction. Paragraph length and structure.

Unit III
Business correspondence – Sales letters, letters of Quotation, Claim and Adjustment letters.
Technical Articles : Nature and significance, types. Journal articles and Conference papers, elements of technical articles.

Unit IV
Technical Reports : Types, significance, structure, style and writing of reports. Routine reports, Project reports.
Technical Proposals : Definition, types, characteristics, structure and significance.

Unit V
Mechanics of Meetings : Preparation of agenda, participation, chairing and writing minutes of a meeting. Memorandum. Seminars, workshops and conferences.
Technical Presentations : Defining purpose, audience and locale, organizing content, preparing an outline, use of Audio Visual Aids, nuances of delivery, importance of body language and voice dynamics.

Text Book :
1. Meenakshi Raman & Sangeeta Sharma, "Technical Communications-Principles and Practice", Oxford University Press, Second Edition, 2012.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

2. 1.M Ashraf Rizvi, “Effective Technical Communication”, Tata McGraw Hill Education Pvt Ltd, 2012.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Suggested Reading :

1. .Kavita Tyagi & Padma Misra, “Basic Technical Communication”, PHI Learning Pvt Ltd, 2012.
2. R.C Sharma & Krishna Mohan, “Business Correspondence and Report Writing”, Tata McGraw Hill, 2003

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc18_mg13/preview
2. https://www.technical-writing-training-and-certification.com/
3. https://academy.whatfix.com/technical-writing-skills

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18CSO04 **BASICS OF DATA SCIENCE USING R**

(Open Elective-2)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Probability and Statistics, basics of programming languages.

Course Objectives: The objectives of this course are

1. Understand R programming language.
2. Explore the programming skills needed to use R tool for statistical analysis of Biological data.
3. Analyze biological data.

Course Outcomes: On Successful completion of the course, students will be able to

1. Summarize the basics of R and in-built data visualization packages.
2. Describe the data analysis using Bayesian and stochastic modelling.
3. Relate gibbs, Z- sampling distributions and compare the binomial, chi-square, wilcoxon and Fisher's exact tests in hypothesis testing.
4. Explore the ANOVA in Regression analysis and classify the multivariate data.
5. Experiment with the biological data using R tool and apply clustering algorithms to biological data.
6. Identify R commands for data manipulation and database technologies for datasets of bioinformatics.

UNIT - I

Basics of R: Introduction, R features, setting up and exploring R environment, loading packages, types of data objects in R, working with R data objects, Controlling work space, importing files. Programming with R: Variables and assignment, operators, control structures, Functions-built-in, writing own functions, package creation.

UNIT - II

Data Analysis and Graphics: Data summary functions in R, Graphics technology in R, saving graphics, additional graphics packages. Bayesian Data Analysis: Need of Bayesian approach, Application of Bayes rule, Priors, Likelyhood functions, evaluating the posterior, Applications of Bayesial Statistics in Bioinformatics. Stochastic Modeling: Stochastic process and Markov Processes, Classification of Stochastic processes, modeling a DNA sequence with Markov Chain, Characteristics of Markov Chain.

UNIT - III

MCMC using Brugs: ABO blood type example. Gibbs sampling. Statistical Inference: Sampling distributions, Parameter estimation, interval estimation, bootstrapping, R packages for bootstrapping. Hypothesis Testing: Package ctest, Binomial test, comparing variances, Wilcoxon tests, Chi-Square test, Fisher's Exact tests, Likelihood Ratio tests.

UNIT - IV

ANOVA and Regression: ANOVA table, perforating ANOVA using R, graphical analysis of ANOVA comparison, Regression: Correlations, linear regression model, fitting and testing of regression model, generalization of the model. Working with Multivariate Data: Multivariate data, sample statistics, display of multivariate data, outliers and principal components. Classification of discriminate analysis- classification with two population and more than two populations, cross validation classification trees.

UNIT - V

Clustering methods: measures of dissimilarities, K-means clustering, K-Medoid clustering, Hierarchical clustering-Agglomerate and divisive. R Packages: Bio-conductor and Seqin R.

Data Technologies: R for Data manipulation, example, Database technologies, Bioinformatics resources on the WWW.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Textbooks:

1. Kim Seefeld, Ernest Linder, “Statistics using R with Biological examples”, 2007 (https://cran.r-project.org/doc/contrib/Seefeld_StatsRBio.pdf).
2. Robert Gentleman, “R Programming for Bioinformatics”, 1st Edition, CRC Press, 2008.

Suggested Reading:

1. ArvilCohhlan “A Little Book of R for Bioinformatics”, Release 1.0, CC ver 3.0

Online Resources:

1. https://epdf.tips/r-programming-for-bioinformatics.html
2. https://epdf.tips/r-programming-for-bioinformatics.htmlhttps://www.cyclismo.org/tutorial/R/objectOriented.html
3. https://www.w3schools.in/r/object-oriented/

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18CSO07 **BASICS OF CYBER SECURITY**
(Open Elective-2)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Operating System, Computer Network, Cryptography.

Course Objectives: This course aims to:
1. Identify and present indicators that a cybercrime has occurred and understand methods and tools used in cybercrimes.
2. Collect, Process, Analyze and Present Computer Forensics Evidence.
3. Understand the legal perspectives and Organizational implications of Cyber Security

Course Outcomes: Upon completion of this course, students will be able to:
1. List the different types of cybercrimes and analyze legal frameworks to handle cybercrimes.
2. Identify the Tools and Methods used in cybercrimes.
3. Analyze and resolve cyber security issues and laws governing Cyberspace.
4. Describe the need of Digital Forensics and the importance of digital evidence in prosecution.
5. Interpret the commercial activities in the event of significant information security incidents in the Organization.
6. Discuss the vulnerabilities in networking protocols and their mitigation techniques.

UNIT - I
Introduction to Cyber Crime: Cyber Crime: Definition and Origins of the Word, Cybercrime and Information Security, Classification of Cyber Crimes, Cyber Crime: The Legal Perspective, Cyber Crime: An Indian Perspective, A Global Perspective of Cyber Crime.

UNIT - II
Cyber Offenses: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector. Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT - III
Cyber Security: The Legal Perspectives: Cyber Crime and the Legal Landscape around the World, Need of Cyber laws: the Indian Context, The Indian IT Act, Challenges to Indian Law and Cyber Crime Scenario in India, Digital Signatures and the Indian IT Act, Cyber Crime and Punishment, Cyber Law, Technology and Students: The Indian Scenario.

UNIT - IV
Understanding Cyber Forensics: Introduction, Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Cyber Forensics Investigation, Challenges in Computer Forensics.

UNIT - V
Cyber Security: Organizational Implications: Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

Text Books:
1. Sunit Belpre and Nina Godbole, Cyber Security: Understanding Cyber Crimes, Computer Forensics and

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Legal Perspectives, Wiley India Pvt. Ltd, 2011.
2. Kevin Mandia, Chris Prosise, Incident Response and computer forensics, Tata McGraw Hill, 2006.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Suggested Reading:

1. Alfred Basta, Nadine Basta, Mary Brown, Ravinder Kumar, Cyber Security and Cyber Laws, Paperback – 2018.
2. Mark F Grady, Fransesco Parisi, The Law and Economics of Cyber Security, Cambridge university press, 2006.

Online Resources:

1. https://www.edx.org/learn/cybersecurity
2. https://www.coursera.org/courses?query=cyber%20security
3. https://swayam.gov.in/course/4002-cyber-law

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

VIII- SEMESTER

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEC31 **TECHNICAL SEMINAR**

Instruction	2 Hours per week
Duration of Semester End Examination	--
Semester End Examination	--
CIE	50 Marks
Credits	1

Course Objectives:
1. To introduce students to critical reading, understanding, summarizing, explaining and preparing report on state-of- the-art topics in a broad area of his/her specialization.
2. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.
3. Documenting the seminar report in a prescribed format.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Collect, Organize, Analyze and Consolidate information about emerging technologies from the literature.
2. Exhibit effective communication skills, stage courage, and confidence.
3. Demonstrate intrapersonal skills.
4. Explain new innovations/inventions in the relevant field.
5. Prepare and experience in writing the Seminar Report in a prescribed format.

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state-of-the-art topics in a broad area of his/ her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.
The seminar must be clearly structured and the power point presentation shall include following aspects:
1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Each student is required to:
1. Submit a one-page synopsis of the seminar talk for display on the notice board.
2. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes in PowerPoint, followed by Question and Answers session for 10 minutes.
3. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by the department.

- Seminars are to be scheduled from 3rdweek to the last week of the semester and any change in schedule shall be discouraged.
- For the award of sessional marks, the students are judged by three (3) faculty members and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation.

Note: Topic of the seminar shall be preferably from any peer reviewed recent Journal publications.

Guidelines for awarding marks (CIE): Max. Marks: 50		
S.No	**Description**	**Max. Marks**
1	Contents and relevance	10
2	Presentation skills	10
3	Preparation of PPT slides	05

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

4	Questions and answers	05
5	Report in a prescribed format	20

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEC32 **PROJECT: PART-2**

Instruction	20 P Hours per Week
Duration of SEE	Viva Voce
SEE	100 Marks
CIE	100 Marks
Credits	10

Prerequisite: Student must have earned the credit of ‘Project: Part - 1’.

Course Objectives:
1. The object of Project: Part2 is to enable the student extend further the investigative study, either fully theoretical/practical or involving both theoretical and practical work.
2. The work shall be carried out under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry.
3. Preparing an Action Plan for conducting the investigation, including team work;

Course Outcomes:
Upon completion of this course, students will be able to:
1. Recall the details of the approach for the selected problem.
2. Interpret the approach to the problem relating to the assigned topic.
3. Determine the action plan to conduct investigation.
4. Analyze and present the model / simulation /design as needed.
5. Evaluate, present and report the results of the analysis and justify the same.

The objective of 'Project: Part-2' is to enable the student extend further the investigative study taken up, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:
1. In depth study of the topic assigned;
2. Review and finalization of the Approach to the Problem relating to the assigned topic;
3. Preparing an Action Plan for conducting the investigation, including team work;
4. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed;
5. Final development of product/process, testing, results, conclusions and future directions;
6. Preparing a paper for Conference presentation/ Publication in Journals, if possible;
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar presentation before Departmental Committee.

Guidelines for awarding marks in CIE: (**Max. Marks: 100**)

Evaluation by	Max. Marks	Evaluation Criteria / Parameter
Departmental Review Committee	10	Review 1
	15	Review 2
	25	Submission
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	10	Quality of the work which may lead to publications
	10	Report Preparation
	10	Analytical / Programming / Experimental Skills

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEE21 **ADVANCED ELECTRIC DRIVES**

(Core Elective – 6)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To Understand the principles of commutation in converters and study the performance, stability and control aspects of DC motors and Induction motors.
2. To Understand the microprocessor-based control of electric drives
3. To Study the working principles and control aspects of special motors: Brushless DC motor, Switched Reluctance Motor drives.

Course Outcomes: After completion of this course, students will be able to:

1. Identify and consider the requirement of power converters for a given application.
2. Illustrate the digital methods of DC motor speed control techniques.
3. Show how the changes effect in different speed control schemes of Induction motor.
4. Analyse the performance of Synchronous motor with and without sinusoidal supply.
5. Recognize and formulate problems encountered by special motor drives for a particular application.

UNIT I

Review of Power Converters: Over view of Power converters in Electric Drives, Commutation in Thyristorpower converters, Principle of natural commutation and forced commutation, Discontinuous conduction in converters, DC choppers, Force commutated inverters, Frequency conversion. Inverter voltage control, Harmonic neutralisation, Voltage controller.

UNIT II

DC Drives: General considerations, Evaluation of a dc drive performance Forced commutation schemes to improve the performance of the drives, Steady-State Analysis of the Three-Phase Converter Controlled rectifiers, Steady-state analysis of chopper-controlled dc motors, Closed loop control of solid state DC drives, DC motor speed control using microprocessor (Block Diagram and Flowchart Approach only)

UNIT III

Induction Motor Drive: Speed control of IM, Analysis of IM on non-sinusoidal voltage waveforms, Scalar and vector control of induction motor, Direct torque and flux control of induction motor, Analysisof CSI fed IM ,Performance of CSI fed IM, Static slip energy recovery schemes employing Converter cascades in the rotor circuit Dynamic behavior and stability of Variable frequency IM, Induction motor speed control using microprocessor (Block Diagram and Flowchart Approach only).

UNIT IV

Synchronous Motor Drive: Analysis of SM fed from non-sinusoidal supplies, Performance of SM on non-sinusoidal voltages, Performance of CSI fed SM, Marginal angle control of SM, stability of SM on non-sinusoidal supplies, Self-controlled synchronous motor drive, Vector control of synchronous motor, Synchronous motor speed control using microprocessor (Block Diagram and Flowchart Approach only).

UNIT V

Special Motor Drives: Introduction to various special motor drives. **Switched reluctance motor-** drive construction, Working principle, Normalized torque-speed characteristics, Speed Control Schemes, **Brushless DC Motor**–construction, Working principle, Torque-speed characteristics, Speed Control Schemes,Permanent magnet motor drives, **Solar Powered Drive-** motors suitable for pump drives, solar powered pump drives, **Battery Powered Drives**-battery powered vehicles, basics, current status and scope for growth

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Text Books:

1. Vedam Subramanyam, 'Thyristor Control of Electric Drives', Tata McGraw Hill Publishing Co., New Delhi,1987.
2. G.K.Dubey, Fundamentals of Electrical Drives; Narosa Publishing House, 1995.
3. P.S.Bimbra, Generalised theory of Electrical Machines, Khanna Publication, 2006.

Suggested Reading:

1. R. Krishnan, 'Electric Motor Drive: Modeling, Analysis and Control' Prentice Hall of India, 2001.
2. B.K.Bose, 'Power Electronics and AC Drives', Prentice Hall, 2002

18EEE22 **DIGITAL SIGNAL PROCESSING**

(Core Elective – 6)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To explain mathematical representation of signals in continuous, discrete time and frequency domain.
2. To demonstrate analysis of discrete time systems using Z-transforms, Discrete-Fourier Transform (DFT) and the FFT algorithms
3. To illustrate design of IIR and FIR digital filters for various applications.

Course Outcomes: After completion of this course, students will be able to:
1. Represent signals mathematically in continuous and discrete-time domain
2. Analyse discrete-time systems using z-transformation
3. Analyse the Discrete-Fourier Transform (DFT) and FFT algorithms
4. Design analog IIR filter and covert into digital IIR filters by using various digitized techniques
5. Design analog FIR filter by using various windowing techniques

UNIT-I

Discrete-time signals and systems: Sequences, representation of signals on orthogonal basis; Representation of discrete systems using difference equations, Sampling and reconstruction of signals, aliasing, Sampling theorem and Nyquist rate.

UNIT-II

Z-transformations: Region of Convergence, Analysis of Linear Shift Invariant systems using z-transform, Properties of Z-transform for causal signals, Interpretation of stability in z-domain, Inverse z-transforms.

UNIT-III

Discrete Fourier Transform: Frequency Domain Analysis, Discrete Fourier Transform (DFT), Properties of DFT, Convolution of signals, Fast Fourier Transform (FFT) Algorithm, Parseval's Identity, Implementation of Discrete Time Systems.

UNIT-IV

IIR Filters: Design of Butterworth, Chebyshey filters, IIRfilter design by impulse invariant bilinear transformation, impulse invariance method, step invariance method.

UNIT-V

FIR Filters: Characteristics of FIR Digital Filters. Frequency response, comparison of FIR, IIR filters, Window techniques, Design of these filters using Rectangular, Hamming, Bartlet, Kaiser windows, Architecture and features of TMS 320F/2047 and ADSP signal processing chips, Applications of DSP.

Text Books:

1. S. K. Mitra, "Digital Signal Processing: A computer based approach", McGraw Hill, 2011.
2. A.V. Oppenheim and R. W. Schafer, "Discrete Time Signal Processing", Prentice Hall, 1989.
3. J. G. Proakis and D.G. Manolakis, "Digital Signal Processing: Principles, Algorithms and Applications", Prentice Hall, 1997.
4. P. VenkataRamani, M. Bhaskar, "Digital Signal Processo1; Architecture, Programming & Application", TataMcGrawHill-2004

Suggested Reading:

1. Anandkumar A, Digital Signal Processing, Second edition PHI learning, 2015
2. L. R. Rabiner and B. Gold, "Theory and Application of Digital Signal Processing", Prentice Hall,1992.
3. J. R. Johnson, "Introduction to Digital Signal Processing", Prentice Hall, 1992.
4. D. J. DeFatta, J. G. Lucas andW. S. Hodgkiss, "Digital Signal Processing", John Wiley & Sons,1988

18EEE23 **SMART GRID**
(Core Elective – 6)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To study the importance of smart grid and components of smart grid
2. To understand the communication technologies, infrastructure required for smart metering
3. To know various functions of distribution automation and operation of micro grid

Course outcomes: At the end of this course, students will be able to:
1. Discuss the components and operation of Smart Grid at transmission and distribution level
2. Select the communication technology required for smart grid applications
3. Illustrate components and operation of smart metering and implementation of demand side integration
4. Analyze the different types of micro grid, storage systems and communication infrastructure
5. Explain the equipment used in distribution automation and implement the distribution management system functions

UNIT-I
Introduction to smart grid: Today's Grid versus the Smart Grid, drivers of smart grid, functionalities and key components of smart grid, smart grid components for transmission system, smart grid functionalities at distribution level, smart grid vision and road map to India, policies, standards, regulations, national smart grid mission framework,

UNIT-II
Communication Technologies: Dedicated and shared communication channels, switching techniques, communication channels: wired communication, twisted pair, optical fiber, radio communication, Ethernet, wireless LAN, Bluetooth, WiMAX, standards for information exchange

UNIT-III
Smart Metering Infrastructure: Evolution of electricity metering, benefits of smart metering, components of smart metering, hardware requirements, communication infrastructure and protocols for smart metering: Home area network, neighborhood area network, data concentrator, meter data management system, Demand side integration(DSI): services, implementation of DSI, hardware support

UNIT-IV
Micro Grids: Introduction, mini/micro grids, architecture of micro grid, types of micro grid, Dc micro grid, ac micro grid, AC. DC micro grid, Protocols and standards, communication to monitor real time network status, energy storage in micro grids, benefits of distributed generation and energy storage in micro grid systems

UNIT-V:
Distribution Automation: Substation automation equipment: current transformers, voltage transformers, relay IED, faults in distribution system: components for fault isolation and restoration, voltage regulation, Distribution Management systems: Data sources and associated external systems, modelling and analysis tools, Applications: Network reconfiguration, volt/var control, outage management system, operation of DER, fault diagnosis and location

Text Books:
1. Janaka Ekanayake, Liyanage, Wu, Akihiko Yokoyama, Jenkins, Smart Grid, Wiley Publications, 2012
2. Stuart Borlas'e, "Smart Grid: Infrastructure, Technology and solutions" CRC Press

Suggested Reading:
1. James Momoh, "Smart Grid Fundamentals of Design and Analysis" IEEE Press, Wiley Publications, 2012
2. Smart grid Hand Book for Regulators and policy makers, Nov 2017 published by India Smart Grid Forum
3. Bharat Modi, Anuprakash, Yogesh Kumar, "Fundamentals of Smart grid Technology", Katson publishers,

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

2015

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EEE24 **DIGITAL CONTROL SYSTEMS**

(Core Elective-6)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To represent a continuous time system in its discrete form and develop a mathematical modeling.
2. To analyze a discrete time system using Z-transform tool and also to design discrete controllers and compensators.
3. To study the Classical Approach Theory of Discrete-time systems and to analyze non-linear system using Lyapunov stability concept.

Course Outcomes: After the completion of this course, students will able to:
1. Understand the concepts of discrete representation of the continuous time system
2. Analyze the stability of open loop and closed loop discrete-time systems.
3. Develop the state space models for discrete time systems and to examine the effect of pole-zero cancellation on a system
4. Design digital controllers to improve the system reliability
5. Apply the concepts of quadratic function to analyze the stability of linear and nonlinear systems

UNIT-I

Discrete Representation of Continuous Systems: Basics of Digital Control Systems. Discrete representation of continuous systems. Mathematical Modeling of sample and hold circuit. Effects of Sampling and Quantization. Choice of sampling frequency. ZOH equivalent.

UNIT-II

Discrete Time System Analysis and its Stability: Z-Transform and Inverse Z Transform for analyzing discrete time systems. Pulse Transfer function. Pulse transfer function of closed loop systems. Mapping from s-plane to z plane. Solution of Discrete time systems. Time response of discrete time system. Stability analysis of Discrete Time System by Jury test and using bilinear transformation.

UNIT-III

State Space Approach for discrete time systems: State space models of discrete systems, State space analysis. Controllability and observability analysis. Effect of pole - zero cancellation on the controllability & observability. Pole placement by state feedback.

UNIT-IV

Design of Digital Control System: Design of Discrete PID Controller, Design of discrete state feedback controller. Design of set point tracker. Design of Discrete Observer for LTI System. Design of Discrete compensator.

UNIT-V

Lyapunov's Stability Analysis: The concept of linear and nonlinear systems, Quadratic function, Sylvester's criterion for definiteness of quadratic function, Lyapunov's stability criterion, Direct method of Lyapunov for the linear system, Methods of constructing Lyapunov function for non linear systems- Krasovskii's method.

Text Books:

1. K. Ogata, "Digital Control Systems", Prentice Hall India Learning Private Limited, Second edition, 2005.
2. M. Gopal, "Digital Control Engineering", New age international Publications, 2003
3. M.Gopal, ''Digital control and State Variable Methods'', 3rd Edition TMH, Sep -. 2008

Suggested Readings:

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

1. B.C. Kuo, "Digital Control System",2nd Edition, Oxford University Press,2003
2. G.F. Franklin, J.D. Powell & M. L. Workman "Digital Control of Dynamic Systems", 3rd Edition 2006
3. R.T. Stefani et al., "Design of feedback control systems, Oxford University", Press,2002

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18ME O07 **INTELLECTUAL PROPERTY RIGHTS**

(Open Elective-3)

Instruction	3 Hours per week
Duration of SEE	3Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives:

1. Fundamental aspects of IP.
2. Salient features of IPR acts.
3. The methods of registrations of Intellectual property.
4. Awareness for innovation and its importance of protection.
5. The changes in IPR culture and techno-business aspects of IPR.

Outcomes: At the end of the course, the students are able to

1. Understand the evolution of IP, working of organization's at global level to protect and promote IP. (BL-2)
2. Familiarize with the patent filing process at national and international level. (BL-2)
3. Draw the logical conclusion of research, innovation and patent filing. (BL-3)
4. Compare different kinds of IP and their patenting system. (BL-4)
5. Understand the techno-legal-business angle of IP, infringement and enforcement mechanisms for protection. (BL-2)

UNIT-I

Introduction: Definition of intellectual property, the need for intellectual property rights (IPR), kinds of intellectual property rights, IPR in India – genesis and development, IPR abroad, importance of WTO, TRIPS agreement, patent cooperation treaty, Berne and universal copyright conventions.

UNIT-II

Patents: Definition of patent, commercial significance , term of patent, patentable subject- matter, rights and obligations of patentee, searching of existing patents, drafting of patent, specification of patent, filing of a patent, the different layers of the patent system (national, regional and international options), compulsory licensing and licenses of rights, revocation of patents, differences between utility model and patent.

UNIT-III

Industrial designs: Definition of designs, registration of design, rights and duties of proprietor of design, piracy of registered design.

Trademarks: Meaning of trademarks, purpose of protecting trademarks, registration of trademarks, passing off, assignment and licensing of trademarks, infringement of trademarks.

Geographical indications: Definition, differences between GI and trademarks.

UNIT-IV

Copy right: Nature and scope of copy right, term of copyright, subject matter of copyright, rights conferred by copyright ,publication, broad casting, telecasting, computer program, database protection, assignment and transmission of copyright, infringement of copy right trade secrets and know-how agreement.

UNIT-V

Enforcement of intellectual property rights: Infringement of intellectual property rights, enforcement measures, emerging issues in intellectual property protection, case studies of patents and IP Protection.

Unfair competition: What is unfair competition, relationship between unfair competition and intellectual property laws.

Text Books:

1. Ajit Parulekar and Sarita D"Souza, "Indian Patents Law-Legal & Business Implications",Macmillan India Ltd., 2006.
2. B.L.Wadehra, "Law relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications", Universal law Publishing Pvt Ltd., India,2000.
3. P.Narayanan, "Law of Copyright and Industrial Designs"; Eastern law House, New Delhi,2010.

Suggested readings:

1. CronishW.R , " Intellectual Property Patents, Copyright, Trade Marks and Allied rights", Sweet & Maxwell,1993.
2. P.Narayanan, "Intellectual Property Law" Eastern Law Edn.,1997.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18CE O02 **DISASTER MITIGATION AND MANAGEMENT**

(Open Elective-3)

Instruction	3 L Hours per Week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Course Objectives: This course aims to,
1. Equip the students with the basic knowledge of hazards, disasters, risks and vulnerabilities.
2. Impart knowledge in students about the nature, causes, consequences and mitigation measures ofthe variousHydro-meteorological disasters.
3. Introduce the concepts of causes, consequences and mitigation measures of the various Geographical disasters.
4. Enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters.
5. Equip the students with the knowledge of the impacts of disaster, chronological phases in a disaster management cycle and to create awareness about the disaster management framework and legislations in the context of Central and State Level Authorities.

Course Outcomes: Upon completion of this course, the student will be able to,
1. Identify and understand the fundamental terminologies in disaster management.
2. Distinguish between the Hydro-meteorological disasters and apply the concepts of structural and non-structuralmitigation measures.
3. Categorize different Geographical Disasters and apply the knowledge in utilizing the early warning systems.
4. Analyze various mechanisms and consequences of human induced disasters.
5. Develop an awareness of disaster management phases and formulating effective disaster management plans, ability to understand various participatory roles of stakeholders- Central and State Government bodies at different levels.

UNIT- I:
Introduction: Basic definitions- Hazard, Disaster, Vulnerability, Risk, Resilience, Mitigation, Management; classification of types of disaster- Natural and manmade; Introduction to Disaster management cycle; International Decade for natural disaster reduction (IDNDR); International strategy for disaster reduction (ISDR), Nationaldisaster management authority (NDMA).

UNIT- II:
Natural Disasters:
Hydro meteorological disasters:
Causes, Early warning systems- monitoring and management, structural and non-structural measures for floods, drought and Tropical cyclones; Applications. Case studies related to various hydro-meteorological disasters.

UNIT- III:
Geographical based disasters: Causes, zoning, Early warning systems- monitoring and management, structural and non-structural mitigation measures for earthquakes, tsunami, landslides, avalanches and forest fires. Case studies related to various geographical based disasters.

UNIT- IV:
Human Induced Disasters: Chemical disaster- Causes, impacts and mitigation measures for chemical accidents, Risks and control measures in a chemical industry, chemical disaster management; Case studies related to various chemical industrial hazards eg: Bhopal gas leakage; Management of chemical terrorism disasters and biological disasters; Case studies related to power break downs, fire accidents, traffic accidents,

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

oil spills and stampedes, building failure disasters.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

UNIT- V:

Concept of Disaster Impacts and Management:

Disaster impacts- environmental, physical, social, ecological, economical, political, etc.; health, psycho-social issues; demographic aspects, gender, age, special needs; hazard locations; global and national disaster trends;climate change and urban disasters.

Disaster management cycle and its phases, risk analysis, vulnerability and capacity assessment; Post-disaster environmental response water, sanitation, food safety, waste management, disease control; Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Text Books:

1. PradeepSahni, "Disaster Risk Reduction in South Asia", Prentice Hall, 2003.
2. B. K. Singh, "Handbook of Disaster Management: Techniques & Guidelines", Rajat Publication, 2008.

Suggested Reading:

1. Ministry of Home Affairs, Government of India, "National Disaster Management Plan, Part I and II",
2. K. K. Ghosh, "Disaster Management", APH Publishing Corporation, 2006.
3. http://www.indiaenvironmentportal.org.in/files/file\disaster_management_india1.pdf
4. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs)
5. Hazards, Disasters and your community: A booklet for students and the community, Ministry of Home Affairs.
6. Disaster Medical Systems Guidelines, Emergency Medical Services Authority, State of California, EMSA no.214,June 2003.
7. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and PsychosocialSupport in Emergency Settings, Geneva: IASC.
8. http://ndma.gov.in/ (Home page of National Disaster Management Authority)

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

With effect from the academic year 2021-22

18ITO02 **PYTHON PROGRAMMING**

(Open Elective-3)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To facilitate learning to use lists, tuples and dictionaries in Python programs.
2. To familiarize with functions and file handling.
3. To learn data structures of Python programming,
4. To impart knowledge on OOPs concepts and handle exceptions in Python.
5. To introduce GUI Programming and familiarize with data visualization.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the fundamental concepts and control structures of python programming.
2. Write user defined iterative & recursive functions, identify appropriate predefined functions and perform file handling Operations.
3. Use suitable data structures such as sequences, dictionaries and sets in python programming.
4. Apply concepts of OOP, exception handling and build regular expressions using Python.
5. Design and Develop GUI based applications and visualize the data.

UNIT-I

Introduction to Python Programming: Using Python, The IDLE Programming Environment, Input and Output Processing, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, More About Data Output: New line, Item Separator, Escape Characters, Formatting parameters.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables.

Repetition Structures: Introduction, while loop, for loop, Sentinels, Input Validation Loops, Nested Loops.

UNIT-II

Functions: Introduction, Defining and Calling a Function, Designing a Program to Use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Value-Returning Functions Generating Random Numbers, Writing Our Own Value-Returning Functions, The math Module, Random Module, Time Module and Storing Functions in Modules.

Python File Input-Output: Opening and closing file, various types of file modes, reading and writing to files, manipulating directories.

UNIT-III

Lists and Tuples: Sequences, Introduction to Lists, List slicing, Finding Items in Lists with the in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists, Two-Dimensional Lists, Tuples.

Strings: Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings.

Dictionaries and Sets: Dictionaries, Sets, Serializing Objects.

Recursion: Introduction, Problem Solving with Recursion, Examples of Recursive Algorithms.

UNIT-IV

Classes and Object-Oriented Programming: Procedural and Object-Oriented Programming, Classes, Working with Instances, Techniques for Designing Classes.

Exception Handling: What is exception, various keywords to handle exception such try, catch, except, else, finally, raise.

Regular Expressions: The match() Function, The search() Function, The sub() Function, The findall() and finditer() Functions, Flag Options.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

UNIT-V

GUI Programming: Graphical User Interfaces, Using the tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons.

Introduction to plotting in Python – Basic Plots- Line and Scatter Plot, box plot, bar plots, Histograms and plotting data contained in files.

Text Book:

1. Tony Gaddis, "Starting Out With Python", 3rd Edition, Pearson, 2015.

Suggested Reading:

1. ReemaThareja "Python Programming", Oxford Press, 2017
2. Kenneth A. Lambert, "Fundamentals of Python", Delmar Cengage Learning, 2013.
3. Fabio Nelli, "Python Data Analytics (With Pandas, NumPy, and Matplotlib)", Apress, 2nd Edition, 2018.
4. James Payne, "Beginning Python using Python 2.6 and Python 3", wrox programmer to programmer, 2010.
5. Paul Gries, "Practical Programming: An Introduction to Computer Science using Python", 3rd Edition, 2016.

Web Resource:

1. https://www.python.org/

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18EGO02 **GENDER SENSITIZATION**

(Open Elective-3)

Instruction	3 Periods per week
Duration of SEE Examination	3 Hours
SEE Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course will introduce the students to:
1. Sensibility regarding issues of gender in contemporary India.
2. A critical perspective on the socialization of men and women.
3. Popular debates on the politics and economics of work while helping them reflect critically on gender violence.

Course Outcomes: After successful completion of the course the students will be able to:
1. Understand the difference between "Sex" and "Gender" and be able to explain socially constructed theories of identity.
2. Recognize shifting definitions of "Man" and "Women" in relation to evolving notions of "Masculinity" and "Femininity".
3. Appreciate women's contributions to society historically, culturally and politically.
4. Analyze the contemporary system of privilege and oppressions, with special attention to the ways gender intersects with race, class, sexuality, ethnicity, ability, religion, and nationality.
5. Demonstrate an understanding of personal life, the workplace, the community and active civic engagement through classroom learning.

UNIT – I

Understanding Gender:

Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1)

Socialization: Making Women, Making Men (*Towards a World of Equals*: Unit -2)

Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT – II

Gender And Biology:

Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4) Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10) Two or Many? Struggles with Discrimination.

UNIT – III

Gender and Labour:

Housework: the Invisible Labour (*Towards a World of Equals*: Unit -3) "My Mother doesn't Work." "Share the Load."

Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7)

Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT-IV

Issues Of Violence

Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu*".

Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.

Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)

Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

UNIT – V
Gender: Co - Existence
Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12)
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

Textbook:
1. A. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote,VasudhaNagaraj, AsmaRasheed, GoguShyamala, DeepaSreenivas and Susie Tharu **"Towards a World of Equals: A Bilingual Textbook on Gender"** published by Telugu Akademi, Hyderabad, Telangana State, **2015**.

Suggested Reading:
1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. "I Fought For My Life…and Won."Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

Web Resources:
1. https://aifs.gov.au/publications/gender-equality-and-violence-against-women/introduction
2. https://theconversation.com/achieving-gender-equality-in-india

.

Note: Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

18PY O01 **HISTORY OF SCIENCE AND TECHNOLOGY**

(Open Elective-3)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course aims to:
1. Gain the knowledge about origin of science in the Stone Age and its progress during Antiquity period.
2. Familiar with scientific views in the Medieval period and during the Industrial revolution.
3. Aware of modern scientific developments from 19th century onwards.

Course Outcomes: Upon completion of this course, the student will be able to:
1. Demonstrate the process of beginning of science and civilization, knowledge acquisition and philosophical approach of science and its advancements in the Stone Ages and Antiquity period.
2. Illustrate the advancements in science and technology in the medieval period across Asia and Arab countries and decline and revival of science in Europe.
3. Explain the scientific approach and its advances of the Europeans and how the role of engineer during the industrial revolution and the major advancements.
4. Make use of the advancements in the field of science and technology by adopting new philosophies of 19th and first half of 20th century in finding ethical solutions to the societal problems.
5. Interpret the changes in specializations of science and the technology and build the relation between information and society from second half of 20th century onwards.

UNIT-I

Science - The Beginning (through 599 BC): The Stone Ages, Knowledge among hunter gatherers, Agricultural Revolution and other revolutions, Civilization, Major advances.

Science in Antiquity (600 BC - 529 AD): Philosophy, a precursor to science, Hellenistic world and the Roman Empire, Other cultures of the period, major advances.

UNIT-II

Medieval Science (530 AD - 1452 AD): The decline of science in Europe, Science in China, Science and mathematics in India, Arab science, revival of science in Europe, technology revolution of the Middle ages, Major advances.

The Renaissance and the Scientific Revolution (1453 AD – 1659 AD): Renaissance, Scientific Revolution, Technology, Major advances.

UNIT-III

Scientific Method: Measurement and Communication (1660 AD – 1734): European domination, The scientific method, Major advances.

The Industrial Revolution (1735 AD – 1819 AD): Industrial Revolution, Rise of the engineer, Major Advances.

UNIT-IV

Science and Technology in the 19th Century (1820 AD – 1894 AD): Philosophical basis of 19th-century science, Science and the public, Science and technology, Major advances.

Rise of Modern Science and Technology (1895 AD – 1945 AD): The growth of 20thcentury science, New philosophies, Quantum reality, Energy sources, Electricity: a revolution in technology, Major advances.

UNIT-V

Big Science and the Post-Industrial Society (1946 AD – 1972 AD): Big science, Specialization and changing categories, Technology changes society, Major advances.

The Information Age (1973 AD – 2015 AD): Information and society, Globalization, The post-industrial society, Problems of the Information age, Major Advances.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Text Books:

1. Bryan Bunch and Alexander Hellemans, “The History of Science and Technology”, Houghton Mifflin Company (New York), 2004.
2. JD Bernal, “Science in History”, 4 Volumes, Eklavya Publishers, 2012.

Suggested Reading:

1. “The 100 Most Influential Scientists of All Time”, Edited by Kara Rogers, Britannica Educational Publishing, 2010.
2. Alberto Hernandez, “A Visual History of Science and Technology”, The Rosen Publishing Group, 2016.

Scheme of Instruction and Syllabi

of

ME I to IV SEMESTERS

of

TWO YEAR PG COURSE

in

POWER SYSTEMS & POWER ELECTRONICS
(AICTE Model Curriculum with effect from AY 2020-21)

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
(Autonomous Institution under UGC, Affiliated to Osmania University)
Department of Electrical and Electronics Engineering

Accredited by NBA and NAAC-UGC,

Chaitanya Bharathi (Post), Gandipet, Hyderabad–500075

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Department of Electrical and Electronics Engineering

Chaitanya Bharathi Institute of Technology (A)

Gandipet, Hyderabad-500075

Programme: PG-EEE (Power Systems & Power Electronics)

VISION and MISSION of the Institute

Vision

To be a centre of excellence in technical education and research

Mission

To address the emerging needs through quality technical education and advanced research

Quality Policy

Chaitanya Bharathi Institute of Technology imparts value based technical education and training to meet the requirements of student, industry, trade/profession, research and development organizations for self-sustained growth of society.

VISION and MISSION of EEE Department

Vision

To achieve Academic and Professional Excellence in Teaching and Research in the frontier areas of Electrical and Electronics Engineering **Vis-a -Vis** serve as a Valuable Resource for Industry and Society.

Mission

Empowering the Faculty and Student Rendezvous to Nurture Interest for Conceptual Keystone, Applied Multidisciplinary Research, Inspiring Leadership and Efficacious Entrepreneurship culture, Impeccable Innovation in frontier areas to be synergetic with Environmental, Societal and Technological Developments of the National and International community for Universal Intimacy.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

M1: Emphasis on providing Strong Theoretical Foundation & Engineering Leadership Eminence, infusion of Creativity and Management skill while maintaining Ethics and Moral for Sustainable Development. (Individual development)

M2: Enable the Faculty and Student Interactions to trigger interest for Applied Multidisciplinary Research and Entrepreneurship Culture resulting in Significant Advancement of the field of Specialization with Involvement of Industries and Collaborative Educational Networks. (Sense of Ownership, Networking and Eco system Development).

M3: Extend the Conducive Neighborhoods for Innovation in frontier areas to keep pace with Environmental, Societal and Technological Developments of the National and International Community to Serve Humanity. (Service to Society, Atmanirbhar Bharat)

Programme Educational Objectives are: After the Graduation, students

PEO1: Will excel in Power System and Power Electronics area.

PEO2: Will become successful in executing software related applications.

PEO3: Will carry out research in new technologies relevant to PS & PE.

PEO4: Will develop with professional ethics, effective communication skills, and knowledge of societal impacts of computing technologies.

Programme Outcomes are: The student is expected to gain an ability:

PO1: An ability to independently carry out research /investigation and development work to solve practical problems.

PO2: Ability to write and present a substantial technical report/document.

PO3: Students should be able to demonstrate a degree of mastery in the area of PS & PE.

PO4: Ability to discriminate the capability and knowledge in order to refine the problem formulation and methods of solution which will result into an acceptable outcome.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

SCHEME OF INSTRUCTION AND EXAMINATION

OF

MODEL CURRICULUM (R-20)

I-Semester of ME (PS & PE)

S.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
THEORY									
1	20EEC101	Real Time Applications for Power Systems	3	-	-	3	40	60	3
2	20EEC102	Power Electronic Converters	3	-	-	3	40	60	3
3	20EEE10X	Program Specific Elective- I	3	-	-	3	40	60	3
4	20EEE10X	Program Specific Elective- II	3	-	-	3	40	60	3
5	20MEC103	Research Methodology and IPR	2	-	-	2	40	60	2
6	AC-1	Audit Course-I	2	-	-	2	0	50	Non-Credit
PRACTICALS									
7	20EEC103	Power Systems Lab	-	-	4	-	50	-	2
8	20EEC104	Power Electronics Simulation Lab	-	-	4	-	50	-	2
TOTAL			16	-	8	-	300	350	18

L: Lecture T: Tutorial P:Practical SEE - Semester End Examination
CIE - Continuous Internal Evaluation

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

SCHEME OF INSTRUCTION AND EXAMINATION

OF

MODEL CURRICULUM (R-20)

II-Semester of ME (PS & PE)

S.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
THEORY									
1	20EEC105	Power System Dynamics	3	-	-	3	40	60	3
2	20EEC106	Advanced Power Electronic Circuits	3	-	-	3	40	60	3
3	20EEE10X	Program Specific Elective-III	3	-	-	3	40	60	3
4	20EEE10X	Program Specific Elective-IV	3	-	-	3	40	60	3
5	AC-II	Audit Course-II	2	-	-	2	0	50	Non-Credit
PRACTICALS									
6	20EEC107	Power Electronics Lab	-	-	4	-	50	-	2
7	20EEC108	Power Systems Simulation Lab	-	-	4	-	50	-	2
8	20EEC109	Mini Project with Seminar	-	-	4	-	50	-	2
		TOTAL	**14**	**0**	**12**	**-**	**310**	**290**	**18**

L: Lecture T: Tutorial P: Practical SEE - Semester End Examination
CIE- Continuous Internal Evaluation

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

SCHEME OF INSTRUCTION AND EXAMINATION

OF

MODEL CURRICULUM (R-20)

III-Semester of ME (PS & PE)

S.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
THEORY									
1	20EEE10X	Program Specific Elective- V	3	-	-	3	40	60	3
2	OE	Open Elective	3	-	-	3	40	60	3
PRACTICALS									
3	20EEC110	Industrial Project /Dissertation Phase 1		-	20	Viva	100	-	**10**
TOTAL			**6**	**0**	**20**	**-**	**180**	**120**	**16**

L: Lecture T: Tutorial P: Practical SEE - Semester End Examination
CIE - Continuous Internal Evaluation

SCHEME OF INSTRUCTION AND EXAMINATION
OF
MODEL CURRICULUM (R-20)
IV-Semester of ME (PS & PE)

S.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination		Credits
			Hours per week			Maximum Marks		
			L	T	P	CIE	SEE	
PRACTICALS								
1	20EEC111	Industrial Project /Dissertation Phase II	-	-	32	100	100	16
	TOTAL		**0**	**0**	**32**	**100**	**100**	**16**

L: Lecture T: Tutorial P: Practical SEE - Semester End Examination
CIE Continuous Internal Evaluation

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

List of Program Specific Electives/ Open Electives/ Audit Courses

Course Code	Open Electives
20EEE101	Electrical Power Distribution System
20EEE102	Mathematical Methods for Power Engineering
20EEE103	Restructured Power Systems
20EEE107	Renewable Energy System
20EEE109	Digital Protection of Power System
20EEE110	Power Quality
20EEE114	Smart Grids
20EEE115	High Voltage Engineering

Course Code	Program Specific Electives Group-2
20EEE104	Power Semi Conductor devices & Modelling
20EEE105	Electric Drive Systems
20EEE106	HVDC
20EEE108	Artificial Intelligence Techniques for Power Systems
20EEE111	FACTS and Custom power devices
20EEE112	Switch mode & Resonant Converters
20EEE113	Energy Auditing & Management
20EEE116	Electric and Hybrid Vehicles

Course Code	Open Electives
20CSO 101	Business Analytics
20MEO101	Industrial Safety
20MEO 102	Introduction to Optimization Techniques
20MEO 103	Composite Materials
20CEO 101	Cost Management of Engineering Projects
20EEO 101	Waste to Energy

Course Code	Audit Courses – I & II
20EGA 101	English for Research Paper Writing
20EGA 102	Indian Constitution and Fundamental Rights
20EGA 103	Stress Management by Yoga
20EGA 104	Personality Development through Life Enlightenment Skills
20ECA 101	Value Education
20CEA 101	Disaster Mitigation and Management
20ITA 101	Pedagogy Studies
20EEA 101	Sanskrit for Technical Knowledge

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEC101 REAL TIME APPLICATIONS FOR POWER SYSTEMS

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:

1. To understand the real-time computer operations of power system
2. To understand the importance of contingency analysis at planning stage for secured operation of power system.
3. To understand the concept of load forecasting in real time power system operation

Course Outcomes: After completion of this course, the student will be able to:

1. Understand the study of optimal power flows
2. Acquire knowledge of state estimation required for the real-time operation of power system
3. Describe the importance of contingency analysis at planning stage for secured operation of power system; and simulating the contingency studies with different methods.
4. Discuss the power system security and challenges in secured operation of power system in real-time environment.
5. Explain various methods and models available in power system load forecasting

UNIT-I

Optimal Power Flow: introduction to optimal power flow, Gradient method, Newton's method, Linear sensitivity analysis, linear programming method with only real power variables, linear programming with AC power flow variables and detailed cost functions, security constraint optimal power flow, interior point method, bus incremental costs

UNIT-II

State Estimation: Introduction to power system state estimation, Weighted-Least square state estimation, state estimation of AC networks, state estimation by orthogonal decomposition, Detection and identification of bad Measurements, network observability, pseudo-measurements measurements, application of state estimation.

UNIT-III

Contingency Analysis of Power system: Approximations in Contingency Analysis, Simulation of Addition and Removal of Multiple Lines in a Power System, Simulation of Tie-lines in Interconnected Power Systems, Network Reduction for Contingency Analysis, Contingency Analysis, Approximate Power Flow Method for Simulating Contingencies

UNIT-IV

Power system Security: introduction, factors affecting power system security, generator outages, transmission line outage, linear sensitivity factors, contingency selection, concentric relaxation, bounding, adaptive localization

UNIT-V

Load Forecasting: Introduction, Analytic methods, demand models, price forecasting, forecasting errors, system identification, econometric models, time series, time series model development, demand prediction.

Text Books:

1. Wood, A. J., Wollenberg, B. F., & Sheblé, G. B. 'Power Generation, operation and control', John Wiley &Sons, 2013.
2. T.K.Nagsarkar, M.S.Sukhija, 'Power system analysis', Oxford publications, 2007.

Suggested Reading:

1. J J Grainger and W D Stevenson, Power system Analysis, Mc Graw Hill 2003
2. Debs, Atif S. *Modern power systems control and operation*. Springer Science & Business Media, 2012.

With effect from the academic year 2020-2021

20EEC102 **POWER ELECTRONIC CONVERTERS**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:
1. To understand the concepts and basic operation of transient and steady state analysis of all power electronic converters with passive and active loads.
2. To understand the operation of single phase and Three phase full–wave converters and analyse harmonics in the input current.
3. To analyze the operation of single phase Cyclo-converters, Inverters and dc–dc converters

Course Outcomes: After completion of this course, **s**tudents will be able to:
1. Give a systematic approach for transient and steady state analysis of all power electronic converters with passive and active loads.
2. Know and carry out transient and steady state analysis of different power converters of different types of loads and switching sequences.
3. Analyze power electronic devices
4. Analyze and design DC-DC and DC-AC converters.
5. Analyze and design AC regulator and Cyclo converter

UNIT-I
Power Semiconductor Switched Circuits: Analysis of power semiconductor switched circuits with R, L, RL, RC loads and D.C. motor load, Battery charging circuit.

UNIT-II
Phase Controlled Rectifiers: Single-Phase and Three-Phase AC to DC converters, Single phase half controlled and fully controlled converters, operating domains of three phase full converters and semi-converters. Reactive power considerations.

UNIT-III
Non-Isolated DC-to-DC Converters (Choppers): Analysis and design of DC to DC converters, Control of DC-DC converters, Buck converters, Boost converters, Buck Boost converters, Cuck converters.

UNIT-IV
Inverters: Single phase and three phase inverters, Single phase half bridge and full bridge inverters, voltage source and current source inverters, comparison between voltage source and current source inverters, Voltage control and harmonic minimization in inverters.

UNIT-V
AC Voltage Controllers and Cyclo-Converters: AC to AC power conversion using voltage regulators, Uni-directional and Bi-directional AC voltage controllers, applications of AC voltage controllers, AC Choppers and cyclo-converters, step down and step-up cyclo converters, Consideration of harmonics, introduction to Matrix converters.

Text Books:

1. Ned Mohan, Undeland and Robbin,Power Electronics: converters, Application and design, John's Wiley and sons. Inc, Newyork.
2. M.H.Rashid,Power Electronics, Prentice Hall of India 1994.

Suggested Reading:

1. Soumitra Kumar Mandal, Power Electronics, McGraw Hill education
2. Dr. P.S. Bimbhra, Power Electronics, Khanna publications
3. M D Singh, K B Khanchandani, Power Electronics, McGraw Hill education

20MEC 103 **RESEARCH METHODOLOGY AND IPR**

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	2

Course Objectives: To make the students to

1. Motivate to choose research as career, identify various sources for literature review and report writing
2. Formulate the research problem, prepare the research design and Equip with good methods to analyze the collected data
3. Know about IPR copyrights

Course Outcomes: At the end of the course, student will be able to:

1. Define research problem, review and asses the quality of literature from various sources
2. Improve the style and format of writing a report for technical paper/ Journal report, understand and develop various research designs
3. Collect the data by various methods: observation, interview, questionnaires
4. Analyze problem by statistical techniques: ANOVA, F-test, Chi-square
5. Understand apply for patent and copyrights

UNIT - I

Research Methodology: Research Methodology: Objectives and Motivation of Research, Types of Research, research approaches, Significance of Research, Research Methods verses Methodology, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India, Benefits to the society in general. Defining the Research Problem: Selection of Research Problem, Necessity of Defining the Problem

UNIT - II

Literature Survey Report writing: Literature Survey: Importance and purpose of Literature Survey, Sources of Information, Assessment of Quality of Journals and Articles, Information through Internet. Report writing: Meaning of interpretation, layout of research report, Types of reports, Mechanics of writing a report. Research Proposal Preparation: Writing a Research Proposal and Research Report, Writing Research Grant Proposal

UNIT - III

Research Design: Research Design: Meaning of Research Design, Need of Research Design, Feature of a Good Design, Important Concepts Related to Research Design, Different Research Designs, Basic Principles of Experimental Design, Developing a Research Plan, Steps in sample design, types of sample designs.

UNIT - IV

Data Collection and Analysis: Data Collection: Methods of data collection, importance of Parametric, non parametric test, testing of variance of two normal population, use of Chi-square, ANOVA, Ftest, z-test

UNIT - V

Patents and Copyright: Patent: Macro economic impact of the patent system, Patent document, How to protect your inventions. Granting of patent, Rights of a patent, how extensive is patent protection. Copyright: What is copyright. What is covered by copyright. How long does copyright last? Why protect copyright? Related Rights: what are related rights? Enforcement of Intellectual Property Rights: Infringement of intellectual property rights, Case studies of patents and IP Protection

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Text Books:

1. C.R Kothari, “Research Methodology, Methods & Technique”; New Age International Publishers, 2004
2. R. Ganesan, “Research Methodology for Engineers”, MJP Publishers, 2011
3. Y.P. Agarwal, “Statistical Methods: Concepts, Application and Computation”, Sterling Publs., Pvt., Ltd., New Delhi, 2004

Suggested Reading:

1. Ajit Parulekar and Sarita D’ Souza, “Indian Patents Law – Legal & Business Implications”; Macmillan India Ltd., 2006
2. B. L.Wadehra; “Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications”; Universal law Publishing Pvt. Ltd., India 2000.
3. P. Narayanan; “Law of Copyright and Industrial Designs”; Eastern law House, Delhi 2010

Discussion is an exchange of intelligence, argument is an exchange of ignorance; Discussion is to find out what is right, argument is to find out who is right.

Vikasa Mantras- Vivekananda Institute of Human Excellence

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEC103 POWER SYSTEMS LAB

Instruction	4 Hours per week
Continuous Internal Evaluation	50 Marks
Credits	2

Course Objectives:
1. To understand the I–V and P-V characteristics of a PV module
2. To measure the sequence reactance of synchronous machine and 3-phase transformer
3. a) To understand the characteristics of various relays
   b) To estimate efficiency, regulation and ABCD constants of 3-phase transmission line

Course Outcomes:
After completion of the course, **s**tudent will be able to:
1. Learn the measurement of sequence reactance of synchronous machine and 3-phase transformer
2. Knowledge about the relay characteristics
3. Acquire Knowledge to estimate efficiency, regulation and ABCD constants of 3-phase transmission line
4. Learn about various types of faults
5. Validate the I–V and P-V characteristics of a PV module

LIST OF EXPERIMENTS:
1. Measurement of positive, negative and zero sequence reactance of synchronous machine
2. Measurement of positive and zero sequence reactance of three-phase transformer
3. Determination of Regulation & Efficiency of a three phase transmission line
4. Determination of ABCD constants of a three phase transmission line
5. Inverse time characteristics of over current relay
6. Characteristics of static over current relay
7. Differential protection of single-phase transformer
8. Study of microprocessor based inverse current relay characteristics
9. Study of over voltage and under voltage relays
10. Study of line-to-ground, line-to-line and three-phase faults
11. Single PV module I-V and P-V characteristics with radiation and temperature changing effect.
12. I-V and P-V characteristics with series and parallel combination of modules.
13. Effect of shading and Effect of tilt angle on I-V and P-V characteristics of solar module.
14. Finding MPP by varying the resistive load by varying the duty cycle of DC-DC converter.
15. Observe the output voltage waveform of inverter in auto mode.
16. Three-phase UPQC for power quality mitigation

Note: At least **TEN** experiments should be conducted in the semester

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

With effect from the academic year 2020-2021

20EEC104 **POWER ELECTRONICS SIMULATION LAB**

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Continuous Internal Evaluation	50 Marks
Credits	2

Course Objectives:
1. To be acquainted with simulation of different power converters
2. To Simulate and compare the output of single-phase and three-phase converters with R, RL and RLE loads
3. To Simulate single and three-phase Inverters and their voltage control techniques

Course Outcomes: After completion of the course, students will be able to:
1. Acquire the knowledge of using simulation tools for power electronic converters modelling.
2. Analyze the performance of phase -controlled converters by simulation
3. Demonstrate the effects of different topologies and voltage control techniquesin inverters.
4. Simulate different dc-dc converter circuits
5. Investigate with ac-ac conversion and reactive power compensation calculations.

List of Experiments

1. Single-phase semi-converter using RL & RLE loads with and without freewheeling diode.
2. Three-phase full converter using RL load with and without LC Filter
3. Three-phase fully controlled converter fed dc drive
4. Performance analysis of phase-controlled rectifiers with source inductance(single phase and three phase)
5. Analysis of Buck and Buck-Boost converters
6. Speed control of dc drive using dc chopper
7. Analysis of single-phase and Three phase IGBT inverters
8. Single, multiple and sinusoidal PWM techniques
9. Voltage control of an inverter using unipolar & bipolar PWM techniques
10. Inverter voltage control using Space Vector Modulation
11. Single-phase current source inverter with RL load
12. Analysis of three phase AC voltage controller with R & RL loads
13. Single-phase Cyclo-converter with R & RL loads
14. Single-phase Dual converter with R & RL loads
15. Reactive power compensation using FACTS controllers
16. Simulation of matrix converter.

Note: At least **TEN** Experiments should be conducted in the semester

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEC105 **POWER SYSTEM DYNAMICS**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:
1. To understand and analyze the various stability concepts of the power system
2. To study the concept of modeling the synchronous machines
3. To understand the phenomenon of SSR oscillations in power system

Course Outcomes: After completion of the course, the student will be able to
1. Distinguish various stabilities issues in the power system
2. Understand the modeling of synchronous machine
3. Describe the role of Excitation, PSS and Prime Movers in improving the power system performance during disturbances
4. Analyze the small-signal stability of the power system
5. Infer the concepts of LFOs and SSR in detail

UNIT-I

Synchronous Machine Modeling: Introduction, Park's Transformation, Flux Linkage Equations, Voltage Equations, Formulation of State-Space Equations, Current Formulation, Per Unit Conversion, Normalized Voltage and Torque Equations, Torque and Power, Equivalent Circuit of a Synchronous Machine, Flux Linkage State-Space Model

UNIT-II

Stability: Definitions classification of stability, Analysis of Steady state stability, Factors affecting Steady state stability, Transient stability, Equal-area criterion, Factor influencing Transient stability, Numerical Methods for analyzing transient stability,

Definition of voltage stability, voltage security, voltage collapse, Factors contributing and affecting voltage stability and minimization of voltage collapse, analysis of voltage stability/collapse, P-V and Q-V curves

UNIT-III

System performance improvement:

Excitation systems: Requirements, elements of excitation systems, types of excitation systems, modeling of excitation systems

Power system stabilizers: Basic concepts in applying PSS, Structure and tuning of PSS

Load models: Concept of load modeling, static and dynamic load models

Prime Movers: Hydraulic turbine and governing systems, steam turbine and governing system

UNIT-IV

Small-signal stability: Fundamentals of stability of dynamic systems, Modal matrices, free motion of dynamic systems, mode shapes, small-signal analysis of SMIB, synchronizing and damping torque analysis, state equations for small-signal model.

Unit V

Sub-Synchronous Oscillations: Turbine-generator torsional characteristics, Torsional interactions with power system controls, Sub-Synchronous Resonance (SSR), counter-measures for SSR

Text Books:

1. P. M. Anderson & A. A. Fouad "Power System Control and Stability", Wiley 7 Sons, 2003
2. P. Kundur, "Power System Stability and Control", McGraw Hill Inc, 1994
3. K R Padiyar,'power system dynamics: stability and control', BS Publications, 2008

Suggested Reading:-

1. J Machowski, J Bialek& J. R W. Bumby, "Power System Dynamics and Stability", John Wiley & Sons, 1997
2. L. Leonard Grigsby (Ed.); "Power System Stability and Control", Second edition, CRC Press,2007

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEC106 ADVANCED POWER ELECTRONIC CIRCUITS

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: Students will be able to:
1. Understand the operation of advanced power electronic circuit topologies.
2. Understand the load, switch and resonant converters.
3. Understand the modeling and design concepts of various DC-DC converters used in renewable

Course Outcomes: After completion of course Student will be able to:
1. Demonstrate the knowledge of DC isolated and non-isolated regulators
2. Demonstrate the knowledge of load and switch resonant converters
3. Demonstrate the knowledge resonant inverters
4. Model and design DC-DC converters for renewable energy conversion.
5. Apply the knowledge of dc-dc converters used in dc drives and renewable energy applications

UNIT-I
DC Regulators-I: Boost type APFC and control. Three phase utility inter phases and control-Buck, Boost, Buck-Boost SMPS, Topologies

UNIT-II
DC Regulators-II: Modes of operation –Push-Pull and Forward Converter Topologies - Voltage Mode Control. Half bridge, Full bridge and Fly-back Converters.

UNIT-III
Resonant Converters-I: Load Resonant Converter. Zero Voltage Switching Clamped Voltage Topologies.

UNIT-IV
Resonant Converters-II: Resonant DC Link Inverters with Zero Voltage Switching, High Frequency Link Integral Half Cycle Converter

UNIT-V
Application of DC-DC converters: Modeling and design of DC-DC Converters for various renewable energy conversion, Few power electronic circuits used in DC drives.

Text Books:
1. Rashid "Power Electronics" Prentice Hall India 2007.
2. G.K.Dubey et.al "Thyristorised Power Controllers" Wiley Eastern Ltd., 2005, 06.
3. Dewan & Straughen "Power Semiconductor Circuits" John Wiley & Sons., 1975.

Suggested Reading:
1. G.K. Dubey& C.R. Kasaravada "Power Electronics & Drives" Tata McGraw Hill., 1993
2. Cyril W Lander "Power Electronics" McGraw Hill., 2005.
3. B. K Bose "Modern Power Electronics and AC Drives" Pearson Education (Asia)., 2007
4. Abraham I Pressman "Switching Power Supply Design" McGraw Hill Publishing Company., 2001.

20EEC107 **POWER ELECTRONICS LABORATORY**

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Continuous Internal Evaluation	50 Marks
Credits	2

Course Objectives:
1. To understand the performance of converters for different loads.
2. To know various methods of speed control of electric drives.
3. To identify different topologies of converters and switching methods.

Course Outcomes: After the completion of this course, students will be able to:
1. Demonstrate the effects of different loads on the performance of various phase-controlled converters and choppers.
2. Understand the various topologies and control techniques used in inverters.
3. Acquire the conversion principles of AC-AC converters
4. Analyze different power electronic based speed control techniques of electric drives
5. Utilize matrix converter for different power conversions and analyze resonant converters.

List of Experiments
1. Three-phase half controlled and full controlled bridge rectifiers withR and RL loads.
2. Analysis of chopper circuit.
3. Analysis of single-phase series-resonant inverter.
4. Three-phase Mc-Murray Bed-Ford inverter with R and RL loads.
5. Three-phase IGBT inverter with R & RL loads.
6. Closed-loop control of permanent magnet dc drive.
7. Three-phase step down cyclo-converter with R and RL loads.
8. Static rotor resistance control of slip-ring induction motor.
9. Operation of two quadrant dc drive.
10. Analysis of ZVS buck converter
11. Design and implementation of ZCS buck converter
12. Obtaining different converters using Matrix converter module
13. Speed control of SRIM using static Kramer's system.
14. Speed control of Three phase induction motor using AC-AC converter.
15. Design of a flyback converter for solar energy powered DC loads
16. Analysis of three phase cascaded multi-level inverter.

Note: At least **TEN** experiments should be conducted

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEC108 POWER SYSTEMS SIMULATION LAB

Instruction	4 Hours per week
Continuous Internal Evaluation	50 Marks
Credits	2

Course Objectives:
1. To Simulate and compare the various aspects economic load dispatch and load flows.
2. To Simulate and observe stability studies and short-circuit studies
3. To Conduct experiments on modeling of Transmission line

Course Outcomes: After completion of this course**,** students will be able to:
1. Validate the adaptability of economic load dispatch and load flow for a given situation by simulation results.
2. Acquire the knowledge about formation of Impedance and Admittance Matrices
3. Acquire the knowledge to analyze the Symmetrical and un-symmetrical fault currents
4. Acquire the knowledge to simulate various types of transmission models
5. Acquire the knowledge about Symmetrical and Unsymmetrical components for a given system.

List of Experiments:

1. Single Area and Two Area Load Frequency Control
2. Economic Load Dispatch in Power Systems
3. Formation of Z-Bus Matrix using Building Algorithm
4. Load Flow Studies Using Gauss-Seidel and Newton-Raphson Method
5. Transient Stability Studies
6. Short Circuit Analysis for unsymmetrical faults
7. Formation of Bus Admittance Matrix
8. Three Phase Short Circuit Analysis of Synchronous Machine
9. Unsymmetrical Fault Analysis for RLC loads
10. Step Response of Synchronous Machine
11. Determination of Symmetrical Components
12. Simulation of Ferranti Effect
13. Modeling of Transmission Lines
14. Solution of Swing Equation
15. Load flow studies of Distribution Systems
16. Simulation of UPQC for power quality mitigation

Note: At least **TEN** experiments should be conducted in the semester.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEC109 **MINI PROJECT WITH SEMINAR**

Instruction	4 Hours per week
Semester End Examination	50 Marks
Credits	2

I. Course Objectives:

1. Motivate the students to face the challenges in which demonstration of their competence in research techniques.
2. Provide an opportunity to contribute to engineering arena in their own form.

II. Course Outcomes: On successful completion of the course students will be able to:

1. **Organise** the literature review to identify and formulate the engineering problem
2. **Design** engineering solutions to simple problems utilizing modern tools and methods
3. **Demonstrate** a sound technical knowledge of their selected mini project topic
4. **Communicate** with engineers and the community to have the conscious of surroundings
5. **Adapt** the skills and attitudes of a Professional Engineer.

III. General Instructions:

1. Mini Project is of 14 week duration out of which one week prior reading, twelve weeks of active research and final week for presentation of their work for assessment.
2. Each student will be allotted to a faculty supervisor for mentoring.

IV. Methodology:

1. The student can select either mathematical modeling based / experimental investigations or numerical modeling.
2. All the investigations are clearly stated and documented with reasons / explanations.
3. The project should contain
    - i. A clear statement of research objectives
    - ii. Background work
    - iii. Literature review
    - iv. Techniques used
    - v. Prospective deliverables
    - vi. Benefit from this research
    - vii. Detailed discussion on results
    - viii. Conclusions and references

V. Assessment:

1. 50% of the marks for oral presentation which will take place at the end of the semester.
2. Evaluation will be done by a committee consisting of supervisor, one senior faculty and Head of the department or his nominee.
3. Evaluation will be carried out based on 'RUBRIC' (which will be supplied by the dept.)
4. 50% of the marks for scientific report on the project.
5. Report should be written as per standard journal format. The repertoire of the report content can be taken from the department.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

with effect from the academic year 2020-2021

20EEC110 INDUSTRIAL PROJECT / DISSERTATION PHASE- I

Instruction	20 Hours per week
Semester End Examination	100 Marks
Credits	10

Course Objectives: At the end of the course:

1. Students will be exposed to self-learning various topics.
2. Students will learn to survey the literature such as books, national/international refereed journals and contact resource persons for the selected topic of research.
3. Students will learn to write technical reports.
4. Students will develop oral and written communication skills to present.
5. Student will defend their work in front of technically qualified audience.

Course Outcomes: On successful completion of the course students will be able to:

1. **State** research questions related to main problem and identify the Research methods
2. **Identify** literature for review.
3. **Integrate** theory and practice.
4. **Apply** knowledge and understanding in relation to the agreed area of study.
5. **Communicate** in written form by integrating, analysing and applying key texts and practices

Guidelines:

1. The Project work will preferably be a problem with research potential and should involve scientific research, design, generation/collection and analysis of data, determining solution and must preferably bring out the individual contribution.
2. Seminar should be based on the area in which the candidate has undertaken the dissertation work.
3. The CIE shall include reviews and the preparation of report consisting of a detailed problem statement and a literature review.
4. The preliminary results (if available) of the problem may also be discussed in the report.
5. The work has to be presented in front of the committee consists of Head, Chairperson-BoS, Supervisor and Project coordinator.
6. The candidate has to be in regular contact with his supervisor and the topic of dissertation must be mutually decided by the guide and student.

Guidelines for the award of Marks: Max. Marks: 100		
Evaluation by	**Max. Marks**	**Evaluation Criteria / Parameter**
Supervisor	30	Project Status / Review(s)
	20	Report
Department Committee	10	Relevance of the Topic
	10	PPT Preparation(s)
	10	Presentation(s)
	10	Question and Answers
	10	Report Preparation

Note: Department committee has to assess the progress of the student for every two weeks.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEC111 INDUSTRIAL PROJECT / DISSERTATION PHASE- II

Instruction	32 Hours per week
Semester End Examination	100 Marks
Continuous Internal Evaluation	100 Marks
Credits	16

Course Objectives: At the end of the course:

1. Students will be able to use different experimental techniques and will be able to use different software/ computational/analytical tools.
2. Students will be able to design and develop an experimental set up/ equipment/test rig.
3. Students will be able to conduct tests on existing set ups/equipments and draw logical conclusions from the results after analyzing them.
4. Students will be able to either work in a research environment or in an industrial environment.
5. Students will be conversant with technical report writing and will be able to present and convince their topic of study to the engineering community.

Course Outcomes: On successful completion of the course students will be able to:

1. **Contribute** to Research and Development work.
2. **Apply** a holistic view to critically, independently and creatively to identify, formulate and deal with complex issues.
3. **Evaluate** critically different engineering/Technological solutions.
4. **Integrate** knowledge critically and systematically
5. **Develop** the ethical aspects of Research work.

Guidelines:

1. It is a continuation of Project work started in semester III.
2. The student has to submit the report in prescribed format and also present a seminar.
3. Develop strong communication skills to defend their work in front of technically qualified audience
4. The candidate has to prepare a detailed project report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology (experimental set up or numerical details as the case may be) of solution and results and discussion.
5. The report must bring out the conclusions of the work and future scope for the study. The work has to be presented in front of the examiners panel consisting of an approved external examiner, an internal examiner (HoD and BoS Chair Person) guide/co-guide.
6. The candidate has to be in regular contact with his/her guide/co-guide.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Guidelines for awarding marks in CIE: **Max. Marks: 100**

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
Review Committee	05	Review 1
	10	Review 2
	10	Review 3
	15	Final presentation with the draft copy of the report standard format
	10	Submission of the report in a standard format
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	10	Quality of the work which may lead to publications
	10	Analytical / Programming / Experimental Skills
	10	Report preparation in a standard format

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
External and Internal	20	Power Point Presentation
	40	Quality of thesis and evaluation
Examiner(s) together	20	Quality of the project 1. Innovations 2. Applications 3. Live Research Projects 4. Scope for future study 5. Application to society
	20	Viva-Voce

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Programme Specific Electives

20EEE101 ELECTRIC POWER DISTRIBUTION SYSTEM

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:
1. To study sub-transmission, Distribution substations
2. To understand the philosophy of Distribution Automation and SCADA
3. To explore with the optimization aspects of distribution system

Course Outcomes: After completion of the course, students will be able to:
1. Acquire knowledge of sub-transmission, Distribution substations
2. Understand Distribution voltage regulation
3. Discuss the Distribution automation and its application in practice
4. Explain the concept of optimization in distribution automation
5. Demonstrate the need and functioning of SCADA system

UNIT-I
Sub-Transmission Lines & Substations: Types of sub transmission, Distribution substation, Bus schemes, Substation location, Rating of substation, Calculation of voltage drops with primary feeders, Derivation of the K constant, Application curves, Interpretation of the Percentage Voltage drop formula.

UNIT-II
Primary Feeders: Types of primary feeders, Primary feeder loading, Tie lines, Design of radial primary feeders, Voltage drop calculations by ABCD constants, Uniformly distributed load, Non uniformly distributed load, Distribution Feeder Analysis
Secondary Feeders: Secondary voltage levels, Present design practice, Secondary Banking, Economic design of secondaries, Total annual cost equation.

UNIT-III
Distribution voltage regulation: Three-phase balanced and non-three-phase primary lines, analysis distribution and equipment costs, introduction to Distribution system voltage regulation, voltage standards, voltage control, feeder-voltage regulators, line-drop compensation, capacitor automation, voltage fluctuations

UNIT-IV
Distribution Automation: Introduction, Project planning, Definitions, Communication, Sensors, Supervisory Control and Data Acquisition Systems (SCADA), Consumer Information Service(CIS), Geographical Information System (GIS), Automatic Meter Reading (AMR), Automation system.
Optimization: Costing of schemes, optimal placement of Capacitors, Optimum size of line conductor in Distribution Systems, Restoration and Reconfiguration of network, Economic loading of distribution transformers, Optimal switching device placement.

UNIT-V
SCADA: Introduction, Block Diagram, components of SCADA, Functions of SCADA, SCADA applied to distribution automation, Advantages of Distribution Automation through SCADA, Communication protocols in SCADA systems

Text Books:

1. Turan Gonen, Electric Power Distribution System Engineering, CRC Press, 2nd Edition, 2008
2. A.S. Pabla, Electric Power Distribution, Tata McGraw Hill Publishing Co. Ltd., 5th Edition, 2004

Suggested Reading:

1. M.K. Khedkar, G.M. Dhole, A Text Book of Electric power Distribution Automation, University Science Press, New Delhi,2010
2. Anthony J Pansini, Electrical Distribution Engineering, CRC Press, 1992
3. James Momoh, Electric Power Distribution, automation, protection & control,

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEE102 MATHEMATICAL METHODS FOR POWER ENGINEERING

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:
1. To understand the relevance of mathematical methods to solve engineering problems.
2. To understand the theoretical workings of the simplex method for linear programming and perform iterations of it by hand.
3. To understand how to model and solve problems using linear and nonlinear programming with and without constraints

Course Outcomes: After completion of the course, students will be able to:
1. Recognize and identify the nature of the mathematical problems that are commonly encountered in power engineering
2. Knowledge about vector spaces, linear transformation, Eigen values and eigenvectors of linear operators
3. To learn about linear programming problems and understanding the Simplex method for solving linear programming problems in various fields of science and technology
4. Acquire knowledge about nonlinear programming and various techniques used for solving constrained and unconstrained nonlinear programming problems
5. Understanding the concept of random variables, functions of random variable and their probability distribution

UNIT-I
Vector spaces, linear transformations, Matrix representation of linear transformation

UNIT-II
Eigen values and Eigen vectors of linear operator

UNIT-III
Linear Programming Problems, Simplex Method, Duality, Non Linear Programming problems

UNIT-IV
Unconstrained Problems, Search methods, Constrained Problems

UNIT-V
Lagrange method, Kuhn-Tucker conditions, random Variables, distributions, Independent Random Variables

Text Books:

1. Kenneth Hoffman and Ray Kunze,Linear Algebra, 2nd Edition, PHI, 1992
2. Erwin Kreyszig, Introductory Functional Analysis with Applications, John Wiley & Sons, 2004
3. Irwin Miller and Marylees Miller, John E. Freund's, Mathematical Statistics, 6th Edn, PHI, 2002
4. J. Medhi, Stochastic Processes, New Age International, New Delhi., 1994

Suggested Reading:

1. A Papoulis,Probability, Random Variables and Stochastic Processes, 3rd Edition, McGraw Hill, 2002
2. John B Thomas,An Introduction to Applied Probability and Random Processes, John Wiley, 2000
3. Hillier F S and Liebermann G J, Introduction to Operations Research, 7th Edition, McGraw Hill, 2001
4. Simmons D M,Non Linear Programming for Operations Research, PHI, 1975

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEE103 **RESTRUCTURED POWER SYSTEMS**

Instruction	3 Hour per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:
1. To understand open access and operation of power system in deregulated and competitive environment.
2. To understand the role of ISO in pool markets, Bilateral markets and transmission pricing issues
3. To understand different aspects of managing ancillary services and open access same time information system.

Course Outcomes: After completion of the course, students will be able to:
1. understand the operation of power system in de-regulated and competitive environment
2. Discuss operation and planning policies, in deregulated environment.
3. Describe the transmission pricing methodologies.
4. Distinguish different ancillary services provided by the ISO
5. Explain open access same-time information system.

UNIT-I

Introduction to Power System Deregulation: Operation of vertically integrated power systems, Fundamental of Restructured systems, Benefits of deregulation, Power pools, Energy Brokerage system, Electricity market models, Market models based on contractual arrangements, Market architecture, Spot market, Day-ahead market and retail market, Models for trading arrangements. Congestion management.

UNIT-II

Power System Operation in Competitive Environment: Operational planning activities of ISO, ISO in pool markets, ISO in bilateral markets, Operational planning activities of a GENCO, Unit commitment in deregulated environment, Competitive bidding. Risk assessment.

UNIT-III

Transmission Pricing Issues: Power wheeling, transmission open access, cost components in transmission, pricing of power transactions, Transmission cost allocation methods, Postage stamp method, Contract path method, MW-Mile method, MVA-Mile method, Unused transmission capacity method, Comparison of cost allocation methods.

UNIT-IV

Ancillary Services Management: Types of ancillary services, classification of ancillary services, load generation balancing related services, frequency regulation, load following, voltage control and reactive power support service, black start capability service, Synchronous generators as ancillary service providers. Standard market design.

UNIT-V

Open Access Same-time Information System: Structure of oasis, Posting of information, Transfer capability on oasis, Definitions- ATC, TTC, TRM, CBM, Methodologies to calculate ATC. Developments in India, IT applications in Restructured markets.

Text Books:

1. Lai, L.L. (Editor.), 'Power System Restructuring and Deregulation', John Wiley and Sons Ltd., 2001.
2. Bhattacharya, K., Bollen, M.H.J., and Daalder, J.E., 'Operation of Restructured Power Systems', Kluwer Academic Publishers. 2001.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Suggested Readings:

1. LorrinPhilipson, H. Lee Willis, "Understanding electric utilities and de- regulation", Marcel Dekker Pub.,1998.
2. Steven Stoft, "Power system economics: designing markets for electricity", John Wiley and Sons, 2002.
3. M.Ilic, F.Galiana and L.Fink, 'Power System Restructuring Engineering and Economics', Kluwer Academic Publishers 1998.
4. Md Shahidephpour & M. Alomoush, 'Restructured Electrical Power Systems', Marcel Dekker Inc, 2001.

Time is what we need most, but what we use worst; Most of the misfortunes in our life are due to misused time.

Vikasa Mantras- Vivekananda Institute of Human Excellence

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEE107 RENEWABLE ENERGY SOURCES

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:
1. To learn various renewable energy sources
2. To understand the working principles and implementation aspects of solar and wind energy sources.
3. To understand power electronics interface and power quality problems with grid

Course Outcomes: After completion of the course, students will be able to:
1. Acquire the knowledge on design of solar PV systems
2. Implement the concepts of wind power generation
3. Demonstrate the suitability of non-conventional energy for grid connection
4. Understand the working of distributed generation system in autonomous/grid connected modes
5. Analyze economic aspects of power generation and its power quality issues

UNIT-I

Generation of Electrical Energy: Introduction, Conventional and renewable sources of energy, Distributes and central station generation, DG technologies, Advantages and disadvantages of distributed generation, introduction to hydro, tidal, wave, Geothermal and biomass energy.

UNIT-II

Solar Energy Conversion: Solar radiation and its measurements, Types of solar collectors, Combined heat and power, Solar thermal power plant, Components of solar PV system, Efficiency and limits, Design of solar PV Hybrid system, Standalone and Grid connected systems

UNIT-III

Wind Energy: Power in the wind, Types of wind turbines, Components of wind mill, operation of wind turbines, Wind energy extraction, Types and design of wind turbine rotor, modes of wind power generation, Selection of optimum WEG, Grid interfacing of wind farm, Methods of grid connection, Properties of grid system.

UNIT-IV

Integration of grids & Power Quality: Interface with grid, direct and power electronics coupling, Impact of type of interface, Power Quality issues, Impact of distributed generation, Power Quality disturbances

UNIT-V

Economics of power generation: Transmission system operation, Protection of distributed Generators, Economics of distributed generation, Case studies, solar electricity in Sagar Island, Potential of wind energy in India.

Text Books:
1. RanjanRakesh , D.P.Kothari, Singal K C, "Renewable Energy Sources And Emerging Technologies" 2^{nd} Edition Printice Hall Of India 2011
2. Math.H.Bollen, Fainan Hassan, "Integration Of Distributed Generation In The Power System" Wiley IEEE Press, July 2011

Suggested Reading:
1. Loi Lei Lai, Tze Fun Chan, " Distributed Generation: Induction And Permanent Magnet Generators" October 2007, Wiley IEEE Press
2. Roger A Messenger, Amir Abtahi, :" Photovoltaic Systems Engineering" 3rd Edition 2010
3. James A Manwell, John G McGowan Antony L Rogers , "Wind Energy Explained: Theory, Design And Application" John Wiley And Sons 2010

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEE109 DIGITAL PROTECTION OF POWER SYSTEM

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:
1. To study the architecture and the required mathematical background for the design and development of digital relays
2. To Explore the basic elements in digital relays and understand various algorithms used in digital protection
3. To understand the application of various algorithms for the digital protection of practical power system.

Course Outcomes: After completion of the course, students will be able to:
1. Recognize the need and architecture of digital relays
2. Comprehend the application of mathematics in power system protection
3. Describe the importance of every element of digital relay
4. Distinguish various mathematical algorithms used for the estimation of power system parameters
5. Explain various algorithms used for the digital protection of power system.

UNIT-I

Digital Relays: Evolution of digital relays, Advantages, Architecture of digital relays, Performance and operational characteristics of digital protection

Mathematical Background: Finite difference techniques, Forward, backward and central difference interpolation, Numerical differentiation, Curve fitting and smoothing, Fourier analysis, Walsh function analysis.

UNIT-II

Basic Elements of Digital Protection: Signal conditioning: transducers, surge protection, analog filtering, analog multiplexers, Conversion subsystem: the sampling theorem, signal aliasing Error, sample and hold circuits, multiplexers, analog to digital conversion, Digital relay subsystem filtering concepts of the digital relay as a unit consisting of hardware and software

UNIT-III

Sinusoidal-Wave-Based Algorithms: sample, first, second derivative techniques, two-sample and three-sample techniques, Fourier-analysis-based algorithms, walsh-function-based techniques

UNIT-IV:

Algorithms based on Least Squares and Differential Equation:

Least Squares-based Algorithm: Integral LSQ fitting, Power series LSQ fitting, Multi-variable series LSQ

Differential Equation-based Algorithm: Representation of Transmission line, differential equation protection, simultaneous equation techniques,

UNIT-V:

Digital Protection:

Digital Protection of Transformers: Principles of protection, FIR-filter based algorithms, Least-square curve fitting based algorithms, Fourier-based Algorithms

Digital Protection Transmission Lines: current-based differential Protection, composite voltage and current-based protection schemes

Text Books:

1. A.T. Johns and S. K. Salman, “Digital Protection of Power Systems”, IEEE Press,1999
2. S.R.Bhide “Digital Power System Protection” PHI Learning Pvt.Ltd.2014

Suggested Reading:

1. Rebizant, Waldemar, Janusz Szafran, and Andrzej Wiszniewski, "Digital signal processing in power system protection and control" Springer, 2011.
2. A.G. Phadke and J. S. Thorp, “Computer Relaying for Power Systems”, Wiley/Research studiesPress, 2009

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEE110 **POWER QUALITY**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:
1. To understand the theoretical concepts and standards of Power Quality (PQ), and methods to calculate and analyze voltage sag in distribution systems.
2. To have knowledge of Analysis of Voltage Sag
3. To understand PQ issues and sources of harmonics in Industrial systems and its mitigation

Course Outcomes: After completion of this course, students will be able to:
1. Acquire the knowledge of theoretical concepts and standards of Power Quality issues and its measurement
2. Acquire knowledge in identifying sources of harmonics
3. Acquire the knowledge to analyze voltage sag in distribution systems
4. Acquire the knowledge Harmonic Filtering Techniques
5. Acquire the knowledge in Solutions to power factor correction, Wiring and Grounding Problems

UNIT- I
Introduction to power quality: Overview of power quality phenomena, voltage quality, classification of power quality issues, Power quality measures and standards-THD-TIF-DIN-C-message weights. Flicker factor, transient phenomena-occurrence of power quality problems, Power acceptability curves- PQ Measuring Instruments. Standards and recommended practices

UNIT-II
Harmonics: Harmonic distortion and solutions, Voltage distortion Vs Current distortion, Sources of harmonics, Effect of harmonic distortion, Impact of capacitors, transformers and motors, harmonic sources from commercial and industrial loads, locating harmonic sources of power system.

UNIT-III
Voltage sag Analysis: Voltage sag Analysis, causes and sources of voltage sags, voltage flow chart, voltage sag magnitude and duration plots, fast assessment methods for voltage sags in distribution systems, effect of momentary voltage dips on the operation of Induction motor and Synchronous Motors.

UNIT-IV
Harmonic Filtering: Passive Harmonic Filtering, Three Phase Three-wire Shunt Active Filtering and their control using p-q theory and d-q modeling, Hybrid Filtering using Shunt Active Filters, Dynamic Voltage Restorer and its control, Power Quality Conditioner,

UNIT-V
PQ Consideration in Industrial Power Systems: Adjustable speed Drives and its applications, Reasons for grounding, typical wiring and grounding problems-solutions.
Power Factor Correction: Control Methods for Single Phase APFC, Three Phase APFC and Control Techniques

Text Books:
1. G.T. Heydt, “Electric power quality”, McGraw-Hill Professional, 2007
2. Math H. Bollen, “Understanding Power Quality Problems”, IEEE Press, 2000
3. C.Sankaran, ‘Power Quality’, CRC Press, 2001

Suggested Reading:
1. J. Arrillaga, “Power System Quality Assessment”, John wiley, 2000
2. J. Arrillaga, B.C. Smith, N.R. Watson & A. R.Wood ,”Power system Harmonic Analysis”, Wiley, 1997
3. Roger C.Dugan, Mark F.McGranaghan, Surya Santoso, H.Wayne Beaty, ‘Electrical Power Systems Quality’, 3rd Edition,Tata McGraw-Hill, 2012.
4. R.Sastry Vedam, M.Sarma, "Power Quality- Var Compensation in Power Systems ", CRC Press, 2009

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEE114 **SMART GRIDS**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:
1. To Understand concept of smart grid and its advantages and the operation of smart devices such as PMU, IED etc.
2. To know smart metering techniques and wide area measurement techniques.
3. To understand the operation of micro grid and its components and the problems associated with integration of distributed generation & its solution through smart grid.

Course Outcomes: After completion of the course, students will be able to:
1. Appreciate the difference between smart grid & conventional grid.
2. Acquire knowledge of smart devices such as PMU, IED etc
3. Apply smart metering concepts to industrial and commercial installations.
4. Formulate solutions in the areas of smart substations, distributed generation and wide area measurements.
5. Acquire knowledge of micro grid and modern communication technologies

UNIT-I
Introduction to Smart Grid: Evolution of Electric Grid, Concept of Smart Grid, Need of Smart Grid, Concept of Robust &Self-Healing Grid, Present development & International policies in Smart Grid

UNIT-II
Smart Devices-I: Real Time Prizing, Smart Appliances, Automatic Meter Reading (AMR), Outage Management System (OMS), Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid, Smart Sensors, Home and Building Automation, Smart Substations, Substation Automation, Feeder Automation.

UNIT-III
Smart Devices-II: Geographic Information System (GIS),Intelligent Electronic Devices (IED) & their application for monitoring & protection, Wide Area Measurement System (WAMS), Phase Measurement Unit (PMU).

UNIT-IV
Micro-grid: Need and applications of micro-grid, Formation of micro-grid, Issues of interconnection, Protection and control of micro-grid, Plastic and Organic solar cells, Thin film solar cells, Variable speed wind generators, fuel-cells, micro-turbines, Captive power plants, Integration of renewable energy sources.

UNIT-V
Communication Systems: Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighborhood Area Network (NAN), Wide Area Network (WAN), Bluetooth, ZigBee, GPS, Basics of CLOUD computing and Cyber Security for Smart Grid, Broadband over Power line (BPL). IP based protocols.

Text Books:
1. Ali Keyhani, Design of smart power grid renewable energy systems, Wiley IEEE, 2011.
2.Clark W. Gellings,The Smart Grid: Enabling Energy Efficiency and Demand Response, CRC Press.

Suggested Reading:
1. JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, "Smart Grid: Technology and Applications", Wiley 2012.
2. Stuart Borlas'e, "Smart Grid:Infrastructure, Technology and solutions" CRC Press.
3. A.G.Phadke , "Synchronized Phasor Measurement and their Applications", Springer.

With effect from the academic year 2020-2021

20EEE115 HIGH VOLTAGE ENGINEERING

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:

1. To understand different high voltage measurements and the necessary instruments
2. To know how to measure high voltage AC/DC and impulse voltages and currents
3. To understand the planning, safety principles and layout of HV labs

Course Outcomes: After completion of this course, student will be able to:

1. Acquire knowledge about high voltage generation techniques
2. Acquaint with the different methods of generating high voltage AC/DC and impulse voltages and currents
3. Acquire the knowledge of measurement techniques for high voltage AC/DC and impulse voltages and currents
4. Acquire knowledge about planning and layout of HV labs
5. Attain methods of shielding, grounding and other safety precautions of HV labs

UNIT-I

Generation of High DC& AC voltages: Half and full wave rectifier circuits, Voltage doubler circuits, Voltage multiplier circuits: Cascaded rectifier circuit, Cockroft Walton voltage multiplier circuit, Electrostatic machines: Van de Graaff Generators, Electrostatic generators, Cascade transformers, Resonant transformers.

UNIT-II

Generation of Impulse voltages and currents: Impulse generator circuits, Multistage Impulse generator circuit, Generation of switching surges, Generation of impulse currents: Circuit for producing impulse current wave, Generation of high impulse currents, Generation of rectangular current pulses, Tripping and control of impulse generators.

UNIT-III

Measurement of High Voltage and Currents: Sphere gap, Factors affecting the spark over voltage, Uniform field spark gap, Rod gap, Electrostatic voltmeter, Generating voltmeter, Measurement of electric fields, Potential dividers (Resistive and Capacitive), Series impedance ammeters, Rogowski coils, Hall Effect generators, Digital techniques in HV measurements.

UNIT-IV

Planning and Layout of High Voltage Labs: Test facilities in HV labs, Classification of HV labs, Voltage and power ratings of test equipment, Layout of HV labs, Clearance, Shielding and Grounding of HV labs, Recent trends in HV engineering.

UNIT-V

High Voltage Safety Principles: Indian standards for HV clearances, Calibration of HV measuring instruments, Safety earthing, Safety in HV laboratory, Safety regulations for high voltage tests.

Text Book:

1. M.S.Naidu and V.Kamaraju, “High Voltage Engineering”, Tata McGraw Hill 2001.
2. C.L. Wadhwa, “High Voltage Engineering”, Wiley Eastern Ltd., New Delhi, 1994

Suggested Reading:

1. M. Khalifa, “High Voltage Engineering: Theory and Practise”, Dekker, 1990.
2. E.Kuffel, W.S.Zaengl and J.Kuffel, “High Voltage Engineering Fundamentals”, Newness Publication, 2000.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEE104 **POWER SEMICONDUCTOR DEVICES AND MODELING**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:
1. To understand the static and dynamic characteristics of current and voltage controlled power semiconductor devices
2. To enable the selection of devices for different power electronics applications
3. To understand the control, protection and firing circuits for different power devices.

Course Outcomes: After completion of this course, students will be able to:
1. Understand, the attributes of an ideal switch and its selection for a Specific Power electronic application.
2. Analyze the static and switching characteristics of different current controlled semiconductor devices
3. Analyze the static and switching characteristics of different voltage controlled semiconductor devices and also to differentiate various voltage controlled devices.
4. Design different firing and protection circuits for power semiconductor devices.
5. Select different heat sinks for power semiconductor devices.

UNIT-I
Power Switching Devices Overview: Attributes of an ideal switch, application requirements, circuit symbols; Power handling capability – (SOA); Device selection strategy – On-state and switching losses, EMI due to switching, Power diodes, Types, forward and reverse characteristics, switching characteristics, rating.

UNIT-II
Current Controlled Devices: BJT's, Construction, static characteristics, switching characteristics; Negative temperature coefficient and secondary breakdown; Power Darlington, Thyristors: Physical and electrical principle underlying operating mode, Two transistor analogy, concept of latching; Gate and switching characteristics; converter grade and inverter grade and other types; series and parallel operation; comparison of BJT and Thyristor, steady state and dynamic models of BJT & Thyristor.

UNIT-III
Voltage Controlled Devices: Power MOSFETs and IGBTs, Principle of voltage controlled devices, construction, types, static and switching characteristics, steady state and dynamic models of MOSFET and IGBTs - Basics of GTO, MCT, RCT and IGCT, Comparison of all power devices.

UNIT-IV
Firing and Protecting Circuits: Necessity of isolation, Pulse transformer, Opto coupler, Gate drives circuit-SCR, MOSFET, IGBTs and base driving for power BJT.

Protection: Voltage protection by Selenium Diodes and Metal-Oxide Varistors, Current Protection, Fusing, Fault Current with AC and DC sources, Design of snubbers.

UNIT-V
Thermal Protection: Heat transfer, conduction, convection and radiation; Cooling, liquid cooling, vapour phase cooling; Guidance for hear sink selection, Thermal resistance and impedance, Electrical analogy of thermal components, heat sink types.

Text Books:
1. B.W Williams, Power Electronics Circuit Devices and Applications, John wiley & sons, 1987.
2. Rashid M.H., Power Electronics Circuits, Devices and Applications, PHI, Third Edition, New Delhi, 2004
3. Mohan, Undeland and Robins, Power Electronics Concepts, applications and Design, John Wiley and Sons, Singapore, 2000.

Suggested Reading:
1. MD Singh and K.B Khanchandani, Power Electronics, Tata McGraw Hill, 2001.
2. Joseph Vithayathil, Power Electronics: Principles and Applications, Delhi, Tata McGrawHill, 2010.

20EEE105 **ELECTRIC DRIVE SYSTEM**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:

1. To understand Basic electrical drives and their analysis.
2. To learn Design of controller for drives.
3. To understand vector control of electrical drives.

Course Outcomes: After completion of this course, **s**tudents will be able to:

1. Model the Electric Drive System
2. Design modulation strategies of power electronics converters, for drives application
3. Design appropriate current/voltage regulators for electric drives
4. Select and implement the drives for Industrial Process
5. Implement various variable speed drives in Electrical Energy Conversion System

UNIT-I

Dynamics of Electric Drives: Fundamentals of torque equation. Speed torque convention and multi-quadrant operation, components of load torques. Classification of load torques steady state stability. Load equation, Speed control and drive classification. Close loop control of drives.

UNIT -II

DC Motor Drives: Modeling of DC machines. Steady state characteristics with armature and speed control. Phase controlled DC motor drives, chopper-controlled DC motor drives.

UNIT-III

Three Phase Induction Motor Drive: Dynamic modeling of induction machines. Small signal equations, control characteristics of induction machines, Phase-controlled induction machines, Stator voltage control, Static Slip recovery schemes, frequency control and vector control of induction motor drives.

UNIT-IV

Traction Motor: Review of characteristics of different types of DC & AC motors used for traction and their suitability. Starting and Braking methods of traction motors.

UNIT -V

Industrial Drives: Digital Control of Electric Drives. Stepper motor. Servo motor and their Applications.

Text Books:

1. G.K, Dubey, Power semi-conductor controlled Drives, Prentice Hall international, New Jersey, 1989.
2. R.Krishnan, Electric motor drives modelling, analysis and control, PHI-India-2009.
3. G.K.Dubey,“Fundamentals of electric Drives, Narosa Publishing House”,2nd edition, 2011

Suggested Reading:

1. W. Leonhard, Control of Electrical drives, Springer, 3rd edition, 2001.
2. P.C. Krause, Analysis of Electric Machine, Wiley-IEEE press 3rd edition
3. K. Bose,Modern Power Electronics and AC Drives, Prentice Hall publication, 1st edition, 2001.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEE106 **HVDC TRANSMISSION**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:
1. To understand state of the art of HVDC technology and converter operation for two and multi- terminal DC systems.
2. To acquire knowledge about methods of HVDC converter control.
3. To understand the concept of AC-DC system interactions and protection scheme in HVDC system.

Course Outcomes: After completion of the course, students will be able to:
1. Explain state of the art HVDC technology.
2. Demonstrate the knowledge of HVDC converter operation and methods of control.
3. Demonstrate the knowledge of HVDC converter characteristics and control methods.
4. Demonstrate the knowledge of the protection methods and AC-DC system interactions.
5. Demonstrate the knowledge of multi-terminal DC systems.

UNIT-I
HVDC Power Transmission Technology: Development of HVDC Technology, DC versus AC Transmission, Selection of converter configuration.

UNIT-II
HVDC Converters: Rectifier and Inverter operation with and without overlap, comparison between rectifier and inverter mode of operation, Digital Simulation of converters, Control of HVDC converters and Systems.

UNIT-III
Converter Control: Individual phase control, Equidistant firing controls, higher level controls. Characteristics and non-characteristics harmonics filter design. Fault development and protection.

UNIT-IV
HVDC Systems: Interaction between AC-DC power systems, over voltages on AC/DC side, multi-terminal HVDC systems, control of MTDC systems.

UNIT-V
Modeling of HVDC Systems: Per unit system, Representation for power flow solution, representation for stability studies.

Text Books:
1. S.Kamakshaiah, V.Kamaraju,' HVDC Transmission', Tata McGraw-Hill Education Pvt. Ltd., 2011.
2. K. R. Padiyar, "HVDC Power Transmission Systems", Wiley Eastern Ltd., 1990.

Suggested Reading:
1. E. W. Kimbark, "Direct Current Transmission", Vol. I, Wiley Inderscience, 1971.
2. Erich Uhlmann, "Power Transmission by Direct Current", B.S. Publications, 2004.
3. Arrillaga, "High Voltage Direct Transmission", Peter Peregrinus Ltd. London, 1983.

20EEE108 Artificial Intelligence Techniques for Power Systems

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:
1. To understand concepts of Artificial Neural Networks, Fuzzy logic and Meta-heuristic Techniques
2. To acquire the knowledge of optimization techniques and their hybridization with ANN and Fuzzy
3. To learn the intelligent approaches for the Power systems planning and operation

Course Outcomes: After completion of the subject, students will be able to:
1. Understand the various Artificial Intelligent and Meta-heuristic Techniques
2. Classify the techniques according to their method of approach
3. Select the suitable technique for the given power system problem
4. Implement suitable Intelligent technique for the given power system problem
5. Execute any power system planning and operation using Artificial Intelligent Techniques

UNIT-I
Artificial Neural Network (ANN): Biological foundations to intelligent Systems, Difference between Artificial Neuron and Biological Neuron, Activation functions, Basic Models of ANN, Hebb Rule, Training/Learning of NN, Supervised Learning Algorithms: Perceptron, Adaline, Back propagation algorithm, RBF NN, Associative Memory Networks: BAM NN, Hopfield NN, Unsupervised Learning Networks: LVQ algorithm, ART Network.

UNIT-II
Fuzzy Logic: Introduction to Fuzzy logic, Fuzzy sets, Fuzzy relations, Membership Functions, Defuzzification methods, Fuzzy reasoning, Fuzzy Inference System (FIS), Fuzzy Decision Making

UNIT-III
Meta-heuristic Techniques: Introduction, Genetic Algorithm, Particle Swarm Optimization, Differential Evolution, Simulated Annealing, Ant Colony Optimization, Honey Bee Algorithm, Harmony Search algorithm, Teaching-Learning-based algorithm, JAYA Algorithm.

UNIT-IV:
Hybrid System: characteristics, classification, ANFIS, Genetic-Neuro-Hybrid system: Properties, GA-based BPN, Advantages, Genetic-Fuzzy Hybrid Systems: Genetic-Fuzzy Rule based systems

UNIT-V
Applications:
Applications Artificial Intelligence Techniques in power systems for solving Load flow studies, Fault identification and classification, Load frequency Control, Excitation control, Economic Load Dispatch, Optimal Power Flow.

Text Books:
1. S.N.Sivanandam, S.N.Deepa, 'Principles of soft computing techniques', Wiley publications, 2007.
2. Xin-She Yang, "Nature-inspired optimization algorithms", Elsevier Inc., 2008.
3. S.Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms"- PHI, New Delhi, 2010.

Suggested Reading:
1. Haykin, Simon. *Neural networks: a comprehensive foundation*. Prentice-Hall, Inc., 2007.
2. Ross, Timothy J. *Fuzzy logic with engineering applications*. Vol. 2. New York: wiley, 2004.
3. Goldberg, David E. *Genetic algorithms*. Pearson Education India, 2006.
4. Clerc, Maurice. *Particle swarm optimization*. Vol. 93. John Wiley & Sons, 2010.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEE111 FACTS AND CUSTOM POWER DEVICES

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:
1. To introduce the concepts of reactive power compensation which can be used for interconnected power transmission and distribution systems
2. To study the principles of operation and control of shunt, series and combined FACTS controllers
3. To study the various types of power quality problems in distribution systems and to know about the filters

Course Outcomes: After completion of the course, students will be able to:
1. Distinguish the performance of Transmission line with and without FACTS Devices
2. Compare the SVC and STATCOM
3. Understand the operation and control of various Static Series Compensators
4. Understand the operation and control of Unified Power Flow Controller
5. Distinguish various power quality issues and how are they mitigated by various FACTS Devices

UNIT-I

Reactive Power Flow Control in Power Systems: Power flow control, Constraints of maximum transmission line loading, Benefits of FACTS Transmission line compensation, Uncompensated line, Shunt compensation, Series compensation, Phase angle control, Reactive power compensation, Shunt and Series compensation principles, Reactive compensation at transmission and distribution level.

UNIT-II

Static Shunt Compensation: Static versus passive VAR compensator, Static shunt compensators, SVC and STATCOM, Operation and control of TSC, TCR and STATCOM Compensator control, Comparison between SVC and STATCOM.

UNIT III

Static Series Compensation: TSSC, SSSC -Static voltage and phase angle regulators, TCVR and TCPAR Operation and Control, Applications, Static series compensation, GCSC, TSSC, TCSC and Static synchronous series compensators and their Control.

UNIT IV

Combined Power Flow Controller: Circuit Arrangement, Operation and control of UPFC, Basic Principle of P and Q control, Independent real and reactive power flow control- Applications, Introduction to interline power flow controller (IPFC)

UNIT V

Power Quality Problems in Distribution Systems: harmonics, Loads that create harmonics, harmonic propagation, series and parallel resonances, mitigation of harmonics, passive filters, active filter, shunt, series, hybrid filters and their control.

Voltage swells, sags, flicker, unbalance and mitigation of these problems by unified power quality conditioner (UPQC), IEEE standards on power quality.

Text Books:

1. K R Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International Publishers, 2007.
2. N.G. Hingorani, L. Gyugyi, "Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems", IEEE Press Book, Standard Publishers and Distributors, Delhi, 2001.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Suggested Reading:

1. X P Zhang, C Rehtanz, B Pal, “Flexible AC Transmission Systems- Modelling and Control”, Springer Verlag, Berlin 2006.
2. K.S.Sureshkumar, S.Ashok , “FACTS Controllers & Applications”, E-book edition, Nalanda Digital Library, NIT Calicut, 2003.
3. G. T. Heydt, “Power Quality”, McGraw-Hill Professional, 2007.
4. T. J. E. Miller, “Static Reactive Power Compensation”, John Wiley and Sons, New York, 1982

Education means transformation, but not information!

Vikasa Mantras- Vivekananda Institute of Human Excellence

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEE112 SWITCH MODE & RESONANT CONVERTERS

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:
1. To apply the basic concepts of power electronics for designing converters.
2. To understand various types of SMPS design and its control methods
3. To know the stability analysis for the converters using Bode plots.

Course Outcomes: After completion of this course, students will be able to:
1. Identify different power electronic circuits for designing converters.
2. Design various types of SMPS for electrical applications.
3. Design control methods for SMPS
4. Analyze the stability using Bode plots for the converters.
5. Select different components used in SMPS hardware.

UNIT-I
Basic Converter Circuits: Buck Regulator, Boost Regulator, Buck Boost Regulator, Cuk Converters, Resonant Converters, Choice of Switching Frequency-Design Aspects

UNIT-1I
Isolated SMPS: Fly back Converters, Forward Converters, Half Bridge and Full Bridge Converters, Push Pull Converters and SMPS with multiple outputs, Choice of Switching Frequency-Design Aspects

UNIT-III
Control Aspects: PWM Controllers, isolation in feedback loop, Power Supplies with Multiple outputs, Stability analysis using Bode Diagrams.

UNIT-IV
Design Considerations: Selection of Output Filter Capacitor, Selection of Energy Storage Inductor, Design of High Frequency Inductor and High Frequency Transformer, Selection of Switches, Snubber Circuit Design, Design of Driver Circuits- Power MOSFETS.

UNIT-V
Electromagnet Interference (EMI): EMI Filter Components, Conducted EMI suppression, Radiated EMI suppression, Measurement. Protection: Over current over voltage protection, inrush current protection

Text Books:
1. Mohan N. Undeland. T & Robbins W, Power Electronics Converters, Application and Design, John Wiley, 3rd edition, 2002.
2.. M.H. Rashid, Power Electronics. Prentice-Hall of India.
3. Switched Mode Power Supplies, Design and Construction, H. W. Whittington, B. W. Flynnand D. E. MacPherson, Universities Press, 2009 Edition.

Suggested Reading:
1.Umanand L., Bhat S.R., Design of magnetic components for switched Mode Power Converters. , Wiley Eastern Ltd.,1992
2.Course Material on Switched Mode Power Conversion, V.Ramanarayanan.

20EEE113 ENERGY AUDITING AND MANAGEMENT

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:
1. To understand the need for energy auditing
2. To understand of various loads involved based on power consumption for auditing
3. To know about different audit instruments used in practice

Course Outcomes: After completion of this course, students will be able to:
1. Acquire the background required for engineers to meet the role of energy managers
2. Gain the skills and techniques required to implement energy management
3. Demonstrate energy conservation aspects
4. Apply the energy conservation techniques to industrial loads
5. Perform basic energy audit in an organization

UNIT-I

Energy Auditing: Types and objectives, audit instruments. ECO assessment and Economic methods specific energy analysis, Minimum energy paths, consumption models, Case study

UNIT-II

Energy Efficient Motors: Electric motors, Energy efficient controls and starting efficiency, Motor Efficiency and Load Analysis Energy efficient / high efficient Motors, Case study.

Load Matching and selection of motors, Variable speed drives, Pumps and Fans, Efficient Control strategies, optimal selection and sizing.

UNIT-III

Energy Conservation Aspects: Transformer Loading/Efficiency analysis, Feeder/cable loss evaluation, Reactive Power management, Capacitor Sizing, Degree of Compensation, Capacitor losses, Location, Placement and Maintenance, Peak Demand controls, Methodologies.

UNIT-IV

Industrial Loads: Types of Industrial loads, Optimal Load scheduling-case study, Lighting, Energy efficient light sources, Energy conservation in Lighting Schemes, Electronic ballast, Power quality issues, Luminaries, Case study, Cogeneration, Types and Schemes, Optimal operation of cogeneration plants.

UNIT-V

E.C. Measures: Electric water heating, Geysers, Solar Water Heaters. Power Consumption in Compressors, Energy conservation measures, software, EMS

Text Books:

1. Umesh Rathore: Energy Management,S.K.Kataria &sons second edition
2. Anthony J. Pansini, Kenneth D. Smalling, Guide to Electric Load Management. PennwellPub;(1998)
3. Howard E. Jordan, Energy-Efficient Electric Motors and Their Applications., Plenum Pub Corp; 2ndedition, 1994

Suggested Reading:

1. Tanuj Kumar Bishat: SCADA and Energy Management system ;S.K.Kataria &sons, second edition
2. Giovanni Petrecca, Industrial Energy Management: Principles and Applications, The Kluwer international series -207, 1999

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEE116 **ELECTRIC AND HYBRID VEHICLES**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course objectives:

1. To know the conventional vehicles and their disadvantages.
2. To understand the concept hybrid electric vehicles.
3. To explore the different energy management strategies.

Course Outcomes: After completion of this course, students will be able to:

1. Be familiar to the models of describing hybrid vehicles and their performance.
2. Model the electric vehicles with different acceleration and range.
3. Design various configuration and control strategies for electric drives.
4. Analyze the different possible ways of energy storage.
5. Design of a Hybrid Electric Vehicle, Battery Electric Vehicle.

UNIT-I

Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance, EV System – EV Advantages – Vehicle Mechanics – Performance of EVs.

UNIT-II

Hybrid Electric Vehicles: Introduction, History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Electric Vehicle Modeling– Consideration of Rolling Resistance – Transmission Efficiency – Consideration of Vehicle Mass – Tractive Effort – Modeling Vehicle Acceleration – Modeling Electric Vehicle Range.

UNIT-III

Electric Trains: Hybrid Electric Drive-trains: Basic concept of hybrid traction, introduction to various hybrid drive train topologies, fuel efficiency analysis, Basic concept of electric traction, Electric Propulsion unit, Introduction to electric components used in hybrid and electric vehicles, characteristics and regenerative braking, drive system efficiency.

UNIT-IV

Energy Storage Systems: Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE)

UNIT-V

Energy Management Strategies: Energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies. Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

Text Books:

1. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications withPractical Perspectives", John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies",Springer, 2015.

Suggested Readings:

1. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.
2. T. Denton, "Electric and Hybrid Vehicles", Routledge, 2016.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Open Electives

20CSO 101 **BUSINESS ANALYTICS**

Instruction	3 Hours per week
Duration of End examination	3 Hours
Semester end examinations	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The main objectives of this course are to:

1. Understanding the basic concepts of business analytics and applications
2. Study various business analytics methods including predictive, prescriptive and prescriptive analytics
3. Prepare the students to model business data using various data mining, decision making methods

Course Outcomes: After completion of the course, students will be able:

1. To understand the basic concepts of business analytics
2. Identify the application of business analytics and use tools to analyze business data
3. Become familiar with various metrics, measures used in business analytics
4. Illustrate various descriptive, predictive and prescriptive methods and techniques
5. Model the business data using various business analytical methods and techniques

Unit-I

Introduction to Business Analytics: Introduction to Business Analytics, need and science of data driven (DD) decision making, Descriptive, predictive, prescriptive analytics and techniques, Big data analytics, Web and Social media analytics, Machine Learning algorithms, framework for decision making, challenges in DD decision making and future.

Unit-II

Descriptive Analytics: Introduction, data types and scales, types of measurement scales, population and samples, measures of central tendency, percentile, decile and quadrille, measures of variation, measures of shape-skewness, data visualization

Unit-III

Forecasting Techniques: Introduction, time-series data and components, forecasting accuracy, moving average method, single exponential smoothing, Holt's method, Holt-Winter model, Croston's forecasting method, regression model for forecasting, Auto regression models, auto-regressive moving process, ARIMA, Theil's coefficient

Unit-IV

Decision Trees: CHAID, Classification and Regression tree, splitting criteria, Ensemble and method and random forest. **Clustering**: Distance and similarity measures used in clustering, Clustering algorithms, K-Means and Hierarchical algorithms, **Prescriptive Analytics-** Linear Programming (LP) and LP model building,

Unit-V

Six Sigma: Introduction, introduction, origin, 3-Sigma Vs Six-Sigma process, cost of poor quality, sigma score, industry applications, six sigma measures, DPMO, yield, sigma score, DMAIC methodology, Six Sigma toolbox

Text Books:

1. U Dinesh Kumar, "Data Analytics", Wiley Publications, 1st Edition, 2017
2. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, "Business analytics Principles, Concepts, and Applications with SAS", Associate Publishers, 2015

Suggested Reading:

1. S. Christian Albright, Wayne L. Winston, "Business Analytics - Data Analysis and Decision Making", 5th Edition, Cengage, 2015

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc18-mg11/preview
2. https://nptel.ac.in/courses/110105089/

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20MEO 101 **INDUSTRIAL SAFETY**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The students will be able to understand

1. Causes for industrial accidents and preventive steps to be taken.
2. Fundamental concepts of Maintenance Engineering. About wear and corrosion along with preventive steps to be taken. The basic concepts and importance of fault tracing.
3. The steps involved in carrying out periodic and preventive maintenance of various equipments used in industry

Course Outcomes: At the end of the course the students will be able to:

1. Identify the causes for industrial accidents and suggest preventive measures.
2. Identify the basic tools and requirements of different maintenance procedures.
3. Apply different techniques to reduce and prevent Wear and corrosion in Industry.
4. Identify different types of faults present in various equipments like machine tools, IC Engines, boilers etc.
5. Apply periodic and preventive maintenance techniques as required for industrial equipments like motors, pumps and air compressors and machine tools etc

UNIT - I

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes, Fire prevention and firefighting, equipment and methods.

UNIT – II

Fundamentals of Maintenance Engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT – III

Wear and Corrosion and their Prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications of Screw down grease cup, Pressure grease gun, Splash lubrication, Gravity lubrication, Wick feed lubrication, Side feed lubrication, Ring lubrication, Definition of corrosion, principle and factors affecting the corrosion, Types of corrosion, corrosion prevention methods.

UNIT–IV

Fault Tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, any one machine tool, Pump, Air compressor, Internal combustion engine, Boiler, Electrical motors, Types of faults in machine tools and their general causes.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

UNIT – V

Periodic and Preventive Maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of Machine tools, Pumps, Air compressors, Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Text Books:

1. H. P. Garg, "Maintenance Engineering", S. Chand and Company
2. Audels, "Pump-hydraulic Compressors", Mcgraw Hill Publication

Suggested Readings:

1. Higgins & Morrow, "Maintenance Engineering Handbook", Da Information Services.
2. Winterkorn, Hans, "Foundation Engineering Handbook", Chapman & Hall London

If we have built castles in the air, our work need not be lost; that is where they should be. Now lay the foundation under them. But a fool is one who, having no goal, redoubles his efforts.

Vikasa Mantras- Vivekananda Institute of Human Excellence

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20MEO 102 **INTRODUCTION TO OPTIMISATION TECHNIQUES**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:

1. Students will come to know the formulation of LPP models
2. Students will understand the Algorithms of Graphical and Simplex Methods. Students will understand the Transportation and Assignment techniques. Students will come to know the procedure of Project Management along with CPM and PERT techniques
3. Students will understand the concepts of sequencing

Course Outcomes: At the end of the course, the students were able to:

1. Formulate a managerial decision problem into a mathematical model;
2. Apply transportation problems in manufacturing industries;
3. Build and solve assignment models
4. Apply project management techniques like CPM and PERT to plan and execute project successfully
5. Apply sequencing concepts in industry applications

UNIT-I

Introduction: Definition and Scope of Operations Research.

Linear Programming: Introduction, Formulation of linear programming problems, graphical method of solving LP problem, simplex method

UNIT-II

Transportation Models: Finding an initial feasible solution - North West Corner Method, Least Cost Method, Vogel's Approximation Method, Finding the optimal solution, Unbalanced Transportation problem, Degeneracy in Transportation,

UNIT-III

Assignment Techniques: Introduction, Hungarian technique of Assignment techniques, unbalanced problems, problems with restrictions, Maximization in Assignment problems

UNIT-IV

Project Management: Definition, Procedure and Objectives of Project Management, Differences between PERT and CPM, Rules for drawing Network diagram, Scheduling the activities, Fulkerson's rule, Earliest and Latest times, Determination of critical path, duration of the project

UNIT-V

Sequencing Models: Introduction, General assumptions, processing 'n' jobs through two machines, processing 'n' jobs through three machines.

Text Books:

1. Hamdy, A. Taha, "Operations Research-An Introduction", Prentice Hall of India Pvt. Ltd., 6/e, 1997.
2. S.D. Sharma, "Operations Research", Kedarnath, Ramnath & Co., Meerut, 2009.
3. V.K. Kapoor, "Operations Research", S. Chand Publishers, New Delhi, 2004.

Suggested Reading:

1. Harvey M. Wagner, "Principles of Operations Research", Second Edition, Prentice Hall of India Ltd., 1980.
2. R. Paneer Selvam, "Operations Research", Second Edition, PHI Learning Pvt. Ltd., New Delhi, 2008
3. Nita H. Shah, Ravi M. Gor, Hardik Soni, "Operations Research", PHI Learning Private Limited, 2013

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20MEO 103 **COMPOSITE MATERIALS**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: To make the students to learn the

1. Composite materials and their constituents. Classification of the reinforcements and evaluate the behavior of composites.
2. Fabrication methods of metal matrix composites. Manufacturing of Polymer matrix composites.
3. Failure mechanisms in composite materials.

Course Outcomes: At the end of the course, student will be able to

1. Classify and characterize the composite materials.
2. Describe types of reinforcements and their properties.
3. Understand different fabrication methods of metal matrix composites.
4. Understand different fabrication methods of polymer matrix composites.
5. Decide the failure of composite materials.

UNIT - I

Introduction: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – II

Reinforcements: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT – III

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT–IV

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepegs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT – V

Strength: Lamina Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength;

Text Books:

1. R.W.Cahn – VCH , "Material Science and Technology", (Vol 13) Composites , West Germany.
2. WD Callister, Jr., Adapted by R. Balasubramaniam , "Materials Science and Engineering, an introduction"., John Wiley & Sons, NY, Indian edition, 2007.

Suggested Readings:

1. Ed-Lubin, "Hand Book of Composite Materials"
2. K.K.Chawla, "Composite Materials".
3. Deborah D.L. Chung, "Composite Materials Science and Applications"
4. Daniel Gay, Suong V. Hoa, and Stephen W. Tsai, "Composite Materials Design and Applications"

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20CEO 101 COST MANAGEMENT OF ENGINEERING PROJECTS

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:

1. To enable the students to understand the concepts of Project management. To provide knowledge on concepts of Project Planning and scheduling.
2. To create an awareness on Project Monitoring and Cost Analysis. To provide adequate knowledge to the students on Recourse Management Costing-Variance Analysis
3. To train the students with the concepts of Budgetary Control for cost management and to provide basic platform on Quantitative techniques for cost management.

Course Outcomes: At the end of course students will able to

1. Acquire in-depth knowledge about the concepts of project management and understand the principles of project management.
2. Determine the critical path of a typical project using CPM and PERT techniques.
3. Prepare a work break down plan and perform linear scheduling using various methods.
4. Solve problems of resource scheduling and leveling using network diagrams.
5. Learn the concepts of budgetary control and apply quantitative techniques for optimizing project cost.

UNIT- I:

Project Management: Introduction to project managements, stakeholders, roles, responsibilities and functional relationships. Principles of project management, objectives and project management system. Project team, organization, roles, responsibilities. Concepts of project planning, monitoring, staffing, scheduling and controlling.

UNIT- II:

Project Planning and Scheduling: Introduction for project planning, defining activities and their interdependency, time and resource estimation. Work break down structure. Linear scheduling methods-bar charts, Line of Balance (LOB), their limitations. Principles, definitions of network-based scheduling methods: CPM, PERT. Network representation, network analysis-forward and backward passes.

UNIT- III:

Project Monitoring and Cost Analysis: introduction-Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making, Time cost tradeoff-Crashing project schedules, its impact on time on time, cost. Project direct and indirect costs.

UNIT- IV:

Resources Management and Costing-Variance Analysis: Planning, Enterprise Resource Planning, Resource scheduling and levelling. Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis

Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement

UNIT- V:

Budgetary Control:: Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

Quantitative techniques for cost management: Linear Programming, PERT/CPM, Transportation Assignment problems, Simulation, Learning Curve Theory.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Text Books:

1. Charles T Horngren "*Cost Accounting A Managerial Emphasis*", Pearson Education; 14 edition (2012),
2. Charles T. Horngren and George Foster, "*Advanced Management Accounting*" Prentice-Hall; 6th Revised edition (1 February 1987)
3. Robert S Kaplan Anthony A. Atkinson, "*Management & Cost Accounting*" , Pearson; 2 edition (18 October 1996)

Suggested Readings:

1. K. K Chitkara, "*Construction Project Management: Planning, scheduling and controlling*", Tata McGraw-Hill Education. (2004).
2. Kumar Neeraj Jha "*Construction Project Management Theory and Practice*", Pearson Education India; 2 edition (2015)

Running away does not help us with our problems; unless we are overweight! Running away from our problems is a race we will never win. You can't run away from trouble. There is no place that far.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEO 101 **WASTE TO ENERGY**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:
1. To know the various forms of waste
2. To understand the processes of Biomass Pyrolysis.
3. To learn the technique of Biomass Combustion.

Course Outcomes: After completion of this course, students will be able to:
1. Understand the concept of conservation of waste
2. Identify the different forms of wastage
3. Chose the best way for conservation to produce energy from waste
4. Explore the ways and means of combustion of biomass
5. Develop a healthy environment for the mankind

UNIT-I
Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

UNIT-II
Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT-III
Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers– Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

UNIT-IV
Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT-V
Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

Text Books:
1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.

Suggested Readings:
1. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
2. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Audit Courses

20 EG A 101 ENGLISH FOR RESEARCH PAPER WRITING

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks

Course Objectives:
1. To understand the nuances of language and vocabulary in writing a Research Paper.
2. To develop the content, structure and format of writing a research paper.
3. To enable the students to produce original research papers without plagiarism.

Course Outcomes: After successful completion of the course, the students will be able to:
1. Interpret the nuances of research paper writing.
2. Differentiate the research paper format and citation of sources.
3. To review the research papers and articles in a scientific manner.
4. Avoid plagiarism and be able to develop their writing skills in presenting the research work.
5. Create a research paper and acquire the knowledge of how and where to publish their original research papers.

Unit 1
Academic Writing: Meaning & Definition of a research paper– Purpose of a research paper – Scope –Benefits-Limitations – outcomes.

Unit II
Research Paper Format: Title – Abstract – Introduction – Discussion – Findings – Conclusion – Style of Indentation – Font size/Font types – Indexing – Citation of sources.

Unit III
Research Methodology: Methods (Qualitative – Quantitative) Review of Literature. Criticizing, Paraphrasing & Plagiarism.

Unit IV
Process of Writing a research paper: Choosing a topic **-** Thesis Statement – Outline – Organizing notes **-** Language of Research – Word order, Paragraphs – Writing first draft –Revising/Editing **-** The final draft and proof reading.

Unit V
Research Paper Publication: Reputed Journals – National/International – ISSN No, No. of volumes, Scopus Index/UGC Journals – Free publications **-** Paid Journal publications – /Advantages/Benefits

Textbook:
1. C. R Kothari, Gaurav, Garg, **Research Methodology Methods and Techniques,** New Age International Publishers. 4th Edition.

Suggested Reading:
1. Day R (2006) **How to Write and Publish a Scientific Paper,** Cambridge University Press
2. **MLA Hand book for writers of Research Papers**, East West Press Pvt. Ltd, New Delhi, 7th Edition.
3. Lauri Rozakis, Schaum's, **Quick Guide to Writing Great Research Papers**, Tata McGraw Hills Pvt. Ltd, New Delhi.

Online Resources:
NPTEL: https://onlinecourses.nptel.ac.in/noc18_mg13/preview

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EGA 102 INDIAN CONSTITUTION AND FUNDAMENTAL RIGHTS

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks

Course Objectives: The course will introduce the students to:
1. The history of Indian Constitution and its role in the Indian democracy.
2. Address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement. to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. Have knowledge of the various Organs of Governance and Local Administration.

Course Outcomes: After successful completion of the course he students will be able to:
1. Understand the making of the Indian Constitution and its features.
2. Understand the Rights of equality, the Right of freedom and the Right to constitutional remedies.
3. Have an insight into various Organs of Governance - composition and functions.
4. Understand powers and functions of Municipalities, Panchayats and Co-operative Societies.
5. Understand Electoral Process, special provisions.

ÜNIT I
History of making of the Indian constitutions - History, Drafting Committee (Composition & Working).
Philosophy of the Indian Constitution: Preamble, Salient Features.

UNIT-II
Contours of Constitutional Rights and Duties - Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT-III
Organs of Governance- Parliament: Composition, Qualifications, Powers and Functions
Union executives : President, Governor, Council of Ministers, Judiciary, appointment and transfer of judges, qualifications, powers and functions

UNIT-IV
Local Administration - District's Administration head: Role and importance. Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayati Raj: Introduction, PRI: Zilla Panchayat, Elected Officials and their roles, CEO Zilla Panchayat: positions and role.
Block level: Organizational Hierarchy(Different departments) Village level: role of elected and appointed officials. Importance of grass root democracy.

UNIT-V
Election commission: Election Commission: Role and functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and functioning. Institute and Bodies for the welfare of SC / ST / OBC and women

Text Books:

1. **The Constitution of India**, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, **Framing of Indian Constitution**, 1st Edition, 2015.
3. M. P. Jain, **Indian Constitution Law**, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, **Introduction to the Constitution of India**, Lexis Nexis, 2015.

Online Resources:
1. http://www.nptel.ac.in/courses/103107084/Script.pdf

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EGA 103 **STRESS MANAGEMENT BY YOGA**

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks

Course Objectives: The Course will introduce the students to:

1. Creating awareness about different types of stress and the role of yoga in the management of stress.
2. Promotion of positive health and overall wellbeing (Physical, mental, emotional, social and spiritual).
3. Prevention of stress related health problems by yoga practice.

Course Outcomes: After successful completion of the course, the students will be able to :

1. To understand yoga and its benefits.
2. Enhance Physical strength and flexibility.
3. Learn to relax and focus.
4. Relieve physical and mental tension through asanas
5. Improve work performance and efficiency.

Unit I

Meaning and definition of Yoga - Historical perspective of Yoga **-** Principles of Astanga Yoga by Patanjali.

Unit II

Meaning and definition of Stress - Types of stress **-** Eustress and Distress. Anticipatory Anxiety and Intense Anxiety and depression. Meaning of Management**-** Stress Management.

Unit III

Concept of Stress according to Yoga - Stress assessment methods **-** Role of Asana, Pranayama and Meditation in the management of stress.

Unit IV

Asanas- (5 Asanas in each posture) **-** Warm up **-** Standing Asanas **-** Sitting Asanas **-** Prone Asanas **-** Supine asanas **-** Surya Namaskar

Unit V

Pranayama- Anulom and Vilom Pranayama **-** Nadishudhi Pranayama – Kapalabhati**-**Pranayama **-** Bhramari Pranayama **-** Nadanusandhana Pranayama.

Meditation Techniques: Om Meditation - Cyclic meditation : Instant Relaxation technique (QRT), Quick Relaxation Technique (QRT), Deep Relaxation Technique (DRT)

Text Books:

1. "**Yogic Asanas for Group Training - Part-I**": Janardhan Swami Yogabhyasi Mandal, Nagpur.
2. "**Rajayoga or Conquering the Internal Nature**"by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata.
3. Nagendra H.R nad Nagaratna R, **Yoga Perspective in Stress Management**, Bangalore, Swami Vivekananda Yoga Prakashan

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc16_ge04/preview
2. https://freevideolectures.com/course/3539/indian-philosophy/11

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EGA 104 **PERSONALITY DEVELOPMENT THROUGH LIFE'S ENLIGHTENMENT SKILLS**

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks

Course Objectives: The course will introduce the students to :
1. To learn to achieve the highest goal happily.
2. To become a person with stable mind, pleasing personality and determination.
3. To awaken wisdom among themselves.

Course Outcomes: After successful completion of the course the students will be able to:
1. Develop their personality and achieve their highest goal of life.
2. Lead the nation and mankind to peace and prosperity.
3. To practice emotional self regulation.
4. Develop a positive approach to work and duties.
5. Develop a versatile personality.

UNIT-I

Neetisatakam – Holistic development of personality - Verses 19, 20, 21, 22 (Wisdom) **-** Verses 29, 31, 32 (Pride and Heroism) **-** Verses 26,28,63,65 (Virtue)

UNIT-II

Neetisatakam – Holistic development of personality (cont'd) **-** Verses 52, 53, 59 (dont's) **-** Verses 71,73,75 & 78 (do's) **-** Approach to day to day works and duties.

UNIT-III

Introduction to Bhagavadgeetha for Personality Development - Shrimad Bhagawad Geeta: Chapter 2 – Verses 41, 47, 48 **-** Chapter 3 – Verses 13,21,27,35 **-** Chapter 6 – Verses 5,13,17,23,35 **-** Chapter 18 – Verses 45, 46, 48 Chapter – 6: Verses 5, 13, 17, 23, 35; Chapter – 18: Verses 45, 46, 48

UNIT-IV

Statements of basic knowledge - Shrimad BhagawadGeeta: Chapter 2**-** Verses 56, 62,68 **-** Chapter 12 – Verses 13, 14, 15, 16, 17, 18 **-** Personality of Role model from Shrimad Bhagawat Geeta.

UNIT-V

Role of Bahgavadgeeta in the present scenario - Chapter 2 – Verses 17 **-** Chapter 3 – Verses 36, 37, 42 **-** Chapter 4 – Verses 18, 38, 39 **-** Chapter 18 – Verses 37, 38, 63.

Text Books:
1. "**Srimad Bhagavad Gita"** by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata
2. Bhartrihari's **Three Satakam** (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi

Online Courses:
1. NTPEL: http://nptel.ac.in/downloads/109104115/

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

With effect from the academic year 2020-21

20ECA 101 **VALUE EDUCATION**

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks

Course Objectives:

1. Understand the need and importance of Values for self-development and for National development.
2. Imbibe good human values and Morals
3. Cultivate individual and National character.

Course outcomes: After completion of the Course, Students will be able to:

1. Gain necessary Knowledge for self-development
2. Learn the importance of Human values and their application in day to day professional life.
3. Appreciate the need and importance of interpersonal skills for successful career and social life
4. Emphasize the role of personal and social responsibility of an individual for all-round growth.
5. Develop a perspective based on spiritual outlook and respect women, other religious practices, equality, non-violence and universal brotherhood.

UNIT I: Human Values, Ethics and Morals: Concept of Values, Indian concept of humanism, human values; Values for self-development, Social values, individual attitudes; Work ethics, moral and non- moral behavior, standards and principles based on religion, culture and tradition.

UNIT II: Value Cultivation, and Self-management: Need and Importance of cultivation of values such as Sense-of Duty, Devotion to work, Self-reliance, Confidence, Concentration, Integrity & discipline, and Truthfulness.

UNIT III: Spiritual outlook and social values: Personality and Behavior, Scientific attitude and Spiritual (soul) outlook; Cultivation of Social Values Such as Positive Thinking, Punctuality, Love & Kindness, Avoiding fault finding in others, Reduction of anger, forgiveness, Dignity of labour, True friendship, Universal brotherhood and religious tolerance.

UNIT IV: Values in Holy Books: Self-management and Good health; **and internal & external Cleanliness,** Holy books versus Blind faith, Character and Competence, Equality, Nonviolence, Humility, Role of Women.

UNIT V:Dharma, Karma and Guna: Concept of soul; Science of Reincarnation, Character and Conduct, Concept of Dharma; Cause and Effect based Karma Theory; The qualities of Devine and Devilish; Satwic, Rajasic and Tamasicgunas.

Text Books:

1. Chakroborty, S.K. “Values & Ethics for organizations Theory and practice”, Oxford University Press, New Delhi, 1998.
2. Jaya DayalGoyandaka, “Srimad Bhagavad Gita”, withSanskrit Text, Word meaning and Prose meaning, Gita Press, Gorakhpur, 2017.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20CEA 101 DISASTER MITIGATION AND MANAGEMENT

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks

Course Objectives: To enable the student

1. To equip the students with the basic knowledge of hazards, disasters, risks and vulnerabilities including natural, climatic and human induced factors and associated impacts. To impart knowledge in students about the nature, causes, consequences and mitigation measures of the various natural disasters

2. To enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters. To enable the students to understand and assimilate the impacts of any disaster on the affected area depending on its position/ location, environmental conditions, demographic, etc.

3. To equip the students with the knowledge of the chronological phases ina disaster management cycle and to create awareness about the disaster management framework and legislations in the context of national and global conventions

Course Outcomes: At the end of the course the student

1. Ability to analyse and critically examine existing programs in disaster management regarding vulnerability, risk and capacity at different levels

2. Ability to understand and choose the appropriate activities and tools and set up priorities to build a coherent and adapted disaster management plan

3. Ability to understand various mechanisms and consequences of human induced disasters for the participatory role of engineers in disaster management

4. To understand the impact on various elements affected by the disaster and to suggest and apply appropriate measures for the same

5. Develop an awareness of the chronological phases of disaster preparedness, response and relief operations for formulating effective disaster management plans and ability to understand various participatory approaches/strategies and their application in disaster management

UNIT- I:
Introduction: Basic definitions- Hazard, Disaster, Vulnerability, Risk, Resilience, Mitigation, Management; classification of types of disaster- Natural and man-made; International Decade for natural disaster reduction (IDNDR); International strategy for disaster reduction (ISDR), National disaster management authority (NDMA).

UNIT- II:
Natural Disasters: Hydro meteorological disasters: Causes, Early warning systems- monitoring and management, structural and non-structural measures for floods, drought and Tropical cyclones; Geographical based disasters: Tsunami generation, causes, zoning, Early warning systems- monitoring and management, structural and non-structural mitigation measures for earthquakes, tsunami, landslides, avalanches and forest fires. Case studies related to various hydro meteorological and geographical based disasters.

UNIT- III:
Human induced hazards: Chemical disaster- Causes, impacts and mitigation measures for chemical accidents, Risks and control measures in a chemical industry, chemical disaster management; Case studies related to various chemical industrial hazards eg: Bhopal gas tragedy; Management of chemical terrorism disasters and biological disasters; Radiological Emergencies and case studies; Case studies related to major power break downs, fire accidents, traffic accidents, oil spills and stampedes, disasters due to double cellar construction in multi-storeyed buildings.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

UNIT- IV:

Disaster Impacts: Disaster impacts- environmental, physical, social, ecological, economical, political, etc.; health, psycho-social issues; demographic aspects- gender, age, special needs; hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT- V:

Concept of Disaster Management: Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; risk analysis, vulnerability and capacity assessment; Post-disaster environmental response- water, sanitation, food safety, waste management, disease control; Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Text Books:

1. Pradeep Sahni*," Disaster Risk Reduction in South Asia*", Prentice Hall, 2003.
2. B. K. Singh*," Handbook of Disaster Management*: *techniques & Guidelines*", Rajat Publication, 2008.

Suggested Reading:

1. Ministry of Home Affairs". *Government of India, "National disaster management plan, Part I and II",*
2. K. K. Ghosh," *Disaster Management",* APH Publishing Corporation, 2006.
3. http://www.indiaenvironmentportal.org.in/files/file/disaster_management_india1.pdf
4. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs)
5. Hazards, Disasters and your community: A booklet for students and the community, Ministry of home affairs.

All the problems in the life are because of only one reason; We forget what is to be remembered, we often remember what is to be forgotten!

Vikasa Mantras- Vivekananda Institute of Human Excellence

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20IT A101 **PEDAGOGY STUDIES**

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks

Course Objectives:

1. To present the basic concepts of design and policies of pedagogy studies. To provide understanding of the abilities and dispositions with regard to teaching techniques, curriculum design and assessment practices.
2. To familiarize various theories of learning and their connection to teaching practice.
3. To create awareness about the practices followed by DFID, other agencies and other researchers. To provide understanding of critical evidence gaps that guides the professional development.

Course Outcomes: Upon completing this course, students will be able to:

1. Illustrate the pedagogical practices followed by teachers in developing countries both in formal and informal classrooms.
2. Examine the effectiveness of pedagogical practices.
3. Understand the concept, characteristics and types of educational research and perspectives of research.
4. Describe the role of classroom practices, curriculum and barriers to learning.
5. Understand Research gaps and learn the future directions.

UNIT-I

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology **-** Theories of learning, Curriculum, Teacher education **-** Conceptual framework, Research questions **-** Overview of methodology and Searching.

UNIT-II

Thematic Overview: Pedagogical practices followed by teachers in formal and informal classrooms in developing countries **-** Curriculum, Teacher education.

UNIT-III

Evidence on the Effectiveness of Pedagogical Practices: Methodology for the in depth stage: quality assessment of included studies **-** How can teacher education (curriculum and Practicum) and the school curriculum and guidance material best support effective pedagogy? **-** Theory of change **-** Strength and nature of the body of evidence for effective pedagogical practices **-** Pedagogic theory and pedagogical approaches **-** Teachers' attitudes and beliefs and pedagogic strategies.

UNIT-IV

Professional Development: alignment with classroom practices and follow up support **-** Support from the head teacher and the community – Curriculum and assessment **-** Barriers to learning: Limited resources and large class sizes.

UNIT-V

Research Gaps and Future Directions: Research design – Contexts – Pedagogy **-** Teacher education **-** Curriculum and assessment – Dissemination and research impact.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Text Books:

1. Ackers J, Hardman F, "Classroom Interaction in Kenyan Primary Schools, Compare", 31 (2): 245 – 261, 2001.
2. Agarwal M, "Curricular Reform in Schools: The importance of evaluation", Journal of Curriculum Studies, 36 (3): 361 – 379, 2004.

Suggested Reading:

1. Akyeampong K, "Teacher Training in Ghana – does it count? Multisite teacher education research project (MUSTER)", Country Report 1.London: DFID, 2003.
2. Akyeampong K, Lussier K, Pryor J, Westbrook J, "Improving teaching and learning of Basic Maths and Reading in Africa: Does teacher Preparation count?, International Journal Educational Development, 33 (3): 272- 282, 2013.
3. Alexander R J, "Culture and Pedagogy: International Comparisons in Primary Education", Oxford and Boston: Blackwell, 2001.
4. Chavan M, "Read India: A mass scale, rapid, 'learning to read' campaign", 2003.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc17_ge03/preview
2. www.pratham.org/images/resources%20working%20paper%202.pdf.

Keep acquaintance with all, friendship with some, but intimacy with only few.
It is hard to find a friend who is highly intelligent, handsome, wise and sweet!
So don't lose ME! My friend has the best friend!

Vikasa Mantras- Vivekananda Institute of Human Excellence

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20EEA101 **SANSKRIT FOR TECHNICAL KNOWLEDGE**

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks

Course Objectives:
1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. To make the novice Learn the Sanskrit to develop the logic in mathematics, science & other subjects
3. To explore the huge knowledge from ancient literature

Course Outcomes: After completion of this course, students will be able to:
1. Develop passion towards Sanskrit language
2. Decipher the latent engineering principles from Sanskrit literature
3. Correlates the technological concepts with the ancient Sanskrit history.
4. Develop knowledge for the technological progress
5. Explore the avenue for research in engineering with aid of Sanskrit

UNIT-I
Introduction to Sanskrit language: Sanskrit Alphabets-vowels-consonants- significance of Amarakosa-parts of speech-Morphology-creation of new words-significance of synonyms-sandhi-samasa-sutras-active and passive voice-Past/Present/Future Tense-syntax-Simple Sentences (elementary treatment only)

UNIT-II
Role of Sanskrit in Basic sciences: Brahmagupthas lemmas (second degree indeterminate equations), sum of squares of n-terms of AP- sulba_sutram or baudhayana theorem (origination of pythogorous theorem)-value of pie-Madhava's sine and cosine theory (origination of Taylor's series).
The measurement system-time-mass-length-temp, Matter elasticity-optics-speed of light (origination of michealson and morley theory).

UNIT-III
Role of Sanskrit in Engineering-I (Civil, Mechanical, Electrical and Electronics Engineering): Building construction-soil testing-mortar-town planning-Machine definition-crucible-furnace-air blower- Generation of electricity in a cell-magnetism-Solar system-Sun: The source of energy, the earth-Pingala chandasutram (origination of digital logic system)

UNIT-IV
Role of Sanskrit in Engineering-II (Computer Science Engineering & Information Technology): Computer languages and the Sanskrit languages-computer command words and the vedic command words-analogy of pramana in memamsa with operators in computer language-sanskrit analogy of physical sequence and logical sequence, programming.

UNIT-V
Role of Sanskrit in Engineering-III (Bio-technology and Chemical Engineering): Classification of plants-plants, the living-plants have senses-classification of living creatures- Chemical laboratory location and layout-equipment-distillation vessel-kosthi yanthram

Text Books:

1. M Krishnamachariar, History of Classical Sanskrit Literature, TTD Press, 1937.
2. Motilal Banarsidass Publishers, ISBN-13: 978-8120801783, 2015
3. Kpail Kapoor, Language, Linguistics and Literature: The Indian Perspective, ISBN-10: 8171880649, 1994.
4. Pride of India, Samskrita Bharti Publisher, ISBN: 81-87276-27-4, 2007
5. Shri Rama Verma, Vedas the source of ultimate science, Nag publishers, ISBN: 81-7081-618-1, 2005

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Suggested Reading:

1. The Wonder that is Sanskrit, AuroPublications, ISBN: 978-8170601821, 2017
2. Science in Sanskrit, Samskrita Bharti Publisher, ISBN-13: 978-8187276333, 2007
3. A Treasury of Indian Wisdom: An Anthology of Spiritual Learn, ISBN: 978-0143426158, 2016.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

Industrial Project / Internship

Guide lines:

To develop advanced knowledge and specific skills required for industrial development, CBIT is implementing the AICTE internship policy guidelines for ME/MTech students from the academic year 2020-21 onwards. Students may choose Industrial problem as Dissertation topic. The proposed Credit Framework for the same is as follows:

S. No	Schedule	Activities	Duration	Credits
1	Semester - III	Industrial Project /Dissertation Phase 1	20 weeks	10
2	Semester - IV	Industrial Project/Dissertation Phase 2	32 weeks	16

Guidelines:

- ✓ The student should submit a synopsis of the proposed work to be done during the internship Programme/Industrial Project/Dissertation/Industrial Dissertation which is examined or evaluated by the departmental Project Review Committee to ensure that the proposed work is equivalent to ME/MTech dissertation work. This synopsis should be submitted to the department before the candidate is relieved.
- ✓ Student has to submit the information about the commencement of internship to the HOD before the registration of the courses in that semester (i.e III/IV).
- ✓ Two supervisors will monitor the internship/ Industry project work, one from the department and another from industry.
- ✓ Industry/Educational Organization must submit the month-wise attendance of the students to the department.
- ✓ Student should regularly present his/her project progress report to their respective internal supervisor(s)
- ✓ The final project presentation is evaluated on the basis of the recommendation given by external supervisor, and further can be evaluated by the institute supervisor.
- ✓ If the internship project is not found to be of high quality, then the student will have to reappear in the next semester for their ME/MTech dissertation work.
- ✓ The student is required to publish internship work in conferences and journals with due permission/consent from the organization/Industry where he/she has undergone the internship.
- ✓ If the student feels that the internship work is not of high quality/not related to that field of interest, then the student should submit the application to the department HoD within THREE weeks and can re-join the institute.
- ✓ Industry/Institute should allow producing results obtained during project/internship period in the project report. The written certificate to this effect from the industry/institute is mandatory before consideration of the proposed project/internship.

HEAD
Dept. of EEE, CBIT (A)
Gandipet, Hyderabad - 75

20MT C05

CALCULUS
(Common to ECE, EEE, MECH, CHEM, CIVIL)

Instruction	3 L+1T /2P Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives:

1. To explain the solutions of system of linear equations by Matrix Methods.
2. To discuss mean value theorems.
3. To explain the Partial Derivatives and the extreme values of functions of two variables.
4. To discuss the convergence and divergence of the series.
5. To explain the expansion of functions in sine and cosine series.

Course Outcomes:

Upon completing this course, students will be able to:

1. Apply the Matrix Methods to solve system of linear equations.
2. Analyse the geometrical interpretation of Mean value theorems.
3. Determine the extreme values of functions of two variables.
4. Examine the convergence and divergence of infinite Series.
5. Calculate the Euler's coefficients for Fourier series of a function.

UNIT-I

Matrices: Rank of a matrix, Echelon form, consistency of linear system of equations, Linear dependence and independence of vectors. Eigen values, Eigenvectors, Properties of Eigen values & Eigen vectors, Cayley-Hamilton theorem, Quadratic form, Reduction of quadratic form to canonical form by linear transformation, Nature of quadratic form.

UNIT-II

Calculus: Rolle's Theorem, Lagrange's Mean value theorem, Cauchy's mean value theorem (without proofs). Curvature, Radius of curvature, Centre of curvature, Evolute and Involute.

UNIT-III

Multivariable Calculus (Differentiation): Functions of two variables, Partial derivatives, Higher order partial derivatives, Total derivative, Differentiation of implicit functions , Change of variables, Jacobians, Taylor's theorem for functions of two variables, Maxima and minima of functions of two variables.

UNIT-IV

Sequences and Series: Convergence of sequence and series. Tests for convergence of series: Comparison test, limit comparison test, D'Alembert's ratio test, Raabe's test, Cauchy's root test, alternating series, Leibnitz's series, absolute and conditional convergence.

UNIT-V

Fourier series: Periodic functions, Euler' formulae**,** Conditions for a Fourier expansion, functions having points of discontinuity, change of interval, even and odd functions, half range sine series, half range cosine series, and its applications in practical Harmonic analysis.

Text Books:

1. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. B.V.Ramana., Higher Engineering Mathematics, Tata McGraw-Hill, New Delhi, 11th Reprint, 2010.

Suggested Reading:

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw- Hill, New Delhi, 2008.
2. R.K.Jain, S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th edition, 2016.
3. David.Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/ Cole, 2005.

20CY C01

CHEMISTRY

(Common to all branches)

Instruction:	3Hours per Week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE:	40 Marks
Credits:	3

Course Objectives

1. This syllabus helps at providing the concepts of chemical bonding and chemical kinetics to the students aspiring to become practicing engineers
2. Thermodynamic and Electrochemistry units give conceptual knowledge about processes and how they can be producing electrical energy and efficiency of systems.
3. To teach students the value of chemistry and to improve the research opportunities knowledge of stereochemistry and organic reactions is essential.
4. Water chemistry unit impart the knowledge and understand the role of chemistry in the daily life.
5. New materials lead to discovering of technologies in strategic areas for which an insight into Polymers, nanomaterials and basic drugs of modern chemistry is essential.

Course Outcomes

At the end of the course student will be able to:

1. Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions.
2. Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells.
3. Illustrate the major chemical reactions that are used in the synthesis of organic molecules.
4. Classify the various methods used in treatment of water for domestic and industrial use.
5. Outline the synthesis of various Engineering materials & Drugs.

UNIT-I Atomic and molecular structure and Chemical Kinetics:

Atomic and molecular structure: Molecular Orbital theory - atomic and molecular orbitals. Linear combination of atomic orbitals (LCAO) method.Molecular orbitals of diatomic molecules. Molecular Orbital Energy level diagrams (MOED) of diatomic molecules & molecular ions (H_2 , He_2^+ ,N_2 , O_2 , O_2^- , CO, NO). Pi- molecular orbitals of benzene and its aromaticity.

Chemical Kinetics: Introduction, Terms involved in kinetics: rate of reaction, order & molecularity; First order reaction-Characteristics: units of first order rate constant & its half-life period, second order reaction-Characteristics: units of second order rate constant & its half- life period. Numericals.

UNIT-II Use of free energy in chemical equilibria

Use of free energy in chemical equilibria: Thermodynamic functions: Internal energy, entropy and free energy. Significance of entropy and free energy (criteria of spontaneity).Free energy and emf (Gibbs Helmholtz equations and its applications). Cell potentials, electrode potentials, – Reference electrodes (NHE, SCE)-electrochemical series. Nernst equation and its applications. Determination of pH using combined Glass & Calomel electrode. Potentiometric Acid base & Redox Titrations.Numericals.

Battery technology: Rechargeable batteries & Fuel cells.

Lithium batteries: Introduction, construction, working and applications of Li-MnO_2 and Li-ion batteries.
Fuel Cells: Introduction, difference between conventional cell and fuel cell, limitations & advantages.
Construction, working & applications of methanol-oxygen fuel cell.

UNIT- III Stereochemistry and Organic reactions

Stereochemistry: Representations of 3 dimensional structures, Types of stereoisomerism- Conformational isomerism – confirmations of n-butane (Newman and sawhorse representations), Configurational isomerism - Geometrical (cis-trans) isomerism & Optical isomerism- optical activity, Symmetry and chirality: Enantiomers (lactic acid) & Diastereomers (Tartaric acid), Absolute configurations, Sequence rules for R&S notation.

Types of Organic reactions: Substitution Reactions- Electrophilic substitution (Nitration of Benzene); Nucleophilic Substitution (S_N1& S_N2); Free Radical Substitution (Halogenation of Alkanes)

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

Addition Reactions: Electrophilic Addition – Markonikoff's rule, Free radical Addition - Anti Markonikoff's rule (Peroxide effect), Nucleophilic Addition – (Addition of HCN to carbonyl compounds)
Eliminations-E1 and E2 (dehydrohalogenation of alkyl halides)
Cyclization (Diels - Alder reaction)

UNIT–IV Water Chemistry:
Hardness of water – Types, units of hardness, Disadvantages of hard water, Alkalinity and Estimation of Alkalinity of water, Boiler troubles - scales & sludge formation, causes and effects, Softening of water by lime soda process (Cold lime soda process),ion exchange method and Reverse Osmosis.Specifications of potable water & industrial water.Disinfection of water by Chlorination; break point chlorination, BOD and COD definition, Estimation (only brief procedure) and significance, Numericals.

UNIT-V Engineering Materials and Drugs:
Introduction, Terms used in polymer science; Thermoplastic polymers (PVC) &Thermosetting polymers (Bakelite); Elastomers (Natural rubber).Conducting polymers- Definition, classification and applications.
Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography.
Nano materials-Introduction to nano materials and general applications, basic chemical methods of preparation-Sol-gel method.Carbon nanotubes and their applications.Characterisation of nanomaterials by SEM and TEM (only Principle).
Drugs-Introduction, Synthesis and uses of Aspirin (analgesic), Paracetamol (Antipyretic), Atenolol (antihypertensive).

Text Books:

1. P.C. Jain and M. Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company Ltd., New Delhi,16th edition (2015).
2. W.U. Malik, G.D.Tuli and R.D.Madan, "Selected topics in Inorganic Chemistry", S Chand & Company Ltd, New Delhi, reprint (2009).
3. R.T. Morrison, R.N. Boyd and S.K. Bhattacharjee, "Organic Chemistry", Pearson, Delhi, 7th edition(2019).
4. A Textbook of Polymer Science and Technology, Shashi Chawla,Dhanpat Rai & Co. (2014)
5. T. Pradeep, Nano: The Essentials, Tata McGraw-Hill Education, Delhi, 2012
6. G.L. David Krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K.L.N. Reddy and C.Sudhakar, "Drugs", Universities Press (India) Limited, Hyderabad (2007).

Suggested Readings:

1. B. H. Mahan, "University Chemistry", Narosa Publishing house, New Delhi, 3rd edition (2013).
2. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", S. Nagin Chand & Company Ltd., 46th edition (2013).
3. T.W. Graham Solomons, C.B. Fryhle and S.A. Snyder, "Organic Chemistry", Wiley, 12th edition (2017).
4. P.W. Atkins, J.D. Paula, "Physical Chemistry", Oxford, 8th edition (2006).

20CE C01

ENGINEERING MECHANICS – I

Instruction:	3 L Hours per week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE:	40 Marks
Credits:	3

Course Outcomes: At the end of the course the student will be able to

1. Calculate the components and resultant of coplanar forces system.
2. Understand free body diagram and apply equilibrium equations to solve for unknown forces.
3. Apply concepts of friction for solving engineering problems.
4. Analyse simple trusses for forces in various members of a truss.
5. Determine centroid for elementary, composite figures and bodies.

UNIT- I:

Resolution and Resultant of Force System: Basic concepts of a force system. Components of forces in a plane. Resultant of coplanar concurrent force system. Moment of a force, couple and their applications. Resultant of coplanar non-concurrent force system.

UNIT - II:

Equilibrium of Force System: Free body diagram, equations of equilibrium. Lami's theorem, equilibrium of coplanar force systems.

UNIT - III:

Friction: Theory of static friction, Laws of friction, applications to single body, connected systems, wedge friction and belt friction.

UNIT - IV:

Analysis of Simple Trusses: Introduction to trusses, analysis of simple trusses using method of joints and method of sections.

UNIT - V:

Centroid and Centre of Gravity:

Centroid of lines and areas from first principles, centroid of composite figures, theorems of Pappus, centre of gravity of bodies and composite bodies.

Text Books:

1. K. Vijaya Kumar Reddy and J. Suresh Kumar, "*Singer's Engineering Mechanics: Statics and Dynamics*", B. S. Publications (SI Units), 3rd edn. Rpt., 2019.
2. A. Nelson., "*Engineering Mechanics*", Tata McGraw Hill, Delhi, 2010.

Suggested Reading:

1. Irving H. Shames, *"Engineering Mechanics",* 4th Edition, Prentice Hall, 2006.
2. R. C. Hibbeler, *"Engineering Mechanics: Principles of Statics and Dynamics",* Pearson Press, 2006.
3. Basudeb Bhattacharyya, "*Engineering Mechanics*", Oxford University Press, 2nd edn., 2016.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

20CS C01

PROGRAMMING FOR PROBLEM SOLVING
(Common to all Programs)

Instruction	3 Periods per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The objectives of this course are

1. Identification of computer components, Operating environments, IDEs.
2. Understanding the steps in problem solving and formulation of algorithms to problems.
3. Develop programming skills as a means of implementing an algorithmic solution with appropriate control and data structures.
4. Develop in tuition to enable students to come up with creative approaches to problems.
5. Manipulation of text data using files.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify and understand the computing environments for scientific and mathematical problems.
2. Formulate solutions to problems with alternate approaches and represent them using algorithms / Flowcharts.
3. Choose data types and control structures to solve mathematical and scientific problem.
4. Decompose a problem into modules and use functions to implement the modules.
5. Apply arrays, pointers, structures, and unions to solve mathematical and scientific problems.
6. Develop applications using file I/O.

UNIT -I

Introduction to computers and Problem Solving: Components of a computer, Operating system, compilers, Program Development Environments, steps to solve problems, Algorithm, Flowchart / Pseudocode with examples.

Introduction to programming: Programming languages and generations, categorization of high-level languages.

Introduction to C: Introduction, structure of C program, keywords, identifiers, Variables, constants, I/O statements, operators, precedence, and associativity.

UNIT – II

Introduction to decision control statements: Selective, looping, and nested statements.

Functions: Introduction, uses of functions, Function definition, declaration, passing parameters to functions, recursion, scope of variables and storage classes, Case study using functions and control statements.

UNIT – III

Arrays: Introduction, declaration of arrays, accessing and storage of array elements, 1-dimensional array, Searching (linear and binary search algorithms) and sorting (Selection and Bubble) algorithms, 2-D arrays, matrix operations.

Strings: Introduction, strings representation, string operations with examples. Case study using arrays.

UNIT – IV

Pointers: Understanding computer's memory, introduction to pointers, declaration pointer variables, pointer arithmetic, pointers and strings, array of pointers, dynamic memory allocation, advantages, and drawbacks of pointers.

Structures: Structure definition, initialization and accessing the members of a structure, nested structures, structures and functions, self- referential structures, unions, and enumerated data types.

UNIT-V

Files: Introduction to files, file operations, reading data from files, writing data to files, error handing during file operations.

Preprocessor Directives: Types of preprocessor directives, examples.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Text Books:

1. M.T. Somashekar “Problem Solving with C”, 2nd Edition, Prentice Hall India Learning Private Limited 2018
2. AK Sharma, “Computer Fundamentals and Programming”, 2^{nd} Edition, University Press, 2018
3. Pradeep Deyand Manas Ghosh, “Programming in C”, Oxford Press,2nd Edition,2017

Suggested Reading:

1. Byron Gottfried, Schaum’s Outline of Programming with C”, Mc Graw-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
4. Reema Tharaja “Introduction to C Programming”, Second Edition, OXFORD Press, 2015.

Online Resources:

1. https://www.tutorialspoint.com/cprogramming/index.htm.
2. https://onlinecourses.nptel.ac.in/noc18-cs10/preview

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

20CY C02

CHEMISTRY LAB

(Common to all branches)

Instruction:	4 Hours per Week
Duration of SEE:	3 Hours
SEE:	50 Marks
CIE:	50 Marks
Credits:	2

Course Objectives

1. To impart fundamental knowledge in handling the equipment / glassware and chemicals in chemistry laboratory.
2. To provide the knowledge in both qualitative and quantitative chemical analysis
3. The student should be conversant with the principles of volumetric analysis
4. To apply various instrumental methods to analyse the chemical compounds and to improve understanding of theoretical concepts.
5. To interpret the theoretical concepts in the preparation of new materials like drugs and polymers.

Course Outcomes

At the end of the course student will be able to:

1. Identify the basic chemical methods to analyse the substances quantitatively & qualitatively.
2. Estimate the amount of chemical substances by volumetric analysis.
3. Determine the rate constants of reactions from concentration of reactants/ products as a function of time.
4. Calculate the concentration and amount of various substances using instrumental techniques.
5. Develop the basic drug molecules and polymeric compounds.

Chemistry Lab

1. Introduction: Preparation of standard solution of oxalic acid and standardisation of NaOH.
2. Estimation of metal ions (Co^{+2}& Ni^{+2}) by EDTA method.
3. Estimation of temporary and permanent hardness of water using EDTA solution
4. Determination of Alkalinity of water
5. Determination of rate constant for the reaction of hydrolysis of methyl acetate. (first order)
6. Determination of rate constant for the reaction between potassium per sulphate and potassium Iodide. (second order)
7. Estimation of amount of HCl Conductometrically using NaOH solution.
8. Estimation of amount of HCl and CH_3COOH present in the given mixture of acids Conductometrically using NaOH solution.
9. Estimation of amount of HCl Potentiometrically using NaOH solution.
10. Estimation of amount of Fe^{+2} Potentiometrically using $KMnO_4$ solution
11. Preparation of Nitrobenzene from Benzene.
12. Synthesis of Aspirin drug and Paracetamol drug.
13. Synthesis of phenol formaldehyde resin.

Text Books:

1. J. Mendham and Thomas , "Vogel's text book of quantitative chemical analysis", Pearson education Pvt. Ltd. New Delhi ,6th ed. 2002.
2. Senior practical physical chemistry by B.D.Khosla, V.C.Garg & A.Gulati,; R. Chand & Co. : New Delhi (2011).

Suggested Readings:

1. Dr. Subdharani , "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing, 2012.
2. S.S. Dara , "A Textbook on experiment and calculation in engineering chemistry", S.Chand and Company, 9th revised edition, 2015.

20CS C02

PROGRAMMING FOR PROBLEM SOLVING LAB
(Common to All Programs)

Instruction	4 Periods per week
Duration of SEE	3Hours
SEE	50Marks
CIE	50Marks
Credits	2

Course Objectives: The objectives of this course are

1. Setting up programming environment.
2. Develop Programming skills to solve problems.
3. Use of appropriate C programming constructs to implement algorithms.
4. Identification and rectification of coding errors in program.
5. Develop applications in a modular fashion.
6. Manage data using files.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify and setup program development environment.
2. Design and test programs to solve mathematical and scientific problems.
3. Identify and rectify the syntax errors and debug program for semantic errors
4. Implement modular programs using functions.
5. Represent data in arrays, pointers, structures and manipulate them through a program.
6. Create, read, and write to and from simple text files.

Lab experiments

1. Familiarization with programming environment.
2. Simple computational problems using arithmetic expressions.
3. Problems involving if-then-else structures.
4. Iterative problems e.g., sum of series.
5. 1D Array manipulation.
6. 2D arrays and strings.
7. Matrix problems, String operations.
8. Simple functions.
9. Recursive functions.
10. Pointers and structures.
11. Dynamic memory allocation and error handling.
12. File handling:

Text Books:

1. Pradeep Dey and Manas Ghosh, “Programming in C”, Oxford Press, 2nd Edition, 2017.
2. Reema Tharaja “Introduction to C Programming”, Second Edition, OXFORD Press, 2015.

Online Resources:

1. https://www.tutorialspoint.com/cprogramming/index.htm
2. https://www.w3resource.com/c-programming/programming-in-c.php
3. https://www.w3schools.in/c-tutorial/

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20ME C02

WORKSHOP / MANUFACTURING PRACTICE

Instruction	5P Hours per week
Duration of SEE	3 Hours
SEE	50Marks
CIE	50 Marks
Credits	2.5

Course Objectives:

1. Give a feel of Engineering Practices & develop holistic understanding of various Engineering materials and Manufacturing processes.
2. Develop skills of manufacturing, safety, precision, quality, intelligent effort, optimization, positive &team work attitude to get things right the first time.
3. To provide basic knowledge of Steel, Plastic, Composite and other materials for suitable applications.
4. Study of Principle and hands on practice on techniques of fabrication, welding, casting, manufacturing, metrology, and allied skills.
5. To advance important hard & pertinent soft skills, productivity, create skilled manpower which is cognizant of industrial workshop components and processes and can communicate their work in a technical, clear and effective way.

Course Outcomes: At the end of the course, the students are able to

1. Understand safety measures to be followed in workshop to avoid accidents.
2. Identify various tools used in fitting, carpentry, tin smithy, house wiring, welding, casting and machining processes.
3. Make a given model by using workshop trades including fitting, carpentry, tinsmithy and House wiring.
4. Perform various operations in welding, machining and casting processes.
5. Conceptualize and produce simple device/mechanism of their choice.

List of Exercises

CYCLE 1

Exercises in Carpentry

1. To plane the given wooden piece to required size
2. To make a lap joint on the given wooden piece according to the given dimensions.
3. To make a dove tail-joint on the given wooden piece according to the given dimensions.

Exercises in Tin Smithy

1. To make a rectangular box from the given sheet metal with base and top open. Solder the corners.
2. To make a scoop.
3. To make a pamphlet box.

Exercises in Fitting

1. To make a perfect rectangular MS flat and to do parallel cuts using Hacksaw
2. To make male and female fitting using MSflats-Assembly1
3. To make male and female fitting using MSflats-Assembly2

Exercises in House Wiring

1. Wiring of one light point controlled by one single pole switch, a three pin socket controlled by a single pole switch, and wiring of one buzzer controlled by a bellpush
2. Wiring of two light points connected in series and controlled by single pole switch. Verify the above circuit with different bulbs. Wiring of two light points connected in parallel from two single pole switches and a three pin socket
3. Stair case wiring-wiring of one light point controlled from two different places independently using two 2- ways witches.

CYCLE 2

Exercises in Casting

1. Study of Sand casting process and its applications**.**
2. Green sand moulding practice for a single piece pattern
3. Green sand moulding practice for a split pattern with a horizontal core

Exercises in Welding

1. Study of gas welding equipment and process. Identification of flames, making of Butt joint with gas welding.
2. Study of Arc welding process, making Butt joint with DCSP,DCRP
3. Study of Arc welding process, making Lap joint with A.C

Exercises in Machine shop

1. Study of Machine Tools like Lathe, Drilling, Milling and Shaper.
2. Facing, Plain turning and Step turning operations on Lathe machine.
3. Knurling and Taper turning on Lathe machine

Open ended Exercise:

1. Student should produce a component /mechanism by applying the knowledge of any one trade or combination of trades.

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I, 2008 and Vol. II, 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.

Suggested Reading:

1. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I", Pearson Education, 2008.
2. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20ME C03

ENGINEERING EXPLORATION

Instruction	4 Hours per week
Duration of SEE	Nil
SEE	Nil
CIE	50Marks
Credits	1.5

Prerequisites: Nil

Course Outcomes: At the end of the course, the students are able to

1. Understand the role of an engineer as a problem solver.
2. Identify multi-disciplinary approaches in solving an engineering problem.
3. Build simple systems using engineering design process.
4. Analyze engineering solutions from ethical and sustainability perspectives.
5. Use basics of engineering project management skills in doing projects.

UNIT- I

Role of Engineers: Introduction, science, engineering, technology, engineer, scientist, role of engineer, various disciplines of engineering, misconception of engineering, expectations for the 21st century engineer and NBA graduate attributes.

Engineering problems and Design: Multidisciplinary facet of design, pair wise comparison chart, introduction to econometrics system, generation of multiple solution, Pugh chart, motor and battery sizing concepts, introduction to PCB design.

UNIT- II

Mechanisms: Basic components of a mechanism, degrees of freedom or mobility of a mechanism, 4-bar chain, crank rocker mechanism, slider crank mechanism, simple robotic arm building.

Platform-based development: Introduction to programming platforms (Arduino) and its essentials, sensors, transducers and actuators and their interfacing with Arduino.

UNIT- III

Data Acquisition and Analysis: Types of data, descriptive statistics techniques as applicable to different types of data, types of graphs and their applicability, usage of tools (MS-Office /Open Office/ Libre Office / Scilab) for descriptive statistics, data acquisition (temperature and humidity) using sensors interfaced with Arduino, exporting acquired data to spreadsheets, and analysis using representation.

UNIT- IV

Process Management: Introduction to Agile practice, significance of team work, importance of communication in engineering profession, project management tools, checklist, timeline, Gantt chart, significance of documentation.

UNIT -V

Engineering Ethics & Sustainability in Engineering: Identifying Engineering as a profession, significance of professional ethics, code of conduct for engineers, identifying ethical dimensions in different tasks of engineering, applying moral theories and codes of conduct for resolution of ethical dilemmas.

Sustainability in Engineering: Introduction, sustainability leadership, life cycle assessment, carbon foot print.

Text Books:

1. Clive L. Dym, Patric Little, Elizabeth J Orwin, “Engineering Design: A project-based introduction”, 4th edition, Willey.
2. Matthew Python, “Arduino programming for beginners”, Independently published, 2020.
3. Patrick F. Dunn , “Measurement and data Analysis for engineering and science” , thirdedition, 2014.
4. Andrew Stellman, Jennifer Greene, “Head First Agile: A brain-friendly guide to Agile principles, ideas, and real-world practices”, Kindle Edition.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

Suggested Reading:

1. Charles B. Fleddermann, "Engineering ethics", fourth edition, Prentice Hall, 2012.
2. Rob Lawlor, "Engineering in society", second edition, Royal academy of engineering.
3. Richard Dodds, Roger Venables, "Engineering for sustainable development: Guiding principles", The Royal Academy of engineering, 2005.
4. Richard S. Paul, "Robot Manipulators: Mathematics, Programming, and Control", MIT Press.

ENGINEERING EXPLORATION ASSESSMENT SCHEME				
S. No	**Name of the module**	**Work Hours**	**Marks**	**Evaluation**
1	Role of Engineers	4	-	Evaluation - I
2	Engineering Design	16	5	
3	Mechanisms	6	3	
4	Engineering Ethics	2	2	
5	Platform-based Development	16	5	Evaluation - II
6	Data Acquisition and Analysis	6	4	Evaluation-III
7	Project Management	4	4	
8	Sustainability in Engineering	6	2	
9	Course Project Reviews	12	20	Final Evaluation
10	Code of conduct	-	5	
	Total	**72**	**50**	

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20MT C06

VECTOR CALCULUS AND DIFFERENTIAL EQUATIONS
(Common to ECE, EEE, MECH, CHEM, CIVIL)

Instruction	3 L+1T /2P Hours per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives:
1. To explain double and triple integrals of various functions and their significance.
2. To explain Scalar and vector functions with its Physical interpretations.
3. To discuss vector line, surface and volume integrals.
4. To explain relevant methods to solve first order differential equations.
5. To discuss the solution of higher order differential equations.

Course Outcomes:
Upon completing this course, students will be able to:
1. Calculate the areas and volumes.
2. Apply the vector differential operators to Scalars and Vector functions.
3. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.
4. Calculate the solutions of first order linear differential equations.
5. Solve higher order linear differential equations.

UNIT-I
Multivariable Calculus (Integration): Applications of definite integrals to evaluate surface areas and volumes of revolutions. Double integrals, Change of order of integration, Area enclosed by plane curves, Triple integrals, Volumes of solids.

UNIT-II
Vector Differential Calculus: Scalar and vector point functions, Gradient, Directional derivative, potential function. Divergence, Physical interpretation of Divergence, Curl, Physical interpretation of curl, vector identities.

UNIT-III
Vector Integral Calculus: Line integral, Surface integral and Volume integral, Green's theorem in a plane, Stoke's theorem and Gauss's divergence theorem (without proof**).**Fluid flow, Physical interpretation of the divergence.

UNIT-IV
First Order Ordinary Differential Equations: Exact differential equations, Equations reducible to exact equations, Linear equations, Bernoulli's equation, Clairaut's equation, Riccati's equation, Orthogonal trajectories, Chemical reactions and solutions, Rate of decay of Radio-active materials.

UNIT-V
Higher Orders Linear Differential Equations: Higher order linear differential equations with constant coefficients, rules for finding Complementary function, Particular Integral and General solution. Method of variation of parameters, solution of Euler-Cauchy equation. Ordinary point, singular point, regular singular point and Power Series solution. Applications: LR and LCR circuits.

Text Books:

1. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

Suggested Reading:

1. N.P.Bali and Dr.Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 9th edition, 2014.
2. R.K.Jain, S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th edition, 2016.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic Geometry, 9th Edition, Pearson, Reprint, 2002

20 EG C01

ENGLISH
(Common to all branches)

Instruction	2 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	2

Course Objectives: This course will introduce the students:

1. To the role and importance of communication while developing their basic communication skills in English.
2. To basics of writing coherent paragraphs and formal emails.
3. To techniques of writing a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. To description, definition and classification of processes while enabling them to draft formal reports following a proper structure.
5. To gaining adequate reading comprehension techniques.

Course Outcomes: After successful completion of the course the students will be able to:

1. Illustrate the nature, process and types of communication and communicate effectively without barriers.
2. Construct and compose coherent paragraphs, emails and adhering to appropriate mobile etiquette.
3. Apply techniques of precision to write a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. Distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.
5. Critique passages by applying effective reading techniques

UNIT-I Understanding Communication in English:
Introduction, nature and importance of communication; Process of communication; Types of communication - verbal and non-verbal; Barriers to communication; Intrapersonal and interpersonal communication; Understanding Johari Window.
Vocabulary & Grammar: The concept of Word Formation; Use of appropriate prepositions and articles.

UNIT-II Developing Writing Skills I:
Paragraph writing. – Structure and features of a paragraph; Cohesion and coherence. Rearranging jumbled sentences. Email and Mobile etiquette.
Vocabulary & Grammar: Use of cohesive devices and correct punctuation.

UNIT-III Developing Writing Skills II:
Précis Writing; Techniques of writing precisely. Letter Writing – Structure, format of a formal letter; Letter of request and the response
Vocabulary and Grammar: Subject-verb agreement.
Use of prefixes and suffixes to form derivatives. Avoiding redundancies.

UNIT-IV Developing Writing Skills III:
Report writing – Importance, structure, elements of style of formal reports ; Writing a formal report.
Vocabulary and Grammar: Avoiding ambiguity - Misplaced modifiers. Use of synonyms and antonyms.

UNIT-V Developing Reading Skills:
The reading process, purpose, different kinds of texts; Reading comprehension; Techniques of comprehension – skimming, scanning, drawing inferences and conclusions.
Vocabulary and Grammar: Words often confused; Use of standard abbreviations.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Text Books:

1. Language and Life: A Skills Approach, Board of Editors, Orient Black Swan, 2017.
2. Swan Michael, Practical English Usage.OUP. 1995.

Suggested Readings:

1. Wood F.T, Remedial English Grammar,Macmillan, 2007
2. Zinsser William, On Writing Well, Harper Resource Book, 2001
3. Sanjay Kumar and PushpLata, Communication Skills. Oxford University Press, 2011.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

20PY C06

ELECTROMAGNETIC THEORY AND QUANTUM MECHANICS
(Common to ECE & EEE)

Instruction	3L / Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

The objectives of the course is to make the student

1. Understand the fundamentals of wave nature of light
2. Familiar with static and dynamic nature of electric and magnetic fields
3. Acquire knowledge of lasers and fiber optics
4. Learn basics of quantum mechanics and properties of solids

Course Outcomes:

At the end of the course, the student will be able to

1. Interpret the wave nature of the light
2. Extend the laws of electric and magnetic fields for wireless communication
3. Explain the principles of lasers and fiber optic communication
4. Find the applications of quantum mechanics
5. Identify semiconductors for engineering applications

UNIT-I

Wave Optics: Huygens' principle – Superposition of waves – Interference of light by wave front splitting and amplitude splitting –Interference in thin films (reflected light) – Newton's rings – Fraunhofer diffraction from a single slit – Double slit diffraction–Concept of N-slits–Diffraction grating. Polarization: Introduction–Malus's law –Double refraction –Nicol's prism–Quarter-wave plate and half-wave plate– Optical activity– Laurent's half shade polarimeter.

UNIT-II

Electrostatics: Calculation of electric field and electrostatic potential for a charge distribution–Divergence and curl of electrostatic field– Laplace's and Poisson's equations for electrostatic potential–Uniqueness theorem.

Magnetostatics: Bio-Savart law–Divergence and curl of static magnetic field –Equation for magnetic vector potential and its solution for given current densities – Feromagnetic, paramagnetic and diamagnetic materials– B-H curve.

Electromagnetic Theory: Review of steady and varying fields – Conduction current and displacement current–Maxwell's equations indifferential and integral forms–Electromagnetic wave propagation in free space, dielectric and conducting media – Poynting theorem – Skindepth.

UNIT-III

Lasers: Characteristics of lasers – Einstein's coefficients –Amplification of light by population inversion – Ruby laser – He-Ne laser – Semiconductor laser –Applications of lasers in engineering and medicine.

Fiber Optics: Introduction –Construction –Principle –Propagation of light through an optical fiber – Numerical aperture and acceptance angle – Step-index and graded-index fibers –Pulse dispersion –Fiber losses –Fiber optic communication system –Applications.

UNIT-IV

Quantum Mechanics: Introduction –Wave nature of particles – de-Broglie hypothesis –Physical significance of ψ –Time-dependent and time-independent Schrodinger equations – Born interpretation – Probability current –Wave-packets –Uncertainty principle –Particle in infinite square well potential.

UNIT-V

Physics of Solids and Semiconductors: Salient features of free electron theory of metals (Classical and Quantum) – Fermi level – Bloch's theorem for particles in a periodic potential –Kronig-Penney model – Origin of energy bands –Classification of solids: metals, semiconductors and insulators –Intrinsic and extrinsicsemiconductors–Carriergenerationandrecombination–Carriertransport:diffusionanddrift–P-N junction – Thermistor – Hall effect – LED – Solarcell.

Text Books:

1. B.K. Pandey and S. Chaturvedi, *Engineering Physics*, Cengage Publications, 2012.
2. M.N. Avadhanulu and P.G. Kshirsagar, *A Text Book of Engineering Physics*, S. Chand Publications, 2014.
3. M. Arumugam, *Materials Science*, Anuradha Publications, 2015.
4. S.L. Gupta and Sanjeev Gupta, *Modern Engineering Physics*, Dhanpat Rai Publications, 2011.

Suggested Reading:

1. R. Murugeshan and Kiruthiga Sivaprasath, *Modern Physics*, S. Chand Publications S. Chand Publications, 2014.
2. V. Rajendran, *Engineering Physics*, McGraw-Hill Education Publications, 2013.
3. P.K. Palanisamy, *Engineering Physics*, Scitech Publications, 2012.
4. V. Raghavan, *Materials Science and Engineering*, Prentice Hall India Learning Private Limited; 6th Revised edition, 2015.

20EEC01

BASIC ELECTRICALENGINEERING

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To understand the behaviour of different circuit elements R, L & C, and the basic concepts of electrical AC circuit analysis
2. To understand the basic principle of operation of AC and DC machines
3. To know about different types of electrical wires and cables, domestic and industrial wiring. safety rules and methods of earthing

Course Outcomes: After the completion of this course, the student will be able to

1. Understand the concepts of Kirchhoff's laws and to apply them in superposition, Thevenin's and Norton's theorems to get the solution of simple dc circuits
2. Obtain the steady state response of RLC circuits with AC input and to acquire the basics, relationship between voltage and current in three phase circuits.
3. Understand the principle of operation, the emf and torque equations and classification of AC and DC machines
4. Explain various tests and speed control methods to determine the characteristic of DC and AC machines.
5. Acquire the knowledge of electrical wiring, types of wires, cables used and Electrical safety precautions to be followed in electrical installations.
6. Recognize importance of earthing, methods of earthing and various low-tension switchgear used in electrical installations

UNIT-I

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation, Superposition, Thevenin and Norton Theorems, Time-domain analysis of first-order RL and RC circuits.

UNIT-II

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III

Transformers: Construction, Working principle, EMF Equation, Ideal and Practical transformer, Equivalent circuit of Transformer, OC and SC tests on a transformer, Efficiency and Regulation

UNIT-IV

DC and AC Machines: DC Generators: Construction, Principle of operation, EMF equation, Classification, Characteristics of shunt, series and compound generators.

DC Motors: Classification, Torque equation, Characteristics, Efficiency, Speed Control of Series and Shunt Motors.

Three - Phase Induction Motors: Principle of operation, Applications,

UNIT-V

Electrical Installations: Electrical Wiring: Types of wires and cables, Electrical Safety precautions in handling electrical appliances, electric shock, first aid for electric shock, safety rules.

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Earthing (Elementary Treatment only), Elementary calculations for energy consumption

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Text Books:

1. L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011.
2. E. Hughes, Electrical and Electronics Technology, Pearson, 2010.

Suggested Reading:

1. D. P. Kothari & I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989
3. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009
4. P.V. Prasad, S. Sivanagaraju, R. Prasad, "Basic Electrical and Electronics Engineering" Cengage Learning, 1st Edition, 2013

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20EG C02

ENGLISH LAB
(Common to all branches)

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives: This course will introduce the students:

1. To nuances of Phonetics and give them sufficient practice in correct pronunciation.
2. To word stress and intonation.
3. To IELTS and TOEFL material for honing their listening skills.
4. To activities enabling them overcome their inhibitions while speaking in English with the focus being on fluency rather than accuracy.
5. To team work, role behavior while developing their ability to discuss in groups and making oral presentations.

Course Outcomes: After successful completion of the course the students will be able to:

1. Define the speech sounds in English and understand the nuances of pronunciation in English
2. Apply stress correctly and speak with the proper tone, intonation and rhythm.
3. Analyze IELTS and TOEFL listening comprehension texts to enhance their listening skills.
4. Determine the context and speak appropriately in various situations.
5. Design and present effective posters while working in teams ,and discuss and participate in Group discussions.

Exercises

1. **Introduction to English Phonetics**: Introduction to auditory, acoustic and articulatory phonetics, organs of speech: the respiratory, articulatory and phonatory systems.
2. **Sound system of English**: Phonetic sounds and phonemic sounds, introduction to international phonetic alphabet, classification and description of English phonemic sounds, minimal pairs . The syllable: types of syllables, consonant clusters.
3. **Word stress**: Primary stress, secondary stress, functional stress, rules of word stress.
4. **Rhythm & Intonation**: Introduction to Rhythm and Intonation. Major patterns, intonation of English with the semantic implications.
5. **Listening skills** – Practice with IELTS and TOEFL material
6. **Public speaking –** Speaking with confidence and clarity in different contexts on various issues.
7. **Group Discussions -** Dynamics of a group discussion, group discussion techniques, body language.
8. **Pictionary –** weaving an imaginative story around a given picture.
9. **Information Gap Activity –** Writing a brief report on a newspaper headline by building on the hints given
10. **Poster presentation –** Theme, poster preparation, team work and presentation.

Suggested Reading

1. T Balasubramanian. A Textbook of English Phonetics for Indian Students, Macmillan, 2008.
2. J Sethi et al. A Practical Course in English Pronunciation (with CD), Prentice Hall India, 2005.
3. Priyadarshi Patnaik. Group Discussions and Interviews, Cambridge University Press Pvt. Ltd., 2011
4. Aruna Koneru, Professional Speaking Skills, Oxford University Press, 2016

with effect from the Academic Year 2020-21

20PY C09

ELECTROMAGNETIC THEORY AND QUANTUM MECHANICS LAB
(Common to ECE & EEE)

Instruction	4 Periods / Week
Duration of External Assessment	3 Hours
External Assessment	50 Marks
Internal Assessment	50 Marks
Credits	2

Course Objectives:

The objectives of the course is to make the student

1. Apply the concepts of physics while doing experiments
2. Understand the nature of the light experimentally
3. Analyze the behaviour of semiconductor materials and optoelectronic devices

Course Outcomes:

At the end of the course, the student will be able to

1. Experiment with the concept of errors and find the ways to minimize the errors
2. Demonstrate properties of light experimentally
3. Find the applications of lasers and optical fibers in engineering applications
4. Make use of semiconductor devices for practical applications
5. Illustrate the working of optoelectronic devices

Experiments

1.	Error Analysis	:	Estimation of errors in the determination of time period of a torsional pendulum
2.	Newton's Rings	:	Determination of wavelength of given monochromatic source
3.	Single Slit Diffraction	:	Determination of wavelength of given monochromatic source
4.	Diffraction Grating	:	Determination of wavelengths of two yellow lines of light of mercury lamp
5.	Malus's Law	:	Verification of Malus's law
6.	Double Refraction	:	Determination of refractive indices of O-ray and E-ray of given calcite crystal
7.	Polarimeter	:	Determination of specific rotation of glucose
8.	Laser	:	Determination of wavelength of given semiconductor laser
9.	Optical Fiber	:	Determination of numerical aperture and power losses of given optical fiber
10.	Energy Gap	:	Determination of energy gap of given semiconductor
11.	P-N Junction Diode	:	Study of V-I characteristics and calculation of resistance of given diode in forward bias and reverse bias
12.	Thermistor	:	Determination of temperature coefficient of resistance of given thermistor
13.	Hall Effect	:	Determination of Hall coefficient, carrier concentration and mobility of charge carriers of given semiconductor specimen
14.	LED	:	Study of I-V characteristics of given LED
15.	Solar Cell	:	Study of I-V characteristics of given solar cell and calculation of fill factor, efficiency and series resistance

NOTE: A minimum of TWELVE experiments should be conducted.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20EEC02

BASIC ELECTRICAL ENGINEERING LAB

Instruction	2 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To acquire the knowledge of different types of electrical elements and to verify the basic electrical circuit laws and theorems.
2. To determine the parameters and power factor of a coil, calculate the time and frequency responses of RLC circuits and to familiarize with measurement of electric power & energy.
3. To determine the characteristics of Transformers, dc, ac machines and switch gear components

Course Outcomes: At the end of the course, the students are expected to

1. Get an exposure to common electrical components, their ratings and basic electrical measuring equipment.
2. Make electrical connections by wires of appropriate ratings and able to measure electric power and energy.
3. Comprehend the circuit analysis techniques using various circuital laws and theorems.
4. Determine the parameters of the given coil and calculate the time response of RL & RC series circuits.
5. Recognize the basic characteristics of transformer and components of switchgear.
6. Understand the basic characteristics of dc and ac machine by conducting different types of tests on them.

List of Laboratory Experiments/Demonstrations:

1. Demonstration of Measuring Instruments and Electrical Lab components.
2. Verification of KCL and KVL.
3. Time response of RL and RC series circuits.
4. Determination of parameters of a choke or coil by Wattmeter Method
5. Verification of Thevenin's and Norton's theorems
6. Turns ratio /voltage ratio verification of single phase Transformers
7. Open Circuit and Short Circuit tests on a given single phase Transformer
8. Observation of Excitation Phenomenon in Transformer
9. Measurement of three phase power in a balanced system using two Wattmeter method.
10. Measurement of 3-Ph Energy by an Energy Meter (Demonstration of Principle)
11. Load test on DC Shunt motor
12. Speed control of DC Shunt motor
13. Demonstration of Low Tension Switchgear Equipment/Components
14. Demonstration of cut - out section of Machines like DC Machine, Induction Machine etc.

Note: TEN experiments to be conducted from the above list.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20ME C01

CAD AND DRAFTING

Instruction	1 T + 3 D Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2.5

Course Objectives:

1. To get exposure to a cad package and its utility.
2. Understanding orthographic projections.
3. To visualize different solids and their sections in orthographic projection
4. To prepare the student to communicate effectively by using isometric projection.
5. To prepare the student to use the techniques, skills, and modern tools necessary for practice.

Outcomes: At the end of the course, the Students are able to

1. Become conversant with appropriate use of CAD software for drafting.
2. Recognize BIS, ISO Standards and conventions in Engineering Drafting.
3. Construct the projections of points, lines, planes, solids
4. Analyse the internal details of solids through sectional views
5. Create an isometric projections and views

List of Exercises:

1. Introduction to CAD package: Settings, draw, modify tools, dimensioning and documentation
2. Construction of Conic Sections by General method
3. Orthographic projection: Principles, conventions, Projection of points
4. Projection of straight lines: Simple position, inclined to one plane
5. Projection of straight lines inclined to both the planes (without traces and mid-point)
6. Projection of planes: Perpendicular planes
7. Projection of planes: Oblique planes
8. Projection of solids: Simple position
9. Projection of solids: Inclined to one plane
10. Sections of solids: Prism, pyramid in simple position
11. Sections of solids: Cone and cylinder in simple position
12. Isometric projections and views
13. Conversion of isometric views to orthographic projections and vice versa.

Text Books:

1. N.D.Bhatt, “Elementary Engineering Drawing”, Charotar Publishers, 2012.
2. K.Venugopal, “Engineering Drawing and Graphics + AutoCAD”, New Age International Pvt. Ltd, 2011.
3. Basanth Agrawal and C M Agrawal, “Engineering Drawing”, 2/e, McGraw-Hill Education (India) Pvt. Ltd.

Suggested Reading:

1. Shaw M.B and Rana B.C., “Engineering Drawing”, 2/e, Pearson, 2009.
2. K.L. Narayana and P.K. Kannaiah, “Text Book of Engineering Drawing”, Scitech Publications, 2011.

20MBC02

COMMUNITY ENGAGEMENT

Instruction	3 Hours per week (30 hours field work & 2 hours per week)
SEE	Nil
CIE	50 Marks
Credits	1.5 Credits

Course Objectives: The main Objectives of this Course are to:

1. Develop an appreciation of Rural culture, life-style and wisdom among the Students.
2. Learn about the various livelihood activities that contribute to Rural economy.
3. Familiarize the Rural Institutions and the Rural Development Programmes in India.

Course Outcomes: After the completion of this Course, Student will be able to:

2. Gain an understanding of Rural life, Culture and Social realities.
3. Develop a sense of empathy and bonds of mutuality with Local Communities.
4. Appreciate significant contributions of Local communities to Indian Society and Economy.
5. Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economic improvements.
6. Utilise the opportunities provided by Rural Development Programmes.

Module I Appreciation of Rural Society

Rural life style, Rural society, Caste and Gender relations, Rural values with respect to Community, Nature and Resources, elaboration of 'soul of India lies in villages' (Gandhi), Rural Infrastructure.

Module II Understanding Rural Economy and Livelihood

Agriculture, Farming, Landownership, Water management, Animal Husbandry, Non-farm Livelihood and Artisans, Rural Entrepreneurs, Rural markets, Rural Credit Societies, Farmer Production Organization/Company.

Module III Rural Institutions

Traditional Rural organizations, Self-Help Groups, Panchayati Raj Institutions (Gram Sabha), Gram Panchayat, Standing Committees, Local Civil Society, Local Administration.

Module IV Rural Development Programmes

History of Rural Development in India, Current National Programmes: Sarva Shiksha Abhiyan, Beti Bhachao, Beti Padhao, Ayushman, Bharat, Swachh Bharat, PM Awas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA etc.

Text Books:

1. Singh, Katar, Rural Development: Principles, Policies and Management, Sage Publications, New Delhi, 2015.
2. A Hand book on Village Panchayat Administration, Rajiv Gandhi Chair for Panchayati Raj Studies, 2002.
3. United Nations, Sustainable Development Goals, 2015, un.org/sdgs
4. M.P Boraia, Best Practices in Rural Development, Shanlax Publishers, 2016.

Journals:

1. Journal of Rural development (published by NIRD & PR, Hyderabad).
2. Indian Journal of Social Work, (by TISS, Bombay).
3. Indian Journal of Extension Educations (by Indian Society of Extension Education).
4. Journal of Extension Education (by Extension Education Society).
5. Kurukshetra (Ministry of Rural Development, GOI).
6. Yojana (Ministry of Information & Broadcasting, GOI).

20MTC07

APPLIED MATHEMATICS
(For ECE/EEE Programs)

Instruction	3 L+1T Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Prerequisite: Students should have prior knowledge about circuit theory, coordinate systems and vector calculus.

Course Objectives:
This course aims to:
1. To learn the Laplace, Inverse Laplace Transform and Z-Transforms.
2. To learn the Z-Transform& inverse Z-Transform concepts
3. To form PDE and solve Linear and Non-Linear equations.
4. To find roots of equations, and Numerical solutions of Differential Equations.
5. To learn fitting of distribution and predicting the future values

Course Outcomes:
Upon completion of this course, students will be able to:
1. Find Laplace, Inverse Laplace and solution of engineering problems.
2. Find the solution of Difference Equation.
3. Understand the methods to find solution of linear and non-linear PDE and solution of wave equation.
4. Solve Non-Linear algebraic and transcendental equations and first order differential equations.
5. Understand the methods for analyzing the random fluctuations using probability distribution and also identify the importance of Principles of Least Squares approximations for predictions.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO \ PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	2	-	-	-	-	-	2	1	-	1	1	-	-
CO 2	3	2	2	-	-	-	-	-	2	-	-	1	1	-	-
CO 3	3	2	2	-	-	-	-	-	2	-	-	1	1	-	-
CO 4	3	2	2	1	1	-	-	-	2	1	-	1	1	-	-
CO 5	3	2	2	1	1	-	-	-	2	1	-	1	1	-	-

UNIT-I
Laplace Transforms: Laplace Transform of Elementary functions, Linearity property, First Shifting property, Change of scale property. Laplace Transform of Periodic functions, Transforms of derivatives, Transforms of integrals, Multiplication by and division by Evaluation of Integrals by Laplace Transforms. Inverse Laplace transforms of elementary functions, Inverse Laplace Transform by Method of partial fractions and Convolution theorem, Solutions of Ordinary Differential Equations by Laplace Transform method. Laplace transform of Unit step and Unit Impulse function.

UNIT-II
Z-Transforms: Z-transforms of standard functions, linearity property, damping rule, shifting theorems, multiplication by ‘n’, Initial and Final value theorems. Inverse Z-transforms of standard functions, Inverse Z-transform by Convolution theorem and partial fractions method. Z-transform application to difference equations.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

UNIT-III

Partial Differential Equations: Formation of Partial Differential Equations, Linear Equations of First Order (Lagrange's Linear Equations), Solution of First Order Non-linear Partial Differential Equation (Standard forms) and Charpits Method. Solutions by method of separation of variables, solution of one-dimensional wave equation and its applications.

UNIT-IV

Numerical Methods: Solution of Algebraic and transcendental equations by Bisection method, Regula-Falsi method Newton-Raphson method. Numerical Solutions of First Order Ordinary differential equations by Taylor's series method, Euler's method, Modified Euler's method and Runge-Kutta method of fourth order.

UNIT-V

Probability Distributions: Basic probability, Conditional probability, Bayes theorem. Random variable, discrete probability distribution and Continuous probability distribution. Expectation, properties of expectation, properties of variance. Poisson distribution, MGF and Cumulates of the Poisson distribution, Normal distribution, characteristics of Normal distribution MGF and CGF of Normal distribution, Areas under normal curve.

Text Books:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2017.
2. S.C. Gupta, V.K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.

Suggested Reading:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T, "Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2008.
3. S.S. Sastry, "Introductory methods of numerical analysis", PHI, 4th Edition, 2005

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20CSC06

BASICS OF DATA STRUCTURES
(Common for all Programs except CSE & IT)

Instruction	2 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

Prerequisite: Basic knowledge of programming language such as C or C++ is preferred (but not mandatory) and some mathematical maturity also will be expected.

Course Objectives:
This course aims to:
1. Basic linear and non-linear data structures.
2. Analyzing the performance of operations on data structures.
3. Different sorting and searching techniques and their complexities.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Identify various data structures, searching & sorting techniques and their applications.
2. Describe the linear and non-linear data structures, searching and sorting techniques.
3. Apply suitable data structures to solve problems.
4. Analyze various searching and sorting techniques.
5. Evaluate the linear and non-linear data structures.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO \ PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	1	3	3	1	-	-	-	-	2	3	3	2
CO 2	2	2	2	2	3	3	1	-	-	-	-	2	3	3	2
CO 3	2	2	2	1	3	2	1	-	-	-	-	2	3	3	2
CO 4	2	3	2	1	3	3	1	-	-	-	-	2	3	3	2
CO 5	2	2	2	1	3	2	1	-	-	-	-	2	3	3	2

UNIT-I
Introduction: Data Types, Data structures, Types of Data Structures, Operations, ADTs, Algorithms, Comparison of Algorithms- Complexity- Time and space tradeoff.
Recursion: Introduction, format of recursive functions, recursion Vs. Iteration, examples.

UNIT-II
Linked Lists: Introduction, Linked lists and types, Representation of linked list, operations on linked list, Comparison of Linked Lists with Arrays and Dynamic Arrays.

UNIT-III
Stacks and Queues: Introduction to stacks, applications of stacks, implementation and comparison of stack implementations. Introduction to queues, applications of queues and implementations, Priority Queues and applications

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Searching and Sorting: Linear searching, binary Searching, sorting algorithms- bubble sort, selection sort, quick sort, heap sort.

UNIT-IV

Trees: Definitions and Concepts, Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Representations of Trees, Tree Traversals, Binary search Tree.

UNIT-V

Graphs: Introduction, Applications of graphs, Graph representations, graph traversals, Minimal Spanning Trees.

Text Books:

1. Narasimha Karumanchi “Data Structures and Algorithms Made Easy”, Career Monk Publications, 2017
2. E.Horowitz ,S. Sahni and Susan Anderson-Freed, “Fundamentals of Data structures in C”, Silicon Press; 2nd Edition August 2007
3. Reema Thareja, “Data Structures using C”, Oxford, 2014

Suggested Reading:

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2. https://www.edx.org/course/foundations-of-data-structures
3. https://sites.google.com/site/merasemester/data-structures/data-structures-1#DS
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms
5. https://www.coursera.org/specializations/data-structures-algorithms

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20ECC01

ELECTROMAGNETIC THEORYAND TRANSMISSION LINES

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Students should have prior knowledge about circuit theory, coordinate systems and vector calculus.

Course Objectives:
This course aims to:
1. The mathematical fundamentals necessary for understanding the electromagnetic theory.
2. The electrostatics and magnetics along with Maxwell's equations for EM Waves.
3. The concepts of transmission lines

Course Outcomes:
Upon completion of this course, students will be able to:
1. Comprehend mathematically the coordinate systems and solve simple static Electromagnetic problems using various laws and theorems.
2. Understand Maxwell's equations in different forms (differential and integral) and apply them to diverse engineering problems.
3. Demonstrate the Electromagnetic wave properties with respect to different transmission mediums.
4. Predict the behavior of reflection and refraction of the waves in different mediums.
5. Estimate the transmission line properties, reflection, and matching concepts.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	1	1	2	2	1	1	3	3	2	2	3	2	1
CO 2	3	3	3	3	2	3	3	3	3	3	2	2	3	2	1
CO 3	3	3	3	3	2	3	3	1	2	3	2	2	3	2	1
CO 4	3	3	3	3	2	3	3	1	2	3	2	2	3	2	1
CO 5	3	3	3	3	2	3	3	2	2	2	2	2	3	2	1

UNIT-I

Electrostatics: Review of coordinate systems, Coulomb's Law, Electric field, Electric flux, Flux density and Gauss Law. Potential and Potential gradient. Laplace's and Poisson's equations. Current, Current Density and Continuity of current equation.

UNIT-II

Steady Magnetics and Time varying Fields: Biot-Savart's law, Ampere's law, Magnetic flux and Magnetic flux density. Gauss law for magnetic fields, Vector magnetic potential. Boundary conditions. Time varying fields, Maxwell equations: Integral form and Point form.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

UNIT-III

Electromagnetic Waves: Wave equations, Uniform plane waves in lossy and lossless medium. Skin Depth, Polarization, Instantaneous and average Poynting theorem and its applications. Reflection and Refraction of Plane Waves - Normal and Oblique Incidence for perfect Conductor and perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection.

UNIT-IV

Transmission Lines - I: Types, Parameters, Transmission Line Equations, Primary and Secondary Constants, Characteristics Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line. Impedance at any point on the transmission line.

UNIT-V

Transmission Lines - II: RF and UHF Lines, Open and Short circuit lines and their significance. Properties of $\lambda/2$, $\lambda/4$ and $\lambda/8$ Lines. Distortion and distortion less transmission line, Concept of loading of a transmission line, Campbell's formula. Reflection and VSWR. Matching: Quarter wave transformer, Single Stub matching. Smith chart and its applications.

Text Books:

1. Matthew N.O. Sadiku, "Elements of Electromagnetics", 7th Edition, New York Oxford University Press, 2018.
2. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics", 8th Edition, TMH, 2016.
3. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd Edition, PHI, 2000.

Suggested Reading:

1. John D. Ryder, "Networks Lines and Fields", 2nd Edition, PHI, 2015.
2. R.K. Shevgaonkar, "Electromagnetics Waves", Tata McGraw Hill India, 2005.
3. Sunil Bhooshan, "Fundamentals of Engineering Electromagnetics", Oxford University Press Publication, 2012.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20ECC02

ELECTRONIC DEVICES

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Students should have the knowledge of semiconductor fundamentals.

Course Objectives:
This course aims to familiarize:
1. The concepts of semiconductor devices like PN junction diode, Transistor, and special diodes.
2. The applications of diodes.
3. The various configurations, characteristics of transistors – BJT, JFET & MOSFET.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Demonstrate understanding of the characteristic behaviour of various electronic devices such as Diodes, Transistors etc.
2. Apply the acquired knowledge in the analysis of various diode and Transistor circuits.
3. Compare and Contrast the characteristics of BJT and FET in various configurations.
4. Evaluate the performance parameters of various diode circuits (rectifiers, clippers and clampers) and Transistor circuits.
5. Choose an appropriate electronic device for a specific application and discuss IC fabrication process.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	2	-	1	1	-	-	2	-	-	-	2	3	3	1
CO 2	2	3	1	3	2	-	-	2	-	-	-	2	3	3	1
CO 3	-	2	-	1	-	-	-	2	-	-	-	2	3	3	1
CO 4	2	3	-	3	2	-	-	2	-	-	-	2	3	3	1
CO 5	-	3	-	2	2	-	-	2	-	-	-	2	3	3	1

UNIT – I
Semiconductor Diode Characteristics:
The p-n junction Diode, Energy band diagram, Current equations, I-V characteristics, Temperature dependence, Diode resistance, Transition capacitance, Diffusion capacitance, Zener diode - Regulator, Schottky diode.

UNIT – II
Diode Applications:
Diode as a circuit element, Clipping and Clamping circuits, Clamping circuit theorem. Half wave, Full wave and Bridge Rectifiers - their operation, performance characteristics- ripple factor calculations, and analysis; Filters (L, C, LC and CLC filters).

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

UNIT – III

Bipolar Junction Transistor:

Construction and Operation of NPN and PNP transistor, current components and current flow in BJT, Modes of transistor operation, Early effect, BJT input and output characteristics of CB, CE, CC configuration, h-parameters, determination of h-parameters from transistor characteristics.

UNIT – IV

Field Effect Transistor: Junction Field Effect Transistor: Principle of Operation - the Pinch-off Voltage V_P, V-I Characteristics of JFET.

MOSFETs: Enhancement & Depletion mode MOSFETs, V-I characteristics, CMOS inverter.

UNIT – V

Special Purpose Semi-Conductor Devices: Elementary treatment of SCR- UJT- Diac- Triac - Tunnel diode. LED, Photodiode, Solar cell. Introduction to Integrated circuit fabrication process: Oxidation, Diffusion, Ion implantation, Photolithography, Etching, Metallization.

Text Books:

1. Millman and Halkias, "Electronic Devices and Circuits", 2nd Edition, McGraw Hill Publication, 2007.
2. Robert L. Boylestad, "Electronic Devices and Circuit Theory", 10th Edition, PHI, 2009.
3. S.K. Gandhi, "VLSI Fabrication Principles: Silicon and Gallium Arsenide", Wiley India Pvt. Ltd., New Delhi, 2nd Edition. 1994.

Suggested Reading:

1. Jacob Millman, Christos Halkias, Chetan Parikh, "Integrated Electronics", 2nd Edition, McGraw Hill Publication, 2009.
2. David Bell, "Fundamentals of Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2008.
3. Christian Piguet, "Low Power CMOS Circuits Technology, Logic Design and CAD Tools" 1st Indian Reprint, CRC Press, 2010.

20ECC03

NETWORK THEORY

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Knowledge on Elements of Electrical Engineering.

Course Objectives:
This course aims to:
1. Make understand the concepts of Electric Circuits, Network Theorems and the transients.
2. Make understand the concept of steady state and applying phasor analysis to AC circuits and analyzing magnetic coupled circuits.
3. Familiarize resonant circuits, two port network parameters, concept of Passive Filters and Network Synthesis.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Recall basics of electrical circuits with nodal and mesh analysis.
2. Illustrate electrical theorems for AC and DC Circuits.
3. Develop time domain and frequency domain analysis for circuits.
4. Analyze the electrical network and two port network parameters for different applications i.e., magnetic coupled circuits, Filters.
5. Synthesize different network functions using Foster and Cauer form.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	-	-	3	1	2	1	3	3	3	1	2	3
CO 2	2	2	3	1	-	1	-	1	1	1	2	2	2	2	1
CO 3	3	2	1	-	1	-	1	1	-	-	-	1	1	1	-
CO 4	2	2	1	2	-	1	2	-	1	1	1	1	1	1	1
CO 5	2	1	2	1	1	1	1	1	1	-	1	1	3	2	1

UNIT-I
Network Theorems: Network reduction techniques, Super Nodal and Super Mesh Analysis, Superposition, Thevenin's and Norton's theorems. Reciprocity, Maximum Power Transfer, Compensation, Millman's, Duality and Tellegen's Theorems using dependent and independent sources.

UNIT-II
Transients: Introduction, Study of initial conditions, DC transients RL, RC circuits, RLC circuits, Formulation of integral, differential equations. Circuit analysis using Laplace Transform and inverse Laplace Transform, Pole-Zero Plots, Zero Input Response, Zero State Response.

UNIT-III
Steady State Analysis of AC Circuits: Phasor and vector representations, impedance and admittance, Average power, Apparent Power, Complex Power, Power triangle.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Coupled circuits: Concept of self, mutual inductance, co-efficient of coupling, dot convention rules and analysis of simple circuits.

UNIT-IV

Frequency Domain Analysis: Concept of complex frequency, impedance and admittance functions, Series and parallel resonance, Q-factor, selectivity, bandwidth.

Two Port Networks: Z, Y, h, g, ABCD and Inverse ABCD parameters, equivalence of two port networks. Inter connection of two port networks.

UNIT-V

Filters: Introduction to Filters and classification of Filters (Low pass, High pass, Band pass and Band stop) and their design aspects.

Network Synthesis: Elements of circuit synthesis, Foster and Cauer forms of LC, RC and RL networks.

Text Books:

1. William H.Hayt, Jr.,Jck E. Kemmerly and Steven M.Durbin, "Engineering Circuit Analysis", 8th Edition, McGraw Hill, 2013.
2. Van Valkenberg M.E, "Network Analysis", PHI, New Delhi, 3rd Edition 2002.

Suggested Reading:

1. C. L. Wadhwai, "Network Analysis and Synthesis", 4th Edition, New Age Publications, 2016.
2. Sudhakar. A. and Shyam Mohan, S. P., "Circuits and Network", Tata McGraw Hill, New Delhi, 1994.

20ECC04

SIGNALS AND SYSTEMS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Knowledge of Differential and Integral Calculus.

Course Objectives:
This course aims to:
1. Know Signals and systems representation/classification and also the time and frequency domain analysis of continuous time signals with Fourier series, Fourier transforms and Laplace transforms.
2. Understand Sampling, time and frequency domain analysis of discrete time signals with DTFT and Z-Transforms.
3. Understand concepts of convolution and correlation integrals.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Classify signals, systems and analyse the signals using Transform techniques.
2. Evaluate signal characteristics using time and frequency domain analysis.
3. Assess the system stability and causality using ROC and Pole-Zero Plot.
4. Describe the sampling process and analyse the DT Signal/systems using DTF and Z-Transform.
5. Apply the Convolution and correlation concept for analysis of Signal and systems**.**

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO \ PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	1	-	1	-	-	-	-	2	-	2	2	1	1
CO 2	3	2	1	-	1	-	-	-	-	2	-	2	2	1	1
CO 3	3	2	1	-	1	-	-	-	-	2	-	2	2	1	1
CO 4	3	2	1	-	1	-	-	-	-	2	-	2	2	1	1
CO 5	3	2	1	-	1	-	-	-	-	2	-	2	2	1	1

UNIT-I
Continuous Time Signals: Introduction to signals, their representations and classification. Introduction to systems and their classifications, Orthogonality of signals, Complete set of mutually orthogonal signals and Harmonic signals.
Signal Representation: Trigonometric Fourier series, Exponential Fourier series, Existence and Convergence. Symmetry conditions, Amplitude and Phase spectra. Power Spectral Density.

UNIT-II
Fourier Transforms: The direct and inverse Fourier transforms, Existence, Frequency spectrum and properties of Fourier Transforms, Fourier Transform of singularity functions and periodic signals. Energy Spectral Density, characteristics of linear systems, Distortion less system, Phase delay and group delay.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

UNIT-III

Signal Representation by Generalized Exponentials: The Bilateral and unilateral Laplace transforms. Region of convergence and its properties. Properties of Laplace transform, Inverse Laplace transform, Laplace transform of periodic signals.

LTI System: Impulse response, System transfer function, Stability and Causality.

UNIT-IV

Discrete Time Signals: Sampling of continuous time signals. DTS representation. Discrete Time Fourier Transform and properties.

Z–Transform: The Direct Z-Transform, Region of convergence and its properties. S–Plane and Z–Plane correspondence, Z–Transform properties. Inverse Z–Transform.

Discrete LTI system: impulse response and system transfer function. Stability and Causality.

UNIT-V

Convolution: Continuous convolution, Graphical interpretation and its properties. Discrete convolution and its properties.

Correlation: Continuous Cross correlation, Auto correlation and properties. Discrete Cross correlation, Auto correlation and properties.

Text Books:

1. B. P. Lathi, “Signals, Systems and Communications”, BS Publications, 3rd Edition, 2008.
2. Simon Haykin, “Signals and Systems”, Wiley India, 5th Edition, 2009.

Suggested Reading:

1. Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawad, “Signals and Systems”, PHI 2nd Edition, 2015.
2. M. J. Robert, “Fundamentals of signals and systems”, McGraw Hill, 2008.
3. A. Rajeswari, “Signals and Systems”, Wiley India Pvt. Ltd, Publications 2021.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20CEM01

ENVIRONMENTAL SCIENCE

(Common to all Programs)

Instruction	2 L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	No Credits

Prerequisite: Basic knowledge of Science.

Course Objectives:

This course aims to:

1. Identify environmental problems arising due to over utilization of natural resources and understand the importance of use of renewable energy sources.
2. Become aware about the importance of eco system and interlinking of food chain.
3. Identify the importance of biodiversity in maintaining ecological balance.
4. Learn about various attributes of pollution management and waste management practices.
5. Contribute for capacity building of nation for arresting and/or managing environmental disasters.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Identify the natural resources and realise the importance of water, food, forest, mineral, energy, land resources and effects of over utilisation.
2. Understand the concept of ecosystems and realise the importance of interlinking of food chains.
3. Contribute for the conservation of biodiversity.
4. Suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
5. Follow the environmental ethics and contribute to the mitigation and management of environmental disasters.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	-	-	-	-	-	3	-	-	-	-	1	1	-	-
CO 2	1	-	-	-	-	-	2	1	-	-	-	1	1	-	-
CO 3	1	-	-	-	-	-	2	1	-	-	-	1	1	-	-
CO 4	1	-	-	-	-	1	2	1	-	-	-	1	1	-	-
CO 5	1	-	-	-	-	1	2	1	-	-	-	1	1	-	-

UNIT-I

Environmental Studies: Definition, Scope and importance, need for public awareness.

Natural resources: Use and over utilization of Natural Resources - Water resources, Food resources, Forest resources, Mineral resources, Energy resources, Land resources.

UNIT-II

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, role of producers, consumers and decomposers, energy flow in an ecosystem, food chains, food webs, ecological pyramids, Nutrient cycling, Bio-geo chemical cycles, Terrestrial and Aquatic ecosystems.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

UNIT-III

Biodiversity: Genetic, species and ecosystem biodiversity, Bio-geographical classification of India, India as a Mega diversity nation. Values of biodiversity, hot-spots of biodiversity, threats to biodiversity, endangered and endemic species of India, methods of conservation of biodiversity.

UNIT-IV

Environmental Pollution: Cause, effects and control measures of air pollution, water pollution, marine pollution, soil pollution, noise pollution and Solid waste management, nuclear hazards

Environmental Legislations: Environment protection Act, Air, Water, Forest & Wild life Acts, issues involved in enforcement of environmental legislation, responsibilities of state and central pollution control boards.

UNIT-V

Social issues and the environment: Water conservation methods: Rain water harvesting and watershed management, Environmental ethics, Sustainable development and Climate change: Global warming, Ozone layer depletion, forest fires, and Contemporary issues.

Text Books:

1. Y. Anjaneyulu, "Introduction to Environmental Science", B S Publications, 2004.
2. Suresh K. Dhameja, "Environmental Studies", S. K. Kataria& Sons, 2009

Suggested Reading:

1. C. S. Rao," Environmental Pollution Control Engineering", Wiley, 1991.
2. S. S. Dara, "A Text Book of Environmental Chemistry & Pollution Control", S. Chand Limited, 2006.

20CSC07

BASICS OF DATA STRUCTURES LAB
(Common for all Programs except CSE & IT)

Instruction	2 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Prerequisite: Any Programming Language.

Course Objectives:
This course aims to familiarize:
1. Design and construct simple programs by using the concepts of Data structures as abstract data type.
2. To have a broad idea about how efficiently pointers can be used in the implement of data structures.
3. To enhance programming skills while improving their practical knowledge in data structures.
4. To strengthen the practical ability to apply suitable data structure for real time applications.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Implement the abstract data type.
2. Demonstrate the operations on stacks, queues using arrays and linked lists.
3. Apply the suitable data structures including stacks, queues to solve problems.
4. Analyse various searching and sorting techniques.
5. Choose proper data structures, sorting and searching techniques to solve real world problems.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO \ PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1	-	1	2	2	0	-	-	-	-	1	3	3	2
CO 2	2	2	1	2	3	2	1	-	-	-	-	1	3	3	2
CO 3	2	2	2	2	3	2	1	-	-	-	-	1	3	3	2
CO 4	2	3	2	3	3	3	1	-	-	-	-	2	3	3	2
CO 5	2	2	2	3	3	3	1	-	-	-	-	2	3	3	2

List of Experiments:

1. Implementation of operations on arrays
2. Implementation of Stack.
3. Implementation of Queue.
4. Implementation of basic operations on Single Linked List.
5. Implementation of Searching techniques.
6. Implementation of Sorting Techniques
7. Case study like Banking System, Students Marks Management, Canteen Management, Library Management etc.,

Suggested Reading:

1. Brian W Kernighan, Dennis Ritchie, C Programming Language, PH PTR, 2nd Edition.
2. Richard M Reese, Understanding and Using C Pointers, O`Reily, 2013.

Weblinks:

1. https://nptel.ac.in/courses/106102064/
2. https://www.udemy.com/algorithms-and-data-structures-in-python/

20ECC05

ELECTRONIC DEVICES LAB

Instruction	2 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Prerequisite: Students have the knowledge of semiconductor fundamentals.

Course Objectives:
This course aims to familiarize:
1. The V-I characteristics of diodes and special semiconductor devices.
2. The design and performance evaluation of various diodes as rectifiers.
3. The characteristics of transistor in various configurations.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Demonstrate the characteristic behaviour of PN junction diode, Zener diode and special purpose semiconductor diodes.
2. Design various non-linear wave shaping circuits using diodes for a given specification.
3. Analyse the behaviour of non-linear wave shaping circuits using diodes.
4. Examine the characteristics of BJT and FET in various configurations.
5. Evaluate and compare the significant parameters obtained from the characteristics of BJT and FET.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO \ CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	-	1	2	-	-	2	2	2	2	2	3	3	2
CO 2	2	2	-	1	2	-	-	2	2	2	2	2	3	3	2
CO 3	2	2	-	1	2	-	-	2	2	2	2	2	3	3	2
CO 4	2	2	-	1	2	-	-	2	2	2	2	2	3	3	2
CO 5	2	2	-	1	2	-	-	2	2	2	2	2	3	3	2

List of Experiments:

1. V-I Characteristics of Silicon and Germanium diodes and measurement of static and dynamic resistances.
2. Zener diode characteristics and its application as voltage regulator.
3. Clipping and Clamping Circuits.
4. Design, realization and performance evaluation of half wave rectifiers without filters and with filters (capacitor filter and π - section filter).
5. Design, realization and performance evaluation of full wave rectifiers without filters and with C & π section filters.
6. Plotting the characteristics of BJT in Common Base configuration and measurement of h-parameters.
7. Plotting the characteristics of BJT in Common Emitter configuration and measurement of h-parameters.
8. Plotting the characteristics of BJT in Common Collector configuration and measurement of h-parameters.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

9. Plotting the characteristics of JFET in CS configurations and measurement of Transconductance and Drain resistance.
10. Characteristics of special semi-conductor devices-UJT and SCR.
11. Characteristics of LED and photo diode.
12. Characteristics of Tunnel diode.
13. **Structured Enquiry:** Design a switching circuit using BJT and JFET and analyse its operation.
14. **Open ended Enquiry:** Design a LED running lights circuit for vehicles to avoid accidents in fog/rain condition.

Note:

1. Wherever possible, Analysis and design of circuits shall be carried out using simulation tools.
2. A minimum of 12 experiments should be performed.

Suggested Reading:

1. Robert Diffenderfer, "Electronic Devices Systems and Applications", Cengage Learning India Private Limited, 2010.
2. Paul B. Zbar, Albert P. Malvino, Michael A. Miller, "Basic Electronics, A Text - Lab Manual", 7th Edition, TMH 2001.
3. Mahesh Jain, "Practical semiconductors data manual No.3", BPB Publications, 1981.
4. Bharath Electronics Ltd., "Semiconductors data manual", IEC Publication 134, 1969.

20ECC06

ELECTRONIC WORKSHOP AND NETWORKS LAB

Instruction	2 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Prerequisite: Knowledge of basic Electrical components, circuits and equipment.

Course Objectives:
This course aims to:
1. Understand the basic Concepts of Electric Circuits and equipment Like CRO, Multimeter and LCR–Q meter
2. Verify network theorems.
3. Analyze Resonant circuits, Attenuators and passive filters.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Identify and measure the passive and active components using electronic equipment.
2. Apply Network theorems to AC and DC Circuits.
3. Determine and analyze two port network parameters.
4. Design and verification of attenuator and filters.
5. Simulation of different networks and circuits using the simulation software.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO \ PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	-	-	-	-	1	1	-	-	-	-	1	-	1	1
CO 2	3	3	3	2	2	2	1	1	1	2	1	2	1	3	2
CO 3	1	2	-	-	1	1	1	-	-	-	-	1	-	1	1
CO 4	2	2	1	1	-	1	1	1	1	1	1	-	1	1	1
CO 5	1	-	-	-	1	-	-	-	-	-	-	1	-	-	-

List of Experiments:

1. Study of RLC components, Bread board, Regulated power supply, Function generator, CRO Measurement of R, L, C components using color code, multimeter and LCR - Q Meter.
2. Practice of Soldering and de -soldering for simple circuits on single and Multi-Layer PCBs.
3. Verification of Superposition theorem and Tellegen’s theorem.
4. Verification of Maximum power transfer theorem. Verification of Reciprocity theorem.
5. Verification of Compensation theorem and Millman’s theorem. Verification of Transient Response in RC, RL Circuits.
6. Design and Verification of Series Resonance.
7. Determination of two-port network parameters (Z, Y, h, T).
8. Design and Verification of Constant-K low-pass filter.
9. To sense and measure ambient temperature by Pmod TMP3 sensor with My RIO kit.
10. **Structured Enquiry:** Design and Verification of Parallel Resonance.
11. **Open ended Enquiry:** Design and Verification of Constant-K high-pass filter.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Note: Experiments are to be simulated by using any simulation software.

Suggested Reading:

1. Thomas Petruzzellis, "Build Your Own Electronics Workshop", McGraw-Hill Companies, Inc., 2005.
2. A.M. Zungeru, J.M. Chuma, M. Mangwala, L.K. Ketshabetswe, "Handbook of Laboratory Experiments in Electronics and Communication Engineering", Vol. 2, 1st Edition, Notion press, 2017.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20ECI01

MOOCs/Training/Internship

Instruction/Demonstration/Training	3-4 Weeks/90 Hours
Duration of Semester End Presentation	--
Semester End Evaluation	60 Marks
Mid Term Evaluation	40 Marks
Credits	2

Prerequisite: Knowledge of basic Sciences and Engineering Sciences

Course Objectives:
This course aims to:
1.
2.
3.

Course Outcomes:
Upon completion of this course, students will be able to:
1.
2.
3.
4.
5.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1															
CO 2															
CO 3															
CO 4															
CO 5															

For further information refer Internship document

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20ECC07

ANALOG CIRCUITS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Student should have knowledge on Electronic Devices and Network Analysis.

Course Objectives:
This course aims to:
1. The Understand the applications of BJT & FET as a switch and an amplifier.
2. Analysis of BJT & FET in various configurations using small signal equivalent models and their frequency response.
3. Know concept of multistage, feedback amplifiers, and power amplifier and their analysis.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Recall and relate the knowledge of BJT and FET behavior in the design of various biasing and amplifier circuits.
2. Apply low and high frequency models of transistor in the analysis of single stage and multistage amplifiers.
3. Design and analyze amplifier and oscillator circuits.
4. Compare and Contrast different types of biasing, Multistage, Feedback and Power amplifiers.
5. Interpret a given analog circuit and evaluate its performance parameters by applying acquired knowledge.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	3	-	-	-	-	-	-	-	1	3	2	1
CO 2	3	3	3	2	-	-	-	-	-	-	-	1	3	2	1
CO 3	3	3	3	3	-	-	-	-	-	-	-	1	3	2	1
CO 4	3	3	3	2	-	-	-	-	-	-	-	1	3	2	1
CO 5	3	2	1	2	-	-	-	-	-	-	-	1	3	2	1

UNIT-I
Transistor Biasing: BJT biasing techniques, stability factors, Bias compensation techniques, Thermal runaway, Thermal stability, BJT as an amplifier and as a switch. JFET biasing-zero current drift biasing, biasing of JFET, FET as an amplifier and as a switch.

UNIT-II
Single Stage Amplifiers: Analysis of BJT circuits using h-parameters in CB, CE and CC configurations - their comparison (approximate and exact analysis), Millers Theorem & its duality – application circuits. Analysis of FET circuits using small-signal model for CS and CD configurations - their comparison. Frequency response of BJT and FET Amplifiers.

UNIT-III
Multistage amplifiers: Coupling schemes - RC coupling, Transformer coupling and Direct coupling; Analysis of CE-CE, CE-CB, CE-CC, CC-CC – Darlington pair.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Transistor at high frequencies: Hybrid π CE transistor model, Hybrid π Conductances and Capacitances, CE short circuit current gain, Current gain with resistive load.

UNIT-IV

Feed Back Amplifiers: The feedback concept, General characteristics of negative feedback amplifier, Effect of negative feedback on input and output impedances. Method of analysis of feedback amplifiers, Analysis of Voltage series, voltage shunt, current series and current shunt feedback amplifiers.

Oscillators: Positive feedback and conditions for sinusoidal oscillations, RC oscillator, LC oscillator, Crystal oscillator, Amplitude and frequency stability of oscillator.

UNIT-V

Large Signal Amplifies & Voltage Regulators: Large Signal Amplifiers: BJT as large signal audio amplifiers, Classes of operation, Harmonic distortion, Class A resistive coupled and transformer coupled amplifiers, Class-B Push-pull and complementary symmetry amplifiers, Class AB operation. power dissipation and efficiency calculations. Heat sinks.

Voltage Regulators: Transistor series and shunt voltage regulators.

Text Books:

1. Jacob Millman, Christos Halkias, Chetan Parikh, "Integrated Electronics – Analog and Digital Circuits and Systems", 2nd Edition, McGraw Hill Publication, 2010.
2. Robert L. Boylestad, "Electronic Devices and Circuit Theory", 10th Edition, PHI, 2009.

Suggested Reading:

1. David Bell, "Fundamentals of Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2008.
2. Millman and Halkias, "Electronic Devices and Circuits" 2nd Edition, McGraw Hill Publication, 2007.
3. Donald Schilling, Charles Belove, Tuvia Apelewicz Raymond Saccardi, "Electronic Circuits: Discrete and Integrated", TMH, 3rd Edition, 2012.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20ECC08

ANALOG COMMUNICATION

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: A prior knowledge of signals and systems is required.

Course Objectives:
This course aims to:
1. Introduce the fundamentals of analog communication.
2. Provide the design details of various transmitters and receivers used in analog communication system.
3. Involve the students in analyzing performance of communication system by estimating noise.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Understand the various linear and nonlinear modulation schemes.
2. Design various transmitters and receivers.
3. Assess a random signal by computing various statistical properties.
4. Evaluate the performance of analog communication system through the estimation of noise.
5. Infer the concepts of various pulse modulation schemes.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	1	0	2	3	3	1	3	2	2	3	2	2
CO2	3	3	3	3	0	3	3	3	1	3	3	3	3	2	2
CO3	3	3	3	3	0	3	3	0	0	3	3	3	3	1	1
CO4	3	3	3	3	0	3	3	3	1	3	3	3	3	2	2
CO5	3	3	3	1	0	2	3	3	1	3	2	2	3	2	2

UNIT – I
Linear Modulation Schemes:
Need for Modulation, Double Side Band Suppressed Carrier Modulation, Balanced Modulator, Coherent Detector and Costas Detector. Conventional Amplitude Modulation, Phasor Diagram of AM, Switching Modulator, Envelope Detector. Hilbert Transform and its Properties. Single Side Band Modulation. Vestigial Side Band Modulation.

UNIT – II
Non-Linear Modulation Schemes:
Angle Modulation, Frequency Modulation and Phase modulation, Concept of Instantaneous Phase and Frequency. Types of FM modulation: Narrow Band FM and Wide Band FM. FM Spectrum in Terms of Bessel Functions. Phasor Diagram of NBFM. Direct and Indirect (Armstrong's) methods of FM Generation. Foster–Seeley Discriminator for FM Detection. Introduction to PLL.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

UNIT – III

Transmitters and Receivers:

High Level and Low Level AM Transmitters. Principle and Operation of Tuned Radio Frequency receiver and Super Heterodyne Receivers. Selection of RF Amplifier. Choice of Intermediate Frequency. Image Frequency and its Rejection Ratio, Receiver Characteristics: Sensitivity, Selectivity, Fidelity. Double Spotting, Pre-emphasis and De-emphasis.

UNIT – IV

Random Variables and Random Process: Concept of random variable, Uniform Random Variable, Gaussian Random Variable. Random Process: Concept of random process, Stationarity and Ergodicity, Auto Correlation and its Properties, Power Spectral Density and its Properties. Linear System with Random inputs: Random Signal Response of Linear System, Auto Correlation of Response.

UNIT – V

Noise: Thermal Noise. White Noise. Noise Temperature. Noise in Two-Port Network: Noise Figure, Equivalent Noise Temperature and Noise Bandwidth. Noise Figure and Equivalent Noise Temperature for Cascaded Stages. Figure of Merit Calculations for AM, DSB-SC and SSB systems. Pulse Analog Modulation Schemes: PAM, PWM and PPM. Generation and detection of PAM, PWM and PPM.

Text Books:

1. Simon Haykin, "Communication Systems",2nd Edition, Wiley India,2011.
2. Herbert Taub, Donald L. Shilling & Goutam Saha, "Principles of Communication Systems", 3rd Edition, TMH, 2008.
3. Peyton Z. Peebles JR., "Probability Random Variables and Random Signal Principles", Tata McGraw Hill, 4th Edition, 2002.

Suggested Reading:

1. Singh, R.P. and Sapre, S.D., "Communication Systems", TMH, 2007.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20ECC09

ANTENNAS AND WAVE PROPAGATION

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Students should have prior knowledge about Electromagnetics theory and Maxwell's equations.

Course Objectives:
This course aims to:
1. The basic principles of an antenna and its parameters for characterizing its performance.
2. The fundamental concepts of various types of antennas, arrays for customizing the pattern parameters.
3. The propagation behavior of the radio wave in both troposphere and ionosphere.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Understand the basic parameters of an antenna.
2. Extend current distribution concept in order to estimate the field patterns.
3. Appraise the concepts of broad side and end fire arrays.
4. Understand the working principle and characteristics of various antennas.
5. Study the behavior of radio waves in various modes of wave propagation.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO \ PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	1	2	1	1	1	1	1	1	2	2	3	2	1
CO 2	2	2	3	3	2	3	3	3	2	2	2	2	3	2	1
CO 3	2	2	2	2	2	2	2	2	1	1	1	2	3	2	1
CO 4	3	3	3	2	2	3	3	3	3	3	3	2	3	2	1
CO 5	2	3	1	2	2	2	2	2	2	1	2	2	3	2	1

UNIT-I
Antenna Basics: Principles of radiation, Retarded potential, Isotropic, Directional and Omni- directional radiators. Basic antenna parameters: Radiation patterns, radiation intensity, far field, near field, gain and directivity, Antenna Polarization, effective aperture area and efficiency. Point sources, current distribution, Friis transmission formula.

UNIT-II
Antenna Analysis: Analysis of Infinitesimal dipole, Half-wave dipole, quarter wave monopole, loop antenna and their far field patterns, calculation of radiation resistance and directivity.

UNIT-III
Antenna Arrays: Concept of Antenna Array. Uniform linear array: Broadside and End-fire arrays Calculation of Directivity and Beamwidth. Two element array of Infinitesimal dipoles. Qualitative treatment of nonlinear arrays: Binomial and Chebyshev arrays.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

UNIT-IV

Practical Antennas: Qualitative treatment of Helical Antennas: Normal and Axial mode patterns, wideband characteristics. Characteristics, radiation principles and applications of Rhombic Antenna, Yagi-Uda antenna, Parabolic antenna system, Log-Periodic antenna. Microstrip antennas: Radiation mechanism, different types, advantages and disadvantages. Design of rectangular Microstrip antenna.

UNIT-V

Wave Propagation: Ground wave propagation, Space and Surface waves, Tropospheric refraction and reflection, Duct propagation. Sky wave propagation: Critical frequency, Maximum Usable Frequency (MUF) and Skip distance, Line of sight propagation.

Text Books:

1. Constantine A. Balanis, "Antenna Theory: Analysis and Design", 4th Edition, John Wiley, 2016.
2. Edward C. Jordan and Kenneth G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd Edition, PHI, 2001.

Suggested Reading:

1. John D. Krauss, Ronald J. Marhefka and Ahmad S. Khan, "Antennas and Wave Propagation", 4th Edition, TMH, 2010.
2. Dennis Roody and John Coolen, "Electronic Communications", 4th Edition, Prentice Hall, 2008.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20ECC10

CONTROL SYSTEMS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: The student is expected to have knowledge of Laplace transform and electrical and electronic circuits.

Course Objectives:
This course aims to:
1. Introduce various control systems (Open and closed loop) and their equivalent mathematical models using block diagrams, signal flow graphs and state space techniques.
2. Analyze the time and frequency response of control system to access the transient response and steady state response.
3. Study different types of stability concepts in control systems
4. Design various controllers and compensators to improve the system dynamic performance.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Distinguish the closed-loop control systems from open-loop control systems and develop mathematical models in time domain (differential equations, state equations) and S-domain (Transfer function using Laplace transform).
2. Evaluation of transfer function from block diagram and signal flow graph by using block diagram reduction techniques and Mason gain formula, respectively.
3. Investigate the stability of control system via Routh-Hurwitz criteria, Root-locus method and Nyquist Plot.
4. Utilize standard test signals to analyze the time response of first and second-order control systems and frequency response analysis of the control system.
5. Design and develop various controllers and compensators to control the steady state error, stability and transient response.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO \ PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	1	1	-	1	1	-	-	-	-	1	3	2	2
CO 2	3	3	1	2	1	1	1	-	-	-	-	1	3	2	2
CO 3	3	3	3	3	2	1	1	-	-	-	-	1	3	2	2
CO 4	3	3	2	3	2	1	1	-	-	-	-	1	3	2	2
CO 5	3	3	3	2	1	1	1	-	-	-	-	1	3	2	2

UNIT-I
Control System Fundamentals: Classification of control systems, Open and Closed Loop control systems, Block diagram reduction and signal flow graphs, Mathematical modelling of a Mechanical system and conversion into Electrical system.

UNIT-II
Time Response Analysis: Transfer function and Impulse Response, Types of Inputs, Transient Response of first and second Order System with different inputs, Time domain Specifications. Types of Systems, static error coefficients, error series, PD, PI and PID controllers.

UNIT-III

Routh-Hurwitz criteria for stability. Root Locus Techniques, Analysis of typical systems using root locus techniques, Effect of location of roots on system response.

UNIT-IV

Frequency Response Analysis: Frequency domain specifications, bode plot, Principle of Argument, Nyquist plot and stability criterion, Gain and Phase Margins from the Bode and Nyquist diagrams. Lead and Lag compensators.

UNIT-V

State Space Analysis: Concept of State, State Variable, State vector and State space. State space representations of linear time invariant systems, State transition matrix, Solution of state equation, Controllability, Observability and Design of control systems using state variable feedback.

Text Books:

1. I. J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International Publishers, 5th Edition 2012.
2. Benjamin C. Kuo, “Automatic Control Systems”, 7th Edition, PHI, 2010.

Suggested Reading:

1. K. Ogata, “Modern Control Engineering”, EEE, 5th Edition, PHI, 2003.
2. Richard C. Dorf and Robert H. Bishop, “Modern Control Systems”, 11th Edition Pearson, 2008.
3. Gopal Madan, “Digital control engineering” 1st Edition, New age publishers, 2008.

HEAD
DEPARTMENT OF EEE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20ECC11

DIGITAL SYSTEM DESIGN

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Knowledge of Electronic device concepts.

Course Objectives:
This course aims to:
1. Learn various techniques for logic minimization.
2. Comprehend the concepts of various combinational circuits and sequential circuits.
3. Learn the Language fundamentals of Verilog HDL, also able to simulate and synthesize various digital modules.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Understand the basic concepts related to digital system design.
2. Design the combinational and sequential circuits.
3. Analyze the behavior of the digital system design.
4. Develop the digital system using various Verilog HDL modeling.
5. Apply the design concepts of digital system using Verilog HDL.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	3	2	1	1	-	-	-	-	-	3	2	2
CO 2	3	2	2	3	2	1	1	1	-	-	1	1	3	3	2
CO 3	3	3	3	3	2	1	1	1	1	-	1	2	3	2	2
CO 4	3	3	3	3	2	2	1	2	2	1	1	2	3	2	3
CO 5	3	3	3	3	2	2	1	2	2	1	1	2	3	2	2

UNIT-I
Logic Simplification and Combinational Logic Design: Number system representation and conversion, Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Quine –McCluskey Tabular Minimization Method. Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

UNIT-II
Introduction to Combinational Design: Binary Adders, Subtractors and BCD adder, Code converters Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display, Decoders, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Comparators Implementations of Logic Functions using Decoders and Multiplexers.

UNIT-III
Sequential Logic Design: Latches, Flipflops, Difference between latch and flipflop, types of flipflops like S-R, D, T JK and Master-Slave JK FF, Edge triggered FF, flipflop conversions, setup and hold times, Ripple and Synchronous counters, Shift registers, Finite state machines, Design of synchronous FSM, Algorithmic State Machines charts.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

UNIT-IV

Introduction to HDLs: VLSI Design flow, Basic Concepts of Verilog HDL, Data Types, System Tasks and Compiler Directives. Gate Level Modelling: Gate Types and Gate Delays. Dataflow Modeling: Continuous Assignment and Delays. Design of Stimulus Block.

UNIT-V

Behavioral Modeling: Structured Procedures, Procedural Assignments, Timing control, Conditional statements, Sequential and Parallel Blocks. Switch level Modelling. Introduction to tasks and functions. Design of Mealy and Moore state models using Verilog HDL. Introduction to Logic Synthesis. Concept of Programming using FPGA.

Text Books:

1. Morris Mano M. and Michael D.Ciletti, "Digital Design, With an Introduction to Verilog HDL", 5th Edition, Pearson 2013.
2. Samir Palnitkar, "Verilog HDL, A guide to Digital design and synthesis", 2nd Edition, Pearson Education, 2008.

Suggested Reading:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th Edition, 2009.
2. Thomas L. Floyd, "Digital Fundamentals", Pearson, 11th Edition, 2015.

20EGM03

UNIVERSAL HUMAN VALUES II: UNDERSTANDING HARMONY
(Common for all Programs)

Instruction	2 L+1T Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	3

Prerequisite: Knowledge of UNIVERSAL HUMAN VALUES I

Course Objectives:
This course aims to:
1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society, and nature/existence.
2. Understanding (or developing clarity) of the harmony in human being, family, society, and nature/existence.
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
3. They would have better critical ability.
4. They would also become sensitive to their commitment towards what they have understood (human values, human relationship, and human society).
5. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

The course has 28 lectures and 14 practice sessions:

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	-	-	1	-	-	1	-	-	1	-	-	1	-	-	-
CO 2	-	-	1	-	-	1	1	-	1	-	1	1	-	-	-
CO 3	--	-	-	-	-	1	-	-	-	1	-	-	-	-	-
CO 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 5	-	-	-	1	-	-	-	-	1	1	1	1	-	-	-

UNIT-I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education
- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation-as the process for self-exploration.
- Continuous Happiness and Prosperity- A look at basic Human Aspirations.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

- Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority.
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current Scenario.
- Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT-II

Understanding Harmony in the Human Being - Harmony in Myself

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'.
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility.
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer).
- Understanding the characteristics and activities of 'I' and harmony in 'I'.
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.
- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

UNIT-III

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship.
- Understanding the meaning of Trust; Difference between intention and competence.
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship.
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co -existence as comprehensive Human Goals.
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

UNIT-IV

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature.
- Interconnectedness and mutual fulfilment among the four orders of nature - recyclability and self-regulation in nature.
- Understanding Existence as Co-existence of mutually interacting units in all - pervasive space.
- Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT-V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values.
- Definitiveness of Ethical Human Conduct.
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order.
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems.
- Strategy for transition from the present state to Universal Human Order:

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers.
b. At the level of society: as mutually enriching institutions and organizations.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Mode of Conduct (L-T-P-C 2-1-0-3)

- Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions.
- While analysing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.
- In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self- exploration.
- Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.
- Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practicals are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignments and/or activities are included.
- The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

Assessment:

This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self- assessment, peer assessment etc. will be used in evaluation.
Example:
Assessment by faculty mentor: 10 marks
Self-assessment/Assessment by peers: 10 M
Socially relevant project/Group Activities/Assignments: 20 marks
Semester End Examination: 60 marks
The overall pass percentage is 40%. In case the student fails, he/she must repeat the course.

Text Books:

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1 The teacher's manual
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:

1. A Nagaraj Jeevan Vidya: Ek Parichaya, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. Cecile Andrews, Slow is Beautiful
4. Gandhi - Romain Rolland (English)
5. Dharampal, "Rediscovering India"
6. E. FSchumacher. "Small is Beautiful."
7. J. C. Kumarappa "Economy of Permanence"
8. Pandit Sunderlal "Bharat Mein Angreji Raj"
9. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
10. 10.Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
11. Maulana Abdul Kalam Azad, India Wins Freedom -
12. Vivekananda - Romain Rolland (English)
13. The Story of Stuff (Book).

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20EGM01

INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES
(Common to all Programs)

Instruction	2 L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	No Credits

Prerequisite: Knowledge of social studies.

Course Objectives:
This course aims to:
1. History of Indian Constitution and how it reflects the social, political, and economic perspectives of the Indian society.
2. Growth of Indian opinion regarding modern Indian intellectuals constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. Various Organs of Governance and Local Administration.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Understand the making of the Indian Constitution and its features.
2. Identify the difference among Right To equality, Right To freedom and Right to Liberty.
3. Analyze the structuring of the Indian Union and differentiate the powers between Union and States.
4. Distinguish between the functioning of Lok Sabha and Rajya Sabha while appreciating the importance of Judiciary.
5. Differentiate between the functions underlying Municipalities, Panchayats and Co-operative Societies.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO \ PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	-	-	-	-	-	-	-	-	-	-	-		-	-	-
CO 2	--	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 5	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-

UNIT-I
Constitution of India: Constitutional history-Govt of India Act 1909, 1919 and 1935, Constitution making and salient features. Directive Principles of State Policy - Its importance and implementation.

UNIT-II
Scheme of the Fundamental Rights & Duties: The Fundamental Rights - To Equality, to certain Freedom under Article 19, to Life and Personal Liberty Under Article 21. Fundamental Duties - the legal status.

UNIT-III
Union Government and its Administration - Structure of the Indian Union: Federalism, distribution of legislative and financial powers between the Union and the States. Parliamentary form of government in India: Executive-President's role, power and position.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

UNIT-IV

Legislature and Judiciary: Central Legislature-Powers and Functions of Lok Sabha and Rajya Sabha.
Judiciary: Supreme Court-Functions, Judicial Review and Judicial Activism.

UNIT-V

Local Self Government - District's Administration Head (Collector): Role and Importance.
Municipalities: Introduction, Mayor and Role of Elected Representative, CEO of Municipal Corporation.
Panchayati Raj: Introduction, Zilla Panchayat, Elected Officials and their roles, CEO Zilla Panchayat: Position and Role. Block level: Organizational Hierarchy (Different departments). Village level: Role of Elected and Officials.

Text Books:

1. Indian Government & Politics, Ed Prof V Ravindra Sastry, Telugu Akademy, 2nd Edition, 2018.
2. Indian Constitution at Work, NCERT, First Edition 2006, Reprinted- January 2020.

Suggested Reading:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, Framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edition., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Online Resources:

1. http://www.nptel.ac.in/courses/103107084/Script.pdf

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20EGM02

INDIAN TRADITIONAL KNOWLEDGE
(Common to all Programs)

Instruction	2 L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	No Credits

Prerequisite: Knowledge on Indian Culture.

Course Objectives:
This course aims to:
1. To get a knowledge in Indian Culture
2. To know Indian Languages and Literature and the fine arts in India
3. To explore the Science and Scientists of Medieval and Modern India.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Understand philosophy of Indian culture.
2. Distinguish the Indian languages and literature.
3. Learn the philosophy of ancient, medieval, and modern India.
4. Acquire the information about the fine arts in India.
5. Know the contribution of scientists of different eras.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	--	-	1	-	-	1	-	-	-	-	-	-	-	-	-
CO 2	--	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 5	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-

UNIT-I
Culture and Civilization: Culture, civilization and heritage, general characteristics of culture, importance of culture in human literature, Cultural diversity, Aesthetics, Women seers, Indus culture, Indian cuisine, Martial arts.

UNIT-II
Education system: Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India.

UNIT-III
Linguistic Wealth: Indian Languages and Literature: the role of Sanskrit, Paleography, Significance of scriptures to current society, Indian semantics and lexicography, Bhakti literature, Darsanas.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

UNIT-IV

Science and Logic: Helio-centic system, Sulbasutras, Katapayadi, Hindu calendar, 6 pramanas in Indian logic, Scientific method applied to therapeutics, Fallacies, Tarka – Induction &Deduction, Ayurvedic biology, Definition of health.

UNIT-V

Behavioral Modeling: Structured Procedures, Procedural Assignments, Timing control, Conditional statements, Sequential and Parallel Blocks. Switch level Modelling. Introduction to tasks and functions. Design of Mealy and Moore state models using Verilog HDL. Introduction to Logic Synthesis. Concept of Programming using FPGA.

Text Books:

1. Kapil Kapoor, Text and Interpretation: The Indian Tradition, ISBN: 81246033375, 2005.
2. Samskrita Bharati, Science in Samskrit, ISBN-13: 978-8187276333, 2007.
3. Satya Prakash, Founders of sciences in Ancient India, Govindram Hasanand, ISBN-10: 8170770009, 1989.
4. Brajendranath Seal, The Positive Sciences of the Ancient Hindus, Motilal Banarasidass, ISBN-10: 8120809254, 1915.

Suggested Reading:

1. Swami Vivekananda, *Caste, Culture and Socialism*, Advaita Ashrama, Kolkata ISBN-9788175050280.
2. Swami Lokeswarananda, *Religion and Culture*, Advaita Ashrama, Kolkata ISBN-9788185843384.
3. Kapil Kapoor, *Language, Linguistics and Literature: The Indian Perspective*, ISBN-10: 8171880649, 1994.
4. Karan Singh, *A Treasury of Indian Wisdom: An Anthology of Spiritual Learn*, ISBN: 978-0143426158, 2016.
5. Swami Vivekananda, *The East and the West*, Advaita Ashrama, Kolkata 9788185301860.
6. Srivastava R.N., *Studies in Languages and Linguistics*, Kalinga Publications ISBN-13: 978-8185163475.
7. Subhash Kak and T.R.N. Rao, Computation in Ancient India, Mount Meru Publishing ISBN-1988207126.
8. R.N Misra, *Outlines of Indian Arts Architecture, Painting, Sculpture, Dance and Drama*, IIAS, Shimla & Aryan Books International, ISBN 8173055149.
9. S. Narain, *Examinations in ancient India*, Arya Book Depot, 1993.
10. M. Hiriyanna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, ISBN-13: 978-8120810990, 2014.
11. Ravi Prakash Arya, Engineering and Technology in Ancient India, Indian Foundation for Vedic Science, ISBN-10: 1947593072020.

SWAYAM / NPTEL:

1. History of Indian Science and Technology - https://onlinecourses.swayam2.ac.in/arp20_ap35/preview
2. Introduction to Ancient Indian Technology – https://onlinecourses.nptel.ac.in/noc19_ae07/preview
3. Indian Culture & Heritage - https://onlinecourses.swayam2.ac.in/nos21_sc11/preview
4. Language and Society - https://nptel.ac.in/courses/109/106/109106091/
5. Science, Technology & Society - https://nptel.ac.in/courses/109/103/109103024/
6. Introduction to Indian Philosophy - https://nptel.ac.in/courses/109/106/109106059/
7. Introduction to Indian Art - An appreciation - https://onlinecourses.nptel.ac.in/noc20_hs09/preview

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20ECC12

ANALOG CIRCUTS LAB

Instruction	2 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Prerequisite: Knowledge on Electronic Devices Lab and Electronic Workshop and Networks Lab.

Course objectives:
This course aims to:
1. Design and analysis of Biasing circuits and Power Amplifiers.
2. Know frequency response and behaviour of various Single Stage, Multistage and Feedback amplifiers.
3. Generation of sinusoidal signals using Oscillators.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Design various BJT/FET biasing circuits to identify the appropriate circuit for faithful amplification.
2. Experiment with single stage and multistage BJT/FET amplifiers including large signal amplifiers.
3. Compare and contrast different types of feedback topologies.
4. Develop and test various oscillator circuits.
5. Evaluate and compare the significant parameters obtained from the Frequency response plots of BJT and FET amplifier circuits.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO \ PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1	3	2	2	-	-	-	2	1	-	1	3	2	-
CO 2	2	1	3	2	2	-	-	-	2	1	-	1	3	2	-
CO 3	2	1	3	2	2	-	-	-	2	1	-	1	3	2	-
CO 4	2	1	3	2	2	-	-	-	2	1	-	1	3	2	-
CO 5	2	1	3	2	2	-	-	-	2	1	-	1	3	2	-

List of Experiments:

1. Design of BJT and FET Biasing Circuits for given specifications.
2. Design of a Common Emitter BJT amplifier and study of its frequency response.
3. Frequency response of Two RC - Coupled CS FET amplifier
4. Voltage series feedback amplifier.
5. Voltage shunt feedback amplifier.
6. Current series feedback amplifier.
7. Current shunt feedback amplifier.
8. RC Phase Shift Oscillator.
9. Hartley Oscillator
10. Colpitts Oscillator.
11. Design of transformer coupled Class-A amplifier.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

12. Design of Class-B power amplifier.
13. **Structured enquiry:** Design a circuit that converts a given D.C Voltage to Frequency using BJTs and verify its operation.
14. **Open ended Enquiry:** Design and implement a classroom sound monitoring system using BJTs and a 0.5W speaker.

Note: Wherever possible, Analysis and design of circuits should be carried out using SPICE tools.

Suggested Reading:

1. Robert Diffenderfer, “Electronic Devices: Systems and Applications”, Cengage Learning India Private Limited, 2010.
2. Paul B. Zbar, Albert P. Malvino, Michael A. Miller, “Basic Electronics, A Text - Lab Manual”, 7th Edition, TMH 2001.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20ECC13

ANALOG COMMUNICATION LAB

Instruction	2 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Prerequisite: A thorough knowledge on signal analysis and its representation along with communication systems is required.

Course Objectives:
This course aims to:
1. Generate and detect various analog and pulse modulation schemes.
2. Develop and analyze the characteristics of PLL, Mixer and Pre-Emphasis & De-Emphasis circuits.
3. Estimate the power spectral density by analyzing the spectrum of a given signal.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Demonstrate the generation and detection of various analog modulated signals.
2. Illustrate the sampling concept and interpret the generation and detection of various pulse modulated signals.
3. Obtain and Analyze frequency response of Pre-Emphasis and De Emphasis circuits
4. Experiment with Mixer, Radio receiver and PLL characteristics, FDM and TDM.
5. Estimate the Power spectral density of noise and SNR and analyze the spectra of AM and FM signals.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	1	1	2	2	3	3	3	3	3	3	3	3
CO 2	3	3	3	1	1	2	2	3	3	3	3	3	3	3	3
CO 3	3	3	3	1	1	2	2	3	3	3	3	3	3	3	3
CO 4	3	3	3	2	1	2	2	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	1	2	2	3	3	3	3	3	3	3	3

List of Experiments:

1. AM signals generation and detection.
2. Generation of DSB-SC using Balanced modulator.
3. SSB Modulation and Demodulation.
4. FM generation and detection.
5. Frequency response of Pre-Emphasis and De-Emphasis circuits.
6. Evaluation of Radio Receiver characteristics.
7. Sampling of continuous time signal and its Reconstruction (PAM).
8. Frequency division multiplexing and De-Multiplexing.
9. Time division multiplexing and De-Multiplexing.
10. PWM Modulation and Demodulation.
11. PPM Modulation and Demodulation.
12. Determination of PLL Characteristics.
13. Spectral Analysis of AM and FM signals using Spectral Analyzer.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

14. **Structured Enquiry:** Design a frequency mixer based on the given specifications and analyze its characteristics.
15. **Open ended Enquiry:** Design a Phase Locked Loop for the given free running frequency and determine its capture range and Lock range.

Note: Students have to design and develop any concept as a part of Mini project**.**

Suggested Reading:

1. A.M. Zungeru, J.M. Chuma, M. Mangwala, L.K. Ketshabetswe, "Handbook of Laboratory Experiments in Electronics and Communication Engineering", Vol. 2, 1st Edition, Notion press, 2017.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20ECC14

DIGITAL SYSTEM DESIGN LAB

Instruction	2 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Prerequisite: Digital concepts and C language concepts.

Course Objectives:
This course aims to:
1. Simulate and synthesize combinational logic circuits.
2. Simulate and synthesize sequential logic circuits.
3. Learn and implement procedure for any digital design.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Design a Digital circuit using Verilog HDL.
2. Understand various abstraction levels of a digital design.
3. Verify the functionality of a design using Test bench.
4. Simulate and synthesize combinational logic circuits.
5. Simulate and synthesize sequential logic circuits.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	2	2	3	1	1	1	3	2	1	1	2	3	3
CO 2	3	2	2	2	3	1	1	1	3	2	1	1	2	3	3
CO 3	3	3	2	2	3	2	2	1	3	2	2	2	2	3	3
CO 4	3	3	2	3	3	2	2	2	3	2	2	2	3	3	3
CO 5	3	3	2	3	3	2	2	2	3	2	2	2	3	3	3

List of Experiments:

Write a Verilog HDL code to Simulate and synthesize the following in Gate level, Data flow and Behavioral Modeling styles.

1. Logic Gates.
2. Arithmetic Units: Adders and Subtractors.
3. Multiplexers and De-multiplexers.
4. Encoders, Decoders, Priority Encoder and Comparator.
5. Implementation of logic function using Multiplexers and Decoders.
6. Arithmetic and Logic Unit.
7. Flip-Flops.
8. Sequence Detector using Mealy and Moore type state machines.
9. Implementation of SSI Circuits using FPGA.
10. **Structured Enquiry:** Design of a counter for the given specifications.
11. **Open ended Enquiry:** Design of a simple Digital System for real time applications.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Suggested Reading:

1. Samir Palnitkar, "Verilog HDL, A guide to Digital design and synthesis", 2nd Edition, Pearson Education, 2008.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

18ECC15

COMPUTER ARCHITECTURE AND MICROPROCESSORS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Basic knowledge on digital system design

Course Objectives:
This course aims to:
1. Study and understand the principles of computer system
2. Understand the design of computer system
3. Explore the architecture and instruction set of the microprocessors

Course Outcomes:
Upon completion of this course, students will be able to:
1. Understand how computer works.
2. Apply fixed and floating-point arithmetic algorithms.
3. Compare various memories, memory access techniques.
4. Assess the performance of computers.
5. Analyze architecture and instruction set of microprocessors.

UNIT-I
Data representation and Computer Arithmetic: Basic structure of computers, Functional units, Fixed point representation of numbers, Digital arithmetic algorithms for Addition, Subtraction, Multiplication using Booth's algorithm and Division using restoring and non-restoring algorithms, Floating point representation with IEEE standards.

UNIT-II
Basic Computer Organization and Design: Instruction codes, Stored program organization, Computer registers and computer instructions, Timing and control, hardwired and micro programmed control unit, Instruction cycle, Program interrupt, Interrupt cycle, Micro programmed Control organization, Address sequencing, Micro instruction format.

UNIT-III
Central Processing Unit: General register organization, Stack organization, Instruction formats, Addressing modes, Data transfer and manipulation, Program control, CISC and RISC: features and comparison, Instruction Pipeline.
Input-Output Organization: Peripheral devices, I/O interface: I/O Bus and interface modules, isolated versus memory mapped I/O.Modes of Transfer: Programmed I/O, DMA and Interrupt initiated I/O. Priority interrupt: Daisy chaining, Parallel Priority interrupt

UNIT-IV
Memory Organization: Memory hierarchy, Primary memory, Auxiliary memory, Associative memory, Cache memory, mapping functions: direct, associate and set associate, Virtual memory: address mapping using pages, Memory management.

UNIT-V
8086 Microprocessor: Evolution of microprocessors, 8086 Microprocessor: Internal architecture, flag register, Signal description under minimum and maximum mode of operation, register organization, Addressing modes.Overviewof Instruction set. Introduction to the advanced microprocessors (x86): Salient features, real and protected modes. Evolution of Pentium Processors.

Text Books:

1. MorrisMano.M., “Computer System Architecture”, 3/e, Pearson Education, 2005.
2. Hayes J.P, “Computer Architecture and Organization”, 3/e, McGraw Hill, 2012.
3. Barry B. Brey, “The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro, Pentium II, III, IV”, 8/e Pearson Education, 2006.

Suggested Reading:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, “Computer Organization” 5/e McGrawHill, 2011.
2. Ray A.K. and Bhurchandi, K.M., “Advanced Microprocessor and peripherals”, 2/e TMH 2007.
3. Douglas V Hall, SSSP Rao, “Microprocessors and Its Interfacing” (SIE), 3/e, Tata McGraw-Hill Education Pvt. Ltd, 2012.

18EC C16

DIGITAL COMMUNICATION

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Fundamentals of probability theory and analog communication systems is required.

Course Objectives:
This course aims to:

1. Make the student learn the different techniques involved in digital transmission of analog signals.
2. Give the student an understanding of the various concepts of information theory, source coding and Channel coding schemes.
3. Enable the student to interpret the performance of digital modulation schemes and learn various spread spectrum techniques.

Course Outcomes:
Upon completion of this course, students will be able to:

1. Understand the concept of pulse digital modulation schemes and compare their performance.
2. Interpret the concept of information theory and apply source coding schemes.
3. Demonstrate various error control schemes and develop the encoding and decoding techniques to detect and correct the errors.
4. Analyze different digital modulation schemes and can compute the bit error performance.
5. Apply various spread spectrum modulation techniques.

UNIT-I Digital Transmission of Analog Signals: Elements of a digital communication system, Uniform quantization, PCM system, Bandwidth requirement of PCM system, Noise in PCM Systems, Non- uniform quantization, TDM-PCM system. Differential quantization, Differential PCM system, Delta Modulation, Noise in DM system, ADM. Comparison of PCM, DPCM, DM and DM schemes.

UNIT-II Information Theory: Uncertainty, Information and Entropy, Source coding: Source coding theorem, Shannon – Fano algorithm and Huffman coding. Discrete memory-less channels, Types of channels, cascaded channels, mutual information, Channel capacity, Information rate and Information capacity, Rate distortion theory.

UNIT-III Error Control Coding: Need for error control coding, Types of transmission errors. Linear Block Codes (LBC): description of LBC, generation, Syndrome and error detection, minimum distance of a block code, error detecting capabilities and error correcting, Hamming codes, Standard array and syndrome decoding. Binary cyclic codes (BCC): description of cyclic codes, encoding, decoding and error correction of cyclic codes using shift registers, Convolution codes: description, encoding, decoding: Exhaustive search method and sequential decoding.

UNIT-IV Digital Carrier Modulation Schemes: Optimum receiver for Binary Digital Modulation Schemes, Binary ASK, PSK, DPSK, FSK signaling schemes and their error probabilities. Introduction to MSK, Comparison of Digital Modulation Schemes. Introduction to M-ary Signaling Schemes: QPSK, Synchronization methods.

UNIT–V Spread-Spectrum Modulation: Need for spreading a code, generation and properties of PN sequence. Direct Sequence Spread Spectrum, Frequency Hopping spread spectrum systems and their applications.

Text Books:

1. Sam Shanmugham.K., "Digital and Analog Communication Systems", Wiley, 2012.
2. Simon Haykin, "Communication Systems", 4/e, Wiley India, 2011.
3. Herbert Taub, Donald L. Shilling &GoutamSaha, "Principles of Communication Systems", 4/e, Tata McGraw-Hill Education 2013.

Suggested Reading:

1. John Proakis, MassoudSalehi, "Digital Communications", 5/e, McGrawHill Higher Education, 2007.
2. R.P. Singh, S.D. Sapre, "Communication Systems", 2/e, Tata McGrawHill Education, 2008.
3. P.Ramakrishna Rao, "Digital Communication", McGraw Hill Education, 2011.

18EC C17

LINEAR AND DIGITAL INTEGRATED CIRCUITS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Knowledge about Analog electronic circuits.

Course Objectives:
This course aims to:
1. Impart the concepts of Op-Amp, 555 Timers, IC regulator, data converter and its characteristics.
2. Illustrate the linear and nonlinear applications of operational amplifier.
3. Design combinational and sequential circuits with IC, memories and PLD.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Understand the basic construction, characteristics and parameters of Op-Amp.
2. Analyze the linear and nonlinear applications of Op-Amp.
3. Explain the concepts of IC555 timer, IC723 regulator, memories and PLD.
4. Classify and describe the characteristics of different logic families
5. Design logic functions of Combinational and Sequential circuits with ICs.

UNIT – I
Operational Amplifier: Op-Amp block diagram, ideal Op-Amp Characteristics, Inverting and Non-inverting amplifiers with ideal and non-ideal Op-amps, Voltage Follower, Op-Amp parameters: Input offset voltage, Output offset voltage, input offset and bias currents, Slew rate, CMRR and PSRR.

UNIT – II
Op-Amp Applications: Summing Amplifier, Difference Amplifier, ideal and practical Integrator and differentiator. Sample and hold circuit, Comparator, Schmitt Trigger with and without reference voltage, Triangular waveform generator.

UNIT – III
555 Timer: Functional diagram. Modes of operation: Monostable, Astablemulti-vibrators.
Voltage Regulator: IC7805, Analysis and design of regulators using IC 723.
Data Converters: Specifications, DAC- Weighted Resistor, R-2R Ladder, ADC-Parallel Comparator, Successive Approximation and Dual Slope.

UNIT – IV
Logic Families: Digital IC characteristics. TTL logic family, TTL series and TTL output configurations: open collector, Totem pole, Tri state logic. MOS logic family, CMOS logic family and its series characteristics, CMOS transmission gate, CMOS open drain and high impedance outputs. Comparison of TTL and CMOS logic families.

UNIT – V
Combinational and Sequential Circuits: Design of logic functions/circuits with: Decoder, Multiplexer, Adder: Serial adder, parallel adder and BCD adder, counters: asynchronous counter (7493/74293) and synchronous counter (74163/74193)
Semiconductor Memories: Memory Terminology, ROM, RAM types, Architectures, operation, FIFO memory, FIFO depth calculations, Expanding word size and capacity, Introduction to PLD's: PAL and PLA.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Text Books:

1. Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", 4/e, PHI, 2010.
2. Ronald J. Tocci, Neal S. Widmer& Gregory L.Moss, "Digital Systems: Principles and Applications", PHI, 10/e, 2011.

Suggested Reading:

1. K.R.Botkar, "Integrated Circuits", 10/e, Khanna Publishers, 2010.
2. Roy Chowdhury D, Jain S.B, "Linear Integrated Circuits",4/e, New Age International Publishers, 2010.
3. Jain R.P., "Modern Digital Electronics", 4/e, TMH, 2011.
4. Charles H Roth and Larry L Kinney, "Fundamentals of Logic Design" 7th edition, Cengage Publication, 2014.
5. David A. Bell, 'Operational Amplifier and Linear ICs', third edition, Oxford university press, 2013.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

18ME C09

PRINCIPLES OF MANAGEMENT

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

To make the students to

1. Understand basic fundamentals and insights of management
2. Understand the nature and purpose of planning
3. Gain the knowledge about the frame work of organizing
4. Understand the essence and significance of directing
5. Recognize the importance of controlling and its outcomes

.

Course Outcomes:

At the end of the course, student will be able to understand

1. Identify and evaluate the principles of management
2. Demonstrate the ability to have an effective and realistic planning
3. Identify the nature and the type of organization
4. Apply the tools and techniques of directing
5. Explain and evaluate the necessity for controlling and further refinement of an organization.

UNIT - I

Management: Definition of management**,** science or art, manager vs entrepreneur; managerial roles and skills; Evolution of management, Basic management theories by FW Taylor, Henry Fayol, Types of Business Organizations, sole proprietorship, partnership, company, public and private enterprises; Organization culture and environment; Current trends and issues in management

UNIT - II

Planning: Nature and purpose of Planning, types of Planning, objectives, setting objectives, policies, Strategic Management, Planning Tools and Techniques, Planning plant location and layout, Decision making steps & processes.

UNIT - III

Organizing: Nature and purpose of Organizing, formal and informal organization, organization structure, types, line and staff authority, departmentalization, delegation of authority, centralization and decentralization, job design, human resource management, HR planning, Recruitment selection, Training & Development, Performance Management, Career planning and Management

UNIT - IV

Directing: Individual and group behavior, motivation, motivation theories, motivational techniques, job satisfaction, job enrichment, leadership, types & theories of leadership, effective communication.

UNIT - V

Controlling: system and process of controlling, budgetary and non-budgetary control techniques, use of computers and IT in management control, productivity problems and management, control and performance, direct and preventive control, reporting.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Text Books:

1. S.P. Robins and M. Couiter, “Management”, 10^{th}Edition,Prentice Hall India, 2009.
2. JAF Stoner, RE Freeman and DR Gilbert, “Management”, 6/e., Pearson Education,2004.

Suggested Reading:

1. P.C. Tripathy& P.N. Reddy, “Principles of Management”, Tata McGraw Hill,1999
2. Harold Koontz and Cyril O’Donnell “Principles of Management’’, Tata McGraw Hill, 2017

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

18EC E01

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

(Program Elective-I)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Fundamental concepts of Network Theory and Electronic Circuits.

Course Objectives:

This course aims to:

1. Explain basic concepts, definitions and error analysis in measurement.
2. Identify the details of instrumentation and devices intended for a particular application.
3. Elaborate discussion about the importance of signal display devices and analyzers in measurement and describe the various bridge configurations and their applications.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Define the characteristics and analyze the errors of measurement systems.
2. Select the appropriate passive or active transducers for measurement of physical phenomenon.
3. Relate and apply the appropriate measuring techniques to real time applications.
4. Interpret the usage of DVM, Spectrum Analyzer and DSO instruments for appropriate measurements.
5. Develop an understanding of construction and working of different AC and DC bridges and their applications.

UNIT– I

Error - Absolute error, Relative error and Accuracy, Precision - conformity and significant figures, limiting errors, Propagation of errors, Errors in measurement-gross, systematic and random errors, Loading effect, Statistical analysis of measurement data and probable error, Resolution, Sensitivity, Calibration.

UNIT – II

Classification of transducers, Strain gauges - gauge factor, bonded, un-bonded and semiconductor stain gauges, rosettes, LVDT - principle, construction and displacement measurement, Capacitive transducer - principle and thicknessmeasurement, Piezo-electric transducer and different modes of operation, Photo- electric transducers.

UNIT – III

Characteristics, pressure, power and intensity levels of sound, Microphones, Temperature measurement - resistance wire thermometers, semiconductor thermometers and thermocouples.

UNIT – IV

DVMs- ramp, dual-slope integration, integrating and successive-approximation types, digit, resolution, sensitivity and general specifications, Spectrum analyzers, Digital storage oscilloscope, Introduction to Virtual Instrumentation (LabView).

UNIT – V

Introduction to Bridges, DC Bridges - Wheatstone's bridge, Kelvin's bridge, AC bridges - introduction, general balance equation for four arm bridge, capacitance comparison bridge, inductance comparison bridge, Maxwell's bridge, Wien's bridge, Wagner's earth connection.

Text Books:

1. Albert D. Helfric, and William D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI, 2010.
2. D V S Murthy, "Transducers and Instrumentation", 2nd Edition, PHI, 2013.
3. Nakra B.C, and Chaudhry K.K., "Instrumentation, Measurement and Analysis", 3rdEdition, TMH, 2013.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Suggested Reading:

1. David A. Bell, "Electronic Instrumentation and Measurements", 2nd Edition, PHI, 2003.
2. H S Kalsi, "Electronic Instrumentation", 3rdEdition, TMH, 2011.
3. A.K.Sawhney, "Electrical & Electronic Measurement and Instruments", DhanpatRai& Co. Publications, 2005.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

18EC E03

OPTICAL COMMUNICATION

(Program Elective-I)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Fundamentals of Electromagnetic theory and Communication isrequired.

Course Objectives:

This course aims to:

1. Understand the properties of optical fiber that affect the performance of a communication link and types of fiber materials with their properties and the losses occur in fibers and the principles of single and multi-mode optical fibers and their characteristics.
2. Know working of semiconductor lasers, and differentiate between direct modulation and external electro-optic modulation.
3. Analyze the operation of LEDs, laser diodes, and PIN photo detectors (spectral properties, bandwidth, and circuits) and apply in optical systems.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Select necessary components required in modern optical communications systems.
2. Analyze various distortions in optical fibers.
3. Distinguish the various Optical sources and fiber optical receivers.
4. Examine the Power Launching and coupling, Lensing schemes.
5. Determine the performance of optical communication link.

UNIT–I

Overview of Optical Fiber Communication: The general system, advantages ofoptical fiber communications. Optical fiber wave guides- Acceptance angle, Numerical Aperture, Skew rays, Cylindrical fibers: Modes, V-number, Mode coupling, Step Index fibers, Graded Index fibers, Single mode fibers: Cut off wavelength, Mode Field Diameter, Effective Refractive Index.

UNIT–II

Signal Distortion in Optical Fibers: Attenuation, Absorption, Scattering andBending losses, Core and Cladding losses, Information capacity determination,Group delay, Types of Dispersion: Material dispersion, Wave-guide dispersion, Polarization, Mode dispersion, Intermodal dispersion, Pulse broadening in Graded index fiber.

Optical Fiber Connectors: Connector types, Single mode fiber connectors,

Connector return loss, Fiber Splicing: Splicing techniques, Splicing single mode fibers, Fiber alignment and joint loss: Multimode fiber joints, single mode fiber joints.

UNIT–III

Optical Sources: LEDs, Structures, Materials, Quantum efficiency, PowerModulation, Power bandwidth product. Injection Laser Diodes: Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, Resonant frequencies, Optical detectors: Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors.

UNIT–IV

Source to Fiber Power Launching: Power coupling, Power launching,Fundamental receiver operation, error sources, Receiver configuration, Digital receiver performance, Probability of Error, Quantum limit.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

UNIT–V

Optical System Design: Point-to- point links, Component choice andconsiderations, Link power budget, Rise time budget with examples, WDM, Necessity, Principles, Measurement of Attenuation and Dispersion.

Text Books:

1. Gerd Keiser, "Optical Fiber Communications", McGraw-Hill International edition, 3rd Edition, 2000.
2. John M. Senior, "Optical Fiber Communications", PHI, 2nd Edition, 2002.
3. D.K. Mynbaev, S.C. Gupta and Lowell L. Scheiner, "Fiber Optic Communications", Pearson Education,2005.

Suggested Reading:

1. S.C.Gupta, "Text Book on Optical Fiber Communication and its Applications", PHI, 2005.
2. Govind P. Agarwal, "Fiber Optic Communication Systems", John Wiley, 3rd Edition, 2004.
3. Joseph C. Palais, "Fiber Optic Communications", 4th Edition, Pearson Education, 2004.

18ECE04

TELECOMMUNICATION SWITCHING SYSTEMS

(Program Elective-I)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Knowledge on communication systems is required.

Course Objectives:

This course aims to:

1. Understand basic concepts of switching and signalling.
2. Solve problems and design simple systems related to tele-traffic and trunking efficiency.
3. Analyse the switching systems like Space division switching, Time division switching, circuit switching, Packet switching and Cell relay (ATM).

Course Outcomes:

Upon completion of this course, students will be able to:

1. Understand the fundamental concepts of various signaling and switching involved in telecommunication switching systems.
2. Elaborate the basic principle of time and space division switching in telecommunication networks.
3. Design the multistage switch by inclusion of space and time switching techniques.
4. Analyze the performance comparison of Control signaling schemes in circuit switching systems.
5. Evaluate the performance of packet switching and cell relay.

UNIT-I

Introduction:

Introduction to telephone communication, manual switching system, Automatic Strowger switching system, crossbar switching system, Signalling in Automatic Strowger Switching System, Elements of a Switching System, Design parameters of Switching System.

UNIT- II

Electronic Space and Time Division Switching:

Stored program control; centralized and distributed, software architecture, application software, enhanced services; Basic time division space switching, basic time division time switching, time multiplexed space switching, time multiplexed time switching, combination switching, multistage combination switching.

UNIT-III

Elements of Tele-Traffic:

Network traffic, Load and parameters, grade of service, Trunking Efficiency and blocking probability, modelling switching systems, incoming traffic and service time characterization, blocking models and loss estimates, delay systems.

UNIT-IV

Circuit Switching and Signalling:

Circuit Switching concepts, Circuit Switch Elements, Three Stage Blocking Type Space Division Switch**;** Control Signalling Functions, In Channel Signalling, Common Channel Signalling, Features of Signalling System Number7 (SS7).

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

UNIT-V

Packet Switching and Cell Relay:

Packet Switching, Datagram and Virtual Circuit switching Principles, Effects of variable packet size; ATM, features of ATM, Quality of Service in ATM. .

Text books:

1. J E Flood, “Telecommunication switching traffic and networks” Pearson education, 2002.
2. William Stallings, “Data and Computer Communications”, Ninth Edition, Pearson Prentice Hall, 2011.

Suggested Reading:

1. ThiagarajanVishwanathan,“Telecommunication Switching Systems and Networks”, PHI,2nd Edition,2015.
2. Behrouz A. Forouzan, “Data Communications and Networking”, 4thEdition, Tata McGraw Hill, 2007.
3. Roger L. Freeman, “Fundamentals of Telecommunications”,2nd Edition, Wiley-IEEE Press-2005.

18CS O05

FUNDAMENTALS OF VIRTUAL REALITY

(Open Elective-I)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

This course aims to:

1. To introduce hardware and software components of virtual reality.
2. To provide knowledge about geometry of virtual worlds.
3. To understand visual physiology, perception and audio in VR.
4. To study the applications of VR in various domains like military and robotics.

Course Outcomes:

Upon completion of this course, the student will be able to:

1. Define Virtual Reality and describe the components of a VR system
2. Apply geometric modeling and transformation techniques to model real world scenarios
3. Use visual physiology, visual perception and audio for developing interfaces
4. Analyse tracking and rendering for building VR systems
5. Evaluate virtual reality systems for usability
6. Illustrate the applications of VR systems in Medical, Military and Robotics domains

UNIT - I

Introduction: The three I's of virtual reality, commercial VR technology and the five classic components of a VR system. **Input Devices:** Trackers, Navigation and Gesture Interfaces: Three-dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces.

Output Devices: Graphics displays, sound displays and haptic feedback.

UNIT - II

Geometry of Virtual Worlds: Geometric modeling, transforming models, Matrix algebra and 2D rotations, 3D rotations and yaw, pitch, and roll, Axis-angle representations, Quaternions, Converting and multiplying rotations, Homogeneous transforms, The chain of viewing transforms, Eye transforms, Canonical view transform, Viewport transform.

UNIT - III

Light and Optics: Three interpretations of light, Refraction, Simple lenses, Diopters, Imaging properties of lenses, Lens aberrations, Optical system of eyes.

Visual Physiology: Photoreceptors, Sufficient resolution for VR, Light intensity, Eye movements, Eye movement issues for VR, Neuroscience of vision,

Visual Perception: Depth perception, Motion perception, Frame rates and displays.

UNIT - IV

Tracking Systems: Overview, Orientation tracking, Tilt drift correction, Yaw drift correction, Tracking with a camera, Perspective n-point problem, Filtering, Lighthouse approach

Visual Rendering: Overview, Shading models, Rasterization, Pixel shading, VR-specific problems, Distortion shading, Post-rendering image warp.

UNIT – V

Audio: Physics and physiology, Auditory perception, Auditory localization, Rendering, Spatialization and display, Combining other senses.

Interfaces: overview, Locomotion, Manipulation, System control, Social interaction, Evaluation of VR Systems.

Applications: Medical, Military, Robotics.

Text Books:

1. John Vince, "Virtual Reality Systems", Pearson Education Asia, 2007
2. Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi.

Suggested Reading:

1. George Mather, Foundations of Sensation and Perception: Psychology Press; 2nd edition, 2009.
2. Peter Shirley, Michael Ashikhmin, and Steve Marschner, Fundamentals of Computer Graphics, A K Peters/CRC Press; 3rd edition, 2009.
3. K. S. Hale and K. M. Stanney, Handbook on Virtual Environments, 2ndedition, CRC Press, 2015.

Online Resources:

1. http://msl.cs.uiuc.edu/vr/
2. https://nptel.ac.in/courses/106106139/

18ITO01

OBJECT ORIENTED PROGRAMMING USING JAVA

(Open Elective-I)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

This course aims to:

1. To familiarize with fundamentals of object-oriented programming paradigm.
2. To impart the knowledge of string handling, interfaces, packages and inner classes.
3. To facilitate learning Exception handling and Multithreading mechanisms.
4. To gain knowledge on collection framework, stream classes.
5. To familiarize with event driven GUI programming and Database connectivity.

Course Outcomes:

Upon completing this course, students will be able to:

1. Understand the concepts of Object-Oriented Programming and class concept in Java.
2. Apply concepts of OOP such as Inheritance, Interfaces, Packages and Inner classes.
3. Handle exceptions and demonstrate the concepts of Multithreading and Generic classes.
4. Develop programs using Java Collection API and Stream classes.
5. Design and Develop GUI applications with JDBC.

UNIT-I

OOP concepts: Data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, classes and objects, Procedural and object-oriented programming paradigms.

Introduction to Java: Java's Magic: The Byte code, The Java Buzzwords, Simple Java Programs, Java Primitive Types, Arrays: How to create and define arrays, Basic Operators, Control statements.

Introducing Classes: Declaring objects, methods, Constructors, this keyword, Method Overloading and Constructor Overloading, Objects as parameters, Returning objects, Use of static and final keywords.

UNIT-II

Inheritance: super and subclasses,Member access rules, super keyword**,** Method overriding, Dynamic method dispatch,Abstract classes, using final with inheritance, Introduction to Object class.

Packages: Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

Interfaces: Defining andimplementing interfaces, Nested Interfaces.

Strings Handling: String &StringBuffer classes, StringTokenizer class and Wrapper classes and conversion between Objects and primitives.

Inner classes in Java: Types of inner classes, Creating static / non-static inner classes, Local and anonymous inner classes.

UNIT-III

Exception Handling in Java: what areExceptions? Exception types**,** Usage of try, catch, throw, throws and finally clauses, writing your own exception classes.

Multi-threading in Java: The java Thread Model, How to create threads, Thread class in java, Thread priorities, Thread synchronization.

Generics: What are Generics? Generic classes, bounded types, Generic methods and interfaces.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

UNIT-IV

Collections Framework: Overview of Collection Framework, commonly used Collection classes – ArrayList, LinkedList, HashSet, LinkedHashSet, TreeSet, Collection Interfaces –Collection, List, Set, SortedSet, accessing a collection via an Iteration,storing user-defined classes in collections, Map Interfaces and Classes, Using a comparator. Legacy classes – Vector, Hashtable, The Enumeration interface.

Input/Output: How to read user input (from keyboard) using scanner class,Stream classes, InputStream, OutputStream, FileInputStream, FileOutputStream, Reader and Writer, FileReader, FileWriter classes. File class.

UNIT-V

GUI Design and Event Handling: Component, Container, window, Frame classes. Working with Frame window GUI Controls, Layout Managers, Introduction to Swings, Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces, Handling button click events, Adapter classes. Writing GUI Based applications.

Database Handling in Java: Java Database Connectivity (JDBC) using MySQL.

Text Books:

1. Herbert Schildt, “Java: The Complete Reference”, 8th Edition, Tata McGraw Hill Publications, 2011.
2. Cay S. Horstmann, Gary Cornell, “Core Java, Volume I, Fundamentals”, 8th Edition, Prentice Hall, 2008.

Suggested Reading:

1. Sachin Malhotra & Saurabh Choudhary, “Programming in Java”, 2nd Edition, Oxford University Press, 2014.
2. C. Thomas Wu, “An introduction to Object-oriented programming with Java”, 4th Edition, Tata McGraw-Hill Publishing company Ltd., 2010.
3. Kathy Sierra, Bert Bates, “Head First Java: A Brain-Friendly Guide” 2nd Edition, O’Reilly,2005

Web Resources:

1. https://www.cse.iitb.ac.in/~nlp-ai/javalect_august2004.html.
2. http://nptel.ac.in/courses/106106147/
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-092-introduction-to-programming-in-java-january-iap-2010/lecture-notes/

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

18MT O04

QUANTUM COMPUTING

(Open Elective-I)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Knowledge of Number theory and cryptography

Course Objectives:

This course aims to:

1. To translate fluently between the major mathematical representations and its quantum operations,
2. To implement' basic quantum algorithms
3. To explain quantum decoherence in systems for computation
4. To discuss the physical basis of uniquely quantum phenomena.

Course Outcomes:

Upon completion of this course, the student will be able to:

1. Identify the working of a Quantum Computing Program, its architecture and program model.
2. Compute basic mathematical operations.
3. Demonstrate quantum logic gate circuits.
4. Develop quantum algorithm.
5. Appraise quantum algorithm on major toolkits

UNIT-I

Introduction to Quantum Computing:

Motivation for Studying Quantum Computing, Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc), Origin of Quantum Computing, Overview of major concepts in Quantum Commuting (Qubits and multi-qubits states, Bra-ket notation, Bloch Sphere representation, Quantum Superposition, Quantum Entanglement)

UNIT-II

Math Foundation for Quantum Computing:

Matrix Algebra: Basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen Vectors.

UNIT-III

Building Blocks for Quantum Program:

Architecture of a Quantum Computing Platform, Details of q-bit system of information representation (Block Sphere, Multi-qubits States, Quantum superposition of qubits (valid and invalid superposition), Quantum Entanglement, Useful states from Quantum algorithmic perceptive e.g.Bell State,

UNIT-IV

Quantum Logic Gates and Circuits:

Quantum Logic gates and Circuit: Pauli, Hadamard, Phase shift, controlled gates, ising, Deutsch,Swap etc.), Programming model for a Quantum Computing program (Steps performed on classical computer, steps performed on Quantum Computer, Moving data between bits and qubits)

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

UNIT-V

Quantum Algorithms:

Basic techniques exploited by quantum algorithms (Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum walks), Major Algorithms (Shor's Algorithm, Grover's Algorithm, Deutsch's Algorithm, Deutsch-Jozsa Algorithm), OSS Toolkits for implementing Quantum program (IBM quantum experience, Microsoft Q, RigettiPyQuil (QPU/QVM))

Text Books:

1. Michael A.Nielsen, "Quantum Computation and Quantum Information", Cambridge University Press.
2. David McMahon, "Quanturm Computing Explained", Wiley

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

18EC C18 DIGITAL COMMUNICATION LAB

Instruction	2 P Hours per Week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Prerequisite: Knowledge about analog communication is required.

Course Objectives:
This course aims to:
1. Carry out experiments on various pulse digital modulation techniques.
2. Conduct the experiment to identify errors in cyclic codes
3. Work on convolutional encoder and decoder for controlling the errors.

Course outcomes:
Upon completing this course, students will be able to:
1. Demonstrate various pulse digital modulation techniques.
2. Assess different line coding techniques.
3. Detect and correct errors in cyclic codes.
4. Examine the errors in convolutional encoder and decoder.
5. Evaluate various digital carrier modulation techniques experimentally.

List of Experiments:

1. PCM generation and detection.
2. Data formats / Line coding techniques.
3. Linear Delta Modulation and demodulation.
4. Adaptive Delta Modulation and demodulation.
5. Error detection and correction in cyclic codes.
6. Convolutional encoder and decoder.
7. ASK generation and detection.
8. FSK generation and detection.
9. BPSK generation and detection.
10. QPSK generation and detection.
11. MSK generation and detection.
12. Structured Enquiry:
    - Design N-bit PCM encoder based on the given specifications.
13. Open ended Enquiry:
    - Develop a code for different digital modulation schemes and verify through simulation.
    - Design different Line coding schemes using logic Gates.

Suggested Reading:

1. A.M. Zungeru, J.M. Chuma, M. Mangwala , L.K. Ketshabetswe, "Handbook of Laboratory Experiments in Electronics and Communication Engineering", Vol. 2, 1st Edition, Notion press, 2017.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

18EC C19

LINEAR AND DIGITAL INTEGRATED CIRCUITS LAB

Instruction	2 P Hours per Week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Prerequisite: Knowledge of Analog electronic circuits.

Course Objectives:
This course aims to:
1. Know and verify the concepts of 741 Op-Amp, IC555 timer, IC723 and data converters.
2. Know the various characteristics of TTL and CMOS gates and implement the circuits with Digital ICs.
3. Contrast the differences between linear and digital ICs.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Analyze the configurations, parameters of Op-Amp (IC741).
2. Demonstrate the circuits of Op-Amp for various applications.
3. Design the circuits using IC555 timer, IC723 and data converters.
4. Determine the characteristics of TTL and CMOS gates
5. Develop various combinational circuits and sequential circuits using digital ICs.

Lab Experiments

Part-A: Linear IC Experiments
1. Voltage Follower, Inverting and Non-Inverting Amplifiers using OpAmp.
2. Measurement of Op-Amp parameters
3. Arithmetic Circuits using Op-Amp
4. Waveform generation using Op-Amp.
5. Astable and Monostable multi vibrators using IC555Timer.
6. Low and High Voltage Regulators using IC723.
7. D to A Converter using R-2R ladder.

Part-B: Digital IC Experiments
1. Measurement of various characteristic parameters of TTL and CMOS gates.
2. Logic function Implementations using Decoders.
3. Logic function Implementations using Multiplexers
4. Binary adder and subtractor, BCD adders using ICs.
5. Design of Synchronous, Asynchronous up/down counters.
6. Shift registers and ring counter using ICs.
7. Interfacing counters with 7-segment LED display units.
8. Structured enquiry: Implement a Security Monitoring System(Use only nonprogrammable ICs.)
9. Open ended enquiry: Design a Digital Clock structure to display minutes and seconds. (Use only nonprogrammable Ics.)

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

Mini Project cum Design Exercise(s):
To realize and design a Mini project using either linear or digital or combination of linear and digital IC's

Sample Mini Projects:

a. Design and implementation of Binary Multiplier
b. Design and implementation of a Water level indicator using 555 IC
c. Design and implementation of FSK Modulator using 555 IC.
d. Design a circuit to generate a one pulse per second signal from 1 KHz square wave.

Suggested Reading:

1. National Semiconductor Corporation, "Linear applications", Data book, 1986.
2. National Semiconductor Corporation, "Logic data book-Vol-II", 1984.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

18EC C20

DIGITAL SIGNAL PROCESSING

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Concepts of Signals, Systems and Filter designing.

Course Objectives:
This course aims to:
1. Know Discrete-time signals in the frequency domain using DFT and FFT.
2. Design digital IIR and FIR filters for the given specifications.
3. Introduce the basics of Multirate digital signal processing, Digital signal processor and its applications

Course Outcomes:
Upon completion of this course, students will be able to:
1. Understand the concept of DFT and FFT for signal processing applications.
2. Design FIR filters for the given specifications.
3. Implementation of IIR filters for the given specifications.
4. Interpret the concepts of Multirate digital signal processing and its applications.
5. Explain the architecture features of TMS320C67XX processor.

UNIT-I
Discrete Fourier Transform: Introduction, Discrete Fourier Transform (DFT), Properties of DFT, Efficient computation of DFT-Fast Fourier Transform (FFT) algorithms: Radix-2 FFT algorithms – Decimation in Time, Decimation in Frequency algorithms, Inplace computation, Bit reversal algorithm, Linear filtering using FFT algorithm.

UNIT-II
FIR Filter Design: Amplitude and Phase responses of FIR filters – Linear phase FIR filters – Windowing technique for design of FIR filters – Rectangular, Bartlet, Hamming, Blackman, and Kaiser Windows. Realization of digital filters-Direct form-I and II of IIR filters, Realization of linear phase FIR filter, Finite word length effects.

UNIT-III
IIR Filter Design: Butterworth and Chebyshev approximation, IIR digital filter design techniques- Impulse Invariant transformation, Bilinear transform techniques, Digital Butterworth and Chebyshev filters, Spectral transformation techniques. Comparison between FIR and IIR filters.

UNIT- IV
Multirate Digital Signal Processing: Introduction -Decimation by a Factor -D, Interpolation by a Factor -I, Sampling Rate Conversion by a Rational Factor -I/D, Nobel identities, Applications of Multirate Signal Processing: Phase shifters, QMF filter banks, Narrowband filters and sub band coding of speech signal.

UNIT-V
DSP Processors: Introduction, Difference between DSP and General-Purpose Processor architectures, need for DSP processors. General purpose DSP processor- TMS320C67XX processor, architecture, functional units, pipelining, registers, linear and circular addressing modes, instruction set.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Text Books:

1. Alan V. Oppenheim & Ronald W. Schafer, "Digital Signal Processing", PHI, 2/e, 2010.
2. John G. Proakis&Dimtris G. Manolakis, "Digital Signal Processing Principles, Algorithms and Application", PHI, 4/e, 2012.
3. RulphChassaing, "Digital Signal Processing and Applications with the C6713 and C6416 DSK", John wiley& sons, 2005.

Suggested Reading:

1. Sanjit K Mitra, "Digital Signal Processing, A computer-based approach", TMH, 3/e, 2011.
2. TarunKumarRawat, "Digital Signal Processing", 1stedition, Oxford, 2015.
3. Avtar Singh & S. Srinivasan, "Digital Signal Processing Implementation using DSP microprocessors", Thomson Brooks, 2/e, 2004.
4. Chi- Tsong Chen, "Digital Signal Processing Spectral Computation and filter Design", Oxford, 2/e, 2007.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

18ECC21

MICROCONTROLLERS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Knowledge of Computer Architecture and Microprocessors.

Course Objectives:
This course aims to:
1. Understand architecture features of the microcontrollers
2. Learn the programming of the microcontrollers
3. Understand interfacing of various modules with microcontrollers.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Acquire an overview of how a processor and a controller are distinguished.
2. Understand the architectures of different microcontrollers to enable to design applications using them.
3. Develop code both in assembly and in high level language for various applications of microcontrollers.
4. Analyze and design real world applications by using on/off chip peripherals of different microcontrollers.
5. Apply theoretical learning to practical real time problems for automation.

UNIT-I
8051Microcontroller: Introduction to Microcontroller, Overview of 8051 family, Internal Architecture of 8051, PSW, Pin description, I/O Ports, Memory organization and expansion. Addressing modes and Bit addressable features, 8051 Instruction set: Data transfer, Arithmetic, Logical, Program branching and bit manipulation instructions.

UNIT-II
8051 Programming: Introduction to 8051 programming development tools, basic programming using instruction set, Introduction to 8051 C Programming, SFRs, 8051 Timer Programming in Assembly and C, 8051 Serial port Programming in Assembly and C, 8051 Interrupt Programming in Assembly and C.

UNIT-III
8051 Interfacing: 8051 interfacing to external memory (RAM, ROM), 8255 PPI interfacing, LCD and Keyboard interfacing, Digital to Analog converter, Analog to Digital converter and Sensor interfacing, Relay and PWM, DC Motor interfacing, Stepper Motor interfacing

UNIT-IV
ARM: Introduction to RISC Processors, ARM Design Philosophy, ARM Processor families, Architecture- Revisions, Registers, Program status register, Pipeline, Introduction to Exceptions,
ARM Instruction set: Data processing instructions, Branch instructions, Load-Store instructions, Software interrupt instruction, Program Status Register instructions, Loading constants, and Conditional executions. Introduction to THUMB instructions: Differences between Thumb and ARM modes, Register usage.

UNIT-V
ARM 7 Microcontroller (LPC2148)**:** Salient features of LPC 2148, Pin description of 2148, Architectural Overview.
ARM 7(LPC2148) **Peripherals:** Description of General-PurposeInput/output (GPIO) ports, Pin control Block. Features, Pin description, Register description and operation of PLL, Timers, PWM, ADC, DAC. Communication protocols: Brief overview on I2C, SPI, and CAN.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Text Books:

1. Mazidi M.A, Mazidi JG &Rolin D. Mckinlay, "The 8051 Microcontroller & Embedded Systems using Assembly and C", 2/e, Pearson Education, 2007.
2. Andrew N.Sloss, DomonicSymes, Chris Wright, "ARM System Developers Guide Designing and Optimizing system software", 1/e, Elsever, 2004.

Suggested Reading:

1. Ayala K.J, "The 8051 Microcontroller Architecture, Programming and Applications", Penram International, 2007.
2. Steve Furber, "ARM System on Chip Architecture", 2/e, Pearson education, 2000.
3. Philips semiconductors, "ARM 7 (LPC 214x)user manual", 2005.
4. Lyla B. Das, "Architecture, Programming and Interfacing of Low-power Processors-ARM 7, Cortex-M", CENGAGE, 2017.

18ECC22

MICROWAVE AND RADAR ENGINEERING

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
This course aims to:
1. To understand the importance of microwaves and their applications.
2. To understand the principle and operation of microwave sources.
3. To understand principle and operation of different radar systems.

Course Outcomes:
Upon completing this course, students will be able to:
1. Apply the wave equations and their solutions to analyze the waves in the waveguides.
2. Determine the scattering matrix for various microwave components.
3. Analyze the interaction of electron beam and RF field for various microwave sources.
4. Examine the principles of operation of pulse, CW and MTI radar system.
5. Compare different types of tracking radars.

Unit-I
Introduction to Microwaves: Microwave frequency spectrum, Advantages and Applications of Microwaves.
Rectangular Waveguides: Rectangular waveguides, TM and TE waves, Impossibility of TEM wave in waveguides. Wave Impedance.
Circular Waveguides: Solution of wave equations in cylindrical coordinates, Characteristics of TM and TE modes.
Microwave Cavities: Rectangular and Circular Cavity Resonators, Quality factor and applications of cavity resonators.

Unit-II
Microwave Circuits and Components: Concept of microwave hybrid circuit, Introduction to scattering parameters. Properties and S-parameters of reciprocal components – E and H Plane Tees, Magic Tee, Directional Coupler.
Non-Reciprocal Components: Ferrites – Composition and Faraday Rotation; Ferrite Components – Isolators, Gyrators and Circulators. S- Parameters of Isolator and Circulator.

Unit-III
Microwave Tubes: Limitations of Conventional Tubes at Microwave Frequencies. Principles of Gunn Diode.
O-type tubes: Two cavity klystron, velocity modulation process, bunching process. Output power and efficiency. Reflex Klystron-Velocity Modulation, Power out and efficiency, Electronic admittance.
Helix TWT: Slow Wave Structures, Principles of Operation and Applications of TWT (qualitative treatment only).
M-type Tubes: Introduction, Magnetron Oscillators, different types, π-mode of operation, frequency pushing and pulling effects and their remedies.

Unit- IV
Radar Systems: Introduction to radar, radar block diagram and operation, radar frequencies, Applications of radar, Prediction of range performance, minimum detectable signal, receiver noise, probability density function, SNR, Integration of radar pulses, radar cross-section of targets, PRF and range ambiguities, transmitter power, system losses.

Unit-V

Radar Types: Doppler effect, CW radar, FM CW radar, multiple frequency CW radar. MTI radar, delay line canceller, range gated MTI radar, blind speeds, staggered PRF.

Tracking radar: Sequential lobbing, Conical scan, Monopulse: Amplitude comparison and Phase comparison methods.

Text Book:

1. Samuel Y. Liao, "Microwave Devices and Circuits", 3/e, Pearson Education, 2003.
2. Merril. I. Skolnik, "Introduction to Radar Systems", 2/e, MGH, 2001.

Suggested Readings:

1. Rizzi P, "Microwave Devices and Circuits", 3/e, Pearson Education, 2003.
2. Annapurna Das and Sisir K Das "Microwave Engineering" 1/e, 2000, Tata McGraw-Hill.
3. Herbert J.Reich, John G.Skalnik, Philip F. Ordung, Herbert L. Krauss," Microwave Principles", East-West Pvt. Ltd. Madras.

18EC E07

PRINCIPLES AND APPLICATIONS OF AI

(Program Elective-II)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Knowledge of probability, Linear Algebra, Data Structure and programming.

Course Objectives:
This course aims to:

1. Exposure to the foundation of Artificial Intelligence.
2. Familiarize the applications of Artificial Intelligence in Industry
3. Inculcate the concepts of Neural Networks and Pattern Recognition

Course Outcomes:
Upon completion of the course, students will be able to:

1. Understand the basics of AI and intelligent agents.
2. Apply Expert Systems to solve real time problems
3. Understand knowledge representation methods.
4. Build algorithms using Clustering techniques for various applications
5. Solve the various classification problems like object recognition

UNIT-I

Introduction to AI and Intelligent Agents: Concept of AI, current status of AI, Agents, Good Behavior: Environment, problem formulation. The structure of agents. Basic concepts of Search Algorithms.

UNIT-II

Knowledge representation: Bayesiannetwork representation, Construction and inference**.** Hidden Markov Model. Approaches to knowledge representation, knowledge representation using the semantic network, extended semantic networks for Knowledge representation, knowledge representation using frames.

UNIT-III

Neural Networks: What is a neural network, the human brain, models of a neuron, neural networks as a directed graph, feedback and network architectures. Learning processes and learning tasks.

UNIT-IV

Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems, Rule-based expert systems, blackboard systems truth maintenance systems and application of expert systems.

UNIT-V

Applications and tools of Artificial Intelligence: Pre-processing, time series prediction and feature extraction. Principle Component Analysis. **Statistical Pattern Recognition:** Object recognition, Classification and regression, Concepts of Associative memories and optimization. Application of AI in speech, Image processing and IOT.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

Text Books:

1. Stuart Russell and Peter Norvig, “Artificial Intelligence—A Modern Approach”, 3rd Edition, Prentice-Hall Series, 2010.
2. Christopher M. Bishop, Clareddon, “Neural networks for pattern Recognition”, Oxford, 1995.
3. Simon Haykin, “Neural networks and learning Machines”, 3rd Edition, Pearson- Prentice Hall, 2009.
4. M. Narsimhamurty and V. Susheela Devi, “Pattern Recognition- An Algorithmic Approach", Springer Universities Press, 2011
5. B. Yegnanarayana, “Artificial Neural Networks”, PHI, 2005.

Suggested Books:

1. Elaine Rich, Kevin Knight and Shivashankar B Nair, “Artificial Intelligence”, Tata McGraw Hill Education Pvt. Ltd., 2010.
2. Flasiński, Marius, “Introduction to Artificial Intelligence”, Springer International Publisher, 2016.

18ECE11

CPLD AND FPGA ARCHITECTURES

(Program Elective-III)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Digital logic design and digital integrated circuits.

Course Objectives:
This course aims to:
1. Study various PLD, CPLDs and FPGA Architectures and its features.
2. Understand the different programming technologies, placement and routing.
3. Study the design tools for FPGA and ASICs.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Recall the fundamental concepts of Digital logic circuits and PLDs
2. Compare the performance of the various types of PLDs
3. Understand the architecture and design aspects of various CPLDs and FPGAs
4. Implement the various logic functions using PLDs and FPGAs
5. Demonstrate the VLSI tool flow for CPLD and FPGA

UNIT I
Review of Logic Design: Implementation of logic functions with multiplexers.
Programmable Logic Devices: Architectures of PROM, PLA and PAL. Implementation of MSI circuits using Programmable Logic Devices.

UNIT II
Complex Programmable Logic Devices: Introduction to CPLD Architecture of CPLD. Logic Block, I/O Block, Interconnect matrix, and features of Altera max 7000 series, AMD Mach 4 and Xilinx XC-9500 CPLD.

UNIT III
Xilinx FPGAs: Introduction to FPGA, FPGA Programming Technologies. Architecture, Logic Blocks, I/O Block, Routing Architecture and features of Xilinx XC-4000, SPARTAN-II,Virtex-II and salient features of VirtexIII to VII devices.

UNIT IV
Actel and Altera FPGAs: Anti-Fuse Programmed FPGAs: Introduction, Architecture of Actel's Act1, Act2, and Act3 FPGAs. Designing of logic circuits with the ACT devices. Logic Block, I/O Block, Routing Architecture and features of Altera's Flex 10000 series FPGA.

UNIT V
Digital Design Flow: Digital design tools for FPGAs. Digital design flow for CPLDs and FPGAs. Importance of Placement and Routing, Introduction to ASICs: Semi-Custom and Full-Custom ASICs.

Text books:

1. S. Trimberger, Edr, "Field Programmable Gate Array Technology", Springer Publication., 2011.
2. Ronald J.Tocci, Neal S. Widmer, Gregory L. Moss "Digital Systems", 10/e, Pearson academic press 2011.
3. P.K.Chan& S. Mourad, "Digital Design Using Field Programmable Gate Array", PHI, 1994.

Suggested Reading:

1. S. Brown, R.J.Francis, J.Rose, Z.G.Vranesic, “Field programmable gate array”, BSP, 2007.
2. Altera, AMD, Actel, “Manuals Xilinx”, 2015.
3. Ian Grout, “Digital Systems Design with FPGAs and CPLDs”, Elsevier, 2008
4. Bob Zeidman, ―Designing with FPGAs & CPLDs, CMP Books, Berkeley, Calif 2002.
5. John V. Oldfield, Richard C. Dorf, “Field Programmable Gate Arrays”, Wiley India.1995

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

18EC E12

DATA ANALYTICSFOR SIGNAL PROCESSING

(Program Elective-III)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Programming using MATLAB/Python, Probability and Statistics and Linear Algebra.

Course Objectives:

This course aims to:

1. Find a meaningful pattern in data.
2. Insights from data through visual representation.
3. Implementation of various machine learning algorithms.
4. Handle large scale analytics projects from various domains such as image and speech signals.
5. Develop intelligent decision support systems.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Explain data science fundamentals.
2. Explore the principles of probability and statistical theory.
3. Understand various machine learning algorithms using applied statistics.
4. Analyze supervised and unsupervised learning models with regression and classification techniques.
5. Construct various applications of image and speech processing using MATLAB/Python.

Unit-I:

Introduction to Data Analytics: **Descriptive Statistics**: The Central limit theorem, distributions of the sample mean and the sample variance for a normal population, Sampling distributions (Chi-Square, t, F, z), **Probability Distributions:, and Inferential Statistics**: Inferential Statistics through Testing of Hypothesis: Testing for Attributes – Mean of Normal Population – One-tailed and two-tailed tests, F-test and Chi-Square test, Permutation & Randomization test.

Unit-II:

Regression & ANOVA: Regression ANOVA (Analysis of Variance): One way and two-way variance. Machine Learning: Introduction and Concepts, differentiating algorithmic and model-based frameworks, Regression: Ordinary Least Squares, Ridge Regression, Lasso Regression, Regression and Classification.

Unit-III:

Supervised and Unsupervised Learning with Regression and Classification techniques : Bias-Variance Dichotomy, Model Validation Approaches, Logistic Regression, Linear Discriminant Analysis, Quadratic Discriminant Analysis, Support Vector Machines (SVM), Ensemble Methods: Random Forest, Clustering: Partitioned based Clustering - K-means Clustering, Principal Component Analysis (PCA); Hierarchical Clustering - Agglomerative- Divisive- Distance measures; Neural networks- the perceptron algorithm- multilayer perceptron's(MLP)- back propagation nonlinear regression (BPMLP)- multiclass discrimination- training procedures- dimensionality reduction interpretation.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Unit-IV:

Data Analytics in Speech processing:

Speech recognition using Python: Understanding and visualization of the Speech/Audio data, Spectral representation of speech/audio data: Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT), Spectrogram.

Natural Language Processing: Text pre-processing, Parsing and exploratory data analysis. Supervised or unsupervised model of the data, Evaluation and Deployment using Python.

Unit-V:Data Analytics in Image processing:

Transformation of images/videos data using Python: Segmentation and feature extraction, detection of relationships between variables, features and time, Extraction of time stamped variables, Image Compression using K-means Clustering.

Textbooks:

1. Hastie, Trevor, et al." The elements of statistical learning" Vol. 2. No. 1. New York: springer, 2009.
2. Montgomery, Douglas C., and George C. Runger "Applied statistics and probability for engineers" John Wiley & Sons, 2010.
3. C. Bishop, "Pattern Recognition and Machine Learning, Springer", 2006.
4. John Mueller and Luca Massaron, "Machine Learning for Dummies", John Wiley & Sons, 2016.

Suggested Reading:

1. Little, Max A. *Machine Learning for Signal Processing: Data Science, Algorithms, and Computational Statistics*. Oxford University Press, USA, 2019.
2. Chellappa, Rama, and Sergios Theodoridis. *Signal Processing Theory and Machine Learning*. Academic Press, 2014.

18ECE13

SATELLITE COMMUNICATION

(Program Elective-III)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Knowledge of fundamental concepts of analog, digital communication and antennas is required.

Course objectives:

This course aims to:

1. Develop awareness about satellite orbits, orbital mechanics and orbital effects.
2. Make the students acquire the knowledge of various satellite subsystems.
3. Make the student to design a satellite link and understand the functioning of VSATs and DBS TV.

Course outcomes:

Upon completion of this course, students will be able to:

1. Extend the fundamental concepts of analog and digital communications in understanding a basic communication satellite system and satellite orbits.
2. Apply the principles of orbital mechanics to locate the satellite and examine the orbital effects on satellites.
3. Compare the Multiple access techniques for satellite communications and demonstrate the understanding of launch mechanisms and satellite subsystems.
4. Design an appropriate satellite communication link for the given specifications
5. Appraise the working principle and related aspects of DBSTV and VSAT.

UNIT-I

Introduction to Satellite Communication: Brief history of satellite communications, satellite services, frequency allocations, basic communication satellite system – earth segment and satellite segment, advantages and applications of satellite communications, salient features of Indian communication satellites. Introduction to satellite orbits – LEO, MEO, HEO, Polar orbits, sun-synchronous orbits, geo-synchronous and geo-stationary orbits.

UNIT-II

Orbital Mechanics: Kepler's laws, describing the orbit of a satellite, locating the satellite in the orbit and with respect to earth, orbital elements.

Look Angle Determination: sub-satellite point, elevation and azimuth angle calculations, visibility test.

Orbital Perturbations: Longitudinal changes and inclination changes

Orbital Effects on Communication System Performance

UNIT-III

Launches and Launch Vehicles: Launch vehicles, placing satellites into geo-stationary orbit, salient features of Indian launch vehicles – PSLV and GSLV.

Satellite Subsystems: Attitude and orbit control system, TTC&M, power systems, communication subsystems, satellite antennas, reliability and redundancy.

Satellite Multiple Access: Comparison of FDMA, TDMA and CDMA systems in the context of satellite communications.

UNIT-IV

Satellite Link Design: Basic transmission theory, system noise temperature and G/T ratio – noise temperature, calculation of system noise temperature, noise figure and noise temperature, design of down link, uplink design, design for specified C/N – combining C/N and C/I values, overall $(C/N)_0$ with uplink and downlink attenuation, attenuation in rain, uplink attenuation and $(C/N)_{up}$, downlink attenuation and $(C/N)_{dl}$, satellite communication link design procedure.

UNIT-V

DBS TV: Introduction, power rating and number of transponders, frequencies and polarization, transponder capacity, home receiver outdoor unit and indoor unit.

VSAT: Overview, network architecture, modulation, coding and interference issues, brief introduction to VSAT antennas, indoor and outdoor units.

Text Books:

1. Timothy Pratt Charles, W Bostian, and Jeremy and E.Allnutt, “Satellite Communications”, 2/e,, John Wiley,1986.
2. Dennis Roddy, “Satellite Communications”, Fourth edition, McGraw Hill, 2006.

Suggested Reading:

1. M. Richharia, “Satellite Communication Systems: Design Principles”, McGraw Hill, 2/e, 2003.
2. Gagliardi Robert M, “Satellite Communications”, 2/e, Van Nostrand Reinhold, 1991.

18MB C01

ENGINEERING ECONOMICS AND ACCOUNTANCY

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
This course aims to:
1. To demonstrate the importance of Managerial Economics in Decision Making.
2. To explain the concept of Accountancy and provide basic knowledge on preparation of Final accounts.
3. To understand the importance of Project Evaluation in achieving a firm's Objective.

Course Outcomes:
After completion of the course, student will be able to:
1. Apply fundamental knowledge of Managerial Economics concepts and tools.
2. Analyze various aspects of Demand Analysis, Supply and Demand Forecasting.
3. Understand Production and Cost relationships to make best use of resources available.
4. Apply Accountancy Concepts and Conventions and preparation of Final Accounts.
5. Evaluate Capital and Capital Budgeting decision based on any technique.

Unit-I
Introduction to Managerial Economics
Introduction to Economics and its evolution - Managerial Economics - its Nature and Scope, Importance; Relationship with other Subjects. Its usefulness to Engineers; Basic concepts of Managerial economics - Incremental, Time perspective, Discounting Principle, Opportunity Cost, Equimarginal Principle, Contribution, Negotiation Principle.

Unit-II
Demand and Supply Analysis
Demand Analysis - Concept of Demand, Determinants, Law of demand - Assumptions and Exceptions; Elasticity of demand - Price, Income and Cross elasticity - simple numerical problems; Concept of Supply - Determinants of Supply, Law of Supply; Demand Forecasting - Methods.

Unit-III
Production and Cost Analysis
Theory of Production - Production function - Isoquants and Isocosts, MRTS, Input-Output Relations; Laws of returns; Internal and External Economies of Scale.
Cost Analysis: Cost concepts – Types of Costs, Cost-Output Relationship – Short Run and Long Run; Market structures – Types of Competition, Features, Price Output Determination under Perfect Competition, Monopoly and Monopolistic Competition; Break-even Analysis – Concepts, Assumptions, Limitations, Numerical problems.

Unit-IV
Accountancy
Book-keeping, Principles and Significance of Double Entry BookKeeping, Accounting Concepts and Conventions, Accounting Cycle, Journalization, Subsidiary books, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments. Ratio Analysis.

Unit-V
Capital and Capital Budgeting: Capital and its Significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Capital Budgeting, Methods: Traditional andDiscounted Cash Flow Methods - Numerical problems.

Suggested Readings:

1. Mehta P.L., "Managerial Economics: Analysis, Problems and Cases", Sultan Chand & Son's Educational publishers, 2016.
2. Maheswari S.N. "Introduction to Accountancy", Vikas Publishing House, 11th Edition, 2013.
3. Panday I.M. "Financial Management", 11th edition, Vikas Publishing House, 2015.
4. Varshney and K L Maheswari, Managerial Economics, Sultan Chand, 2014.
5. M. Kasi Reddy and S. Saraswathi, Managerial Economics and Financial Accounting, Prentice Hall of India Pvt Ltd, 2007.
6. A. R. Aryasri, Managerial Economics and Financial Analysis, McGraw-Hill, 2013.

18EC C23

DIGITAL SIGNAL PROCESSING LAB

Instruction	2 P Hours per Week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Prerequisite: The knowledge of basics of signals, systems, linear algebra and calculus are required.

Course Objectives:
This course aims to:
1. Simulation of DFT, FFT, Digital filters and multirate concepts using MATLAB.
2. Understand spectral analysis of noisy signals using MATLAB.
3. Implementation of digital filters on DSP Processor.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Illustrate linear convolution and correlation using MATLAB.
2. Design the digital filters using MATLAB.
3. Examine the performance of multirate techniques using MATLAB.
4. Experiment with decimator and interpolator on DSP processor.
5. Implement the digital filters on DSP processor.

List of Experiments

(A) Experiments on signal processing using MATLAB.
1. Basic matrix operations and Generation of test signals.
2. Linear Convolution, circular convolution and Correlation
3. Discrete Fourier Transform (DFT) and Fast Fourier Transform(FFT)
4. FIR filter design using different windows
5. IIR filter design: Butter worth, Chebyshev type 1 and 2: LPF, HPF, BPF & BSF filter.
6. Spectral Analysis of noisy signal using Welch's method
7. Interpolation and Decimation
8. Multistage filter
9. Structured enquiry: Hum noise reduction using FIR filter
10. Open ended enquiry: Spectral Analysis of non-stationary signals.

(B) Experiments on DSK and CCS
1. Study of procedure to work in real- time
2. Solutions of difference equations
3. Linear Convolution
4. Implementation of FIR filter
5. Implementation of second order IIR filters
6. Decimation and Interpolation

Note:
1. Minimum of 6 from Part A and 4 from Part B is mandatory.
2. For Part "A", MATLAB with different toolboxes like Signal Processing, Signal Processing block set and SIMULINK/ MATHEMATICA/ any popular software can be used.

Sample Mini Projects

1. Design the best IIR band pass filter to meet the given specifications:
   Pass band cut off frequencies: [500 600] Hz
   Stop band cut off frequencies: [525 675] Hz
   Pass band ripple: < 2dB
   Stop band attenuation: >60dB
   Phase response: Approximately linear in pass band
   Consider Butterworth, Chebyshev, Elliptic and Bessel filters
2. Design the best low pass filter to meet the given specifications:
   Pass band cut off frequency: 1K Hz
   Stop band cut off frequency: 3K Hz
   Pass band ripple: < 2dB
   Stop band attenuation: >80dB
   Group Dealy: < 5ms
   Phase response: Approximately linear in pass band
   Consider FIR and Elliptic filters.
3. Design a three stage multirate filter to meet the given specifications:
   Pass band cut off frequency: 450 Hz
   Stop band cut off frequency: 500 Hz
   Pass band ripple: <3dB
   Stop band attenuation: >40dB
   Sampling frequency: 40 KHz
   Compare with single stage filter.
4. Consider a clean speech signal of length 5000 samples and compute the Power Spectrum. Now add 0dB random noise. Compute the power spectrum using Welch and Eigen value Estimation method and also compare with the original spectrum.

Suggested Reading:

1. Vinay K. Ingle and John G. Proakis, “Digital Signal Processing using MATLAB”, 4/e, Cengage learning, 2011.
2. B. Venkataramani and M. Bhaskar, “Digital Signal Processor architecture, programming and application”, 6/e, TMH, 2006.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

18ECC24

MICROCONTROLLERS LAB

Instruction	2 P Hours per Week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Prerequisite: Basic knowledge of programming in C language.

Course Objectives:
This course aims to:
1. Develop and understand the 8051 and ARM7 C programming
2. Understand the usage of Integrated Development Environment (Keil)
3. Control the operation of various peripherals using 8051 and ARM7 microcontroller

Course Outcomes:
Upon completing this course, students will be able to:
1. Develop the programs of 8051 and ARM using their respective instruction set.
2. Understand the usage of various debugging tools available to program different microcontrollers
3. Build code for 8051 and ARM7 to interface various input/output modules
4. Analyze the hardware and software interaction and integration.
5. Design and develop the 8051 and ARM 7 based embedded systems for various applications

List of Experiments

I. 8051 Programming

1. Familiarity and use of 8051 microcontroller trainer kit, Keil IDE and simple programs under different addressing modes.
2. Assembly programming using instruction set
3. Timer and counter operations and programming using 8051.
4. Interfacing applications using LED, switch, relay and buzzer.
5. Generation of waveforms using DAC by interfacing it with 8051.
6. Stepper motor interfacing.
7. LCD interfacing.
8. Development of Embedded 'C' Code based on the module specifications. (under Structured enquiry)

II. ARM7 Programming

1. Study and use of LPC214x Microcontroller trainer kit and simple programs using its instruction set
2. Interfacing applications using LED, switch, relay and buzzer.
3. DC Motor interfacing.
4. Programming on-chip ADC.
5. Waveform generation using internal DAC.
6. Development of Embedded 'C' Code based on the module specifications. (under Structured enquiry)

III. Design an experiment related to the Embedded Application of your choice using 8051/ARM based architectures. (under Open ended enquiry)

Suggested Reading:

1. Mazidi M.A, Mazidi JG &Rolin D. Mckinlay, “The 8051 Microcontroller & Embedded Systems using Assembly and C”, 2/e, Pearson Education, 2007.
2. Philips semiconductors, “ARM 7 (LPC 214x) user manual”, 2005.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

18ECC25

MICROWAVE ENGINEERING LAB

Instruction	2 P Hours per Week
Duration of *SEE*	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:

This course aims to:

1. To understand the characteristics of Reflex Klystron Oscillator (RKO) and Gunn Oscillator.
2. To learn frequency measurement techniques using cavity wave meters.
3. To determine VSWR for various loads using slotted section.
4. To calculate power ratios at ports of various microwave components.
5. To learn measurement of impedance for various microwave loads.
6. To plot the radiation pattern for an antenna.

Course Outcomes:

Upon completing this course, students will be able to:

1. Examine the characteristics of RKO and Gunn Oscillator.
2. Compare the relation between guide wavelength, free space wavelength and cut off wavelength.
3. Measure VSWR for various loads at microwave frequencies.
4. Estimate the microwave power ratios at various ports of microwave components.
5. Evaluate unknown impedance of various microwave loads.

List of Experiments

1. Characteristics of Reflex Klystron Oscillator- To find the mode numbers and efficiencies of different modes.
2. Characteristics of Gunn diode and Gunn diode oscillator.
3. Measurement of frequency and Guide wavelength: Verification of the relation between guidewavelength, free space wavelength and cut-off wavelength.
4. Measurement of VSWR for the given loads.
5. Measurement of impedance for horn antenna, matched load, slide screw tuner etc.
6. Characteristics of Directional coupler.
7. Characteristics of E-plane, H-plane and Magic Tee.
8. Characteristics of Circulator.
9. Radiation pattern of horn antenna.
10. Study of various antennas like dipoles, loops, Yagi antenna, log periodic antenna and theirradiation pattern.
11. Structured enquiry: Calibration of given attenuator using microwave bench in X-band frequency.
12. Open ended enquiry: Measurement of impedance for inductive /capacitive window in X-band frequency.

Sample Mini Projects:

1. To design microwave components such as: Directional couplers, circulators and Hybrid junctions using Simulation software.
2. To design antenna arrays such as: Binomial, Chebyshev, using Simulation software.

References:

1. Department Laboratory Manual.
2. G.S. Raghu Vamsi, "Basic microwave techniques and Laboratory manual", 2nd Edition, New age international publishers, 2009.

18EC C26

COMPUTER NETWORKS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: A course on digital communications is required.

Course Objectives:
This course aims to:
1. Understand the division of network functionalities into layers and familiar with the components required to build different types of networks
2. Study the required functionality at each layer
3. Learn the Routing, congestion control algorithms and application layer protocols.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Relate the communication tasks with basic concept of networking, protocols and Service models at different layers.
2. Interpret the principle and function of each layer using protocols and services.
3. Model a network for random accessing to route the packets.
4. Examine the performance of network with routing algorithms and the congestion control approaches.
5. Explain the importance of protocols in each layer and layering concepts.

UNIT-I
Computer Networks and the Internet: Internet, Network Edge: Access Networksand Physical Media, The Network Core: Circuit Switching and Packet Switching, Protocol Layers and Their Service Models.

UNIT-II
Link Layer and Local Area Networks: The Data Link Layer: Introduction,Services. ALOHA, Multiple Access Protocols: Channel portioning protocols, Random access protocols. IEEE 802 standards, Local Area Networks, addressing, Ethernet, Hubs, Switches.

UNIT-III
Network Layer and Routing: Introduction, Virtual circuit and Datagram networks,Router, Internet Protocol, Routing algorithms, Broadcast and Multicast routing.

UNIT-IV
Transport Layer: Introduction and Transport layer services. Connectionlesstransport - User Datagram Protocol, Connection-oriented transport – Transmission Control Protocol.
Principles of Congestion Control: The causes and cost of congestion Control, Approaches to congestion Control.

UNIT-V
Application Layer: Principles of network applications, The Web and Hyper TextTransfer Protocol, File transfer, Electronic mail, Domain name system, Peer-to-Peer file sharing, Socket programming, Layering concepts.

Text Books:

1. J.F. Kurose and K. W. Ross, “Computer Networking – A top down approach featuring the Internet”, Pearson Education, 3rd Edition, 2005.
2. Andrew Tanenbaum and D. Wetherall, “Computer networks”, 5thEdition, Prentice-Hall, 2011
3. William Stallings, “Data and computer communications”, Prentice Hall, 8th Edition,2007.

Suggested Reading:

1. B. A. Forouzan, “Data Communications and Networking”, Tata McGraw Hill, 4th Edition,2007.
2. S. Keshav, “An Engineering Approach to Computer Networking”, Pearson Education, Second Edition, 2001.
3. L. Peterson and B. Davie, “Computer Networks – A Systems Approach”, Elsevier Morgan Kaufmann Publisher, 5th Edition, 2011.

18EC C27

VLSI DESIGN

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: A prior knowledge of Verilog HDL and MOS Transistor Theory.

Course Objectives:
This course aims to:
1. Study the concepts of Verilog HDL, simulation and synthesis process/concepts.
2. Learn the various characteristics of MOS transistor, process steps in IC fabrication.
3. Learn the various concepts required to obtain the digital logic layout diagrams. To know various subsystem design concepts.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Model a digital design using Advanced Verilog HDL constructs.
2. Analyse the characteristic behaviour of MOSFET and discuss CMOS circuit Design Process
3. Explain various process steps involved in IC fabrication.
4. Design various NMOS and CMOS based logic circuits.
5. Discuss the concepts of subsystem designs and Testing.

UNIT-I
Advanced Verilog HDL: Review of behavioural modelling**.** Functions and tasks Switch level Modelling, UDP, Design of Mealy and Moore state models using Verilog, Logic Synthesis, Synthesis Design flow, Gate level Netlist.

UNIT–II
Introduction to MOS Technology, Basic MOS Transistor action: Enhancement and Depletion Modes. Basic electrical properties of MOS, Threshold voltage and Body Effect.
MOS and CMOS circuit Design Process: MOS Layers, Stick diagrams, Lambda based Design rules and Layout diagrams.

UNIT–III
Process steps in IC fabrication Crystal growth and wafer preparation- Czochralski process- apparatus- silicon shaping, slicing and polishing- Diffusion, Ion implantation- Annealing process- Oxidation process- Lithography- Photolithography, electron beam and x-ray lithography- Chemical vapour deposition (CVD)- epitaxial growth- reactors- metallisation and packaging.

UNIT–IV
Design of MOS inverters with different loads. Basic Logic Gates with CMOS: INVERTER, NAND, NOR, AOI and OAI gates. Transmission gate logic circuits, BiCMOS inverter, D flip flop using Transmission gates.

UNIT–V
Subsystem Design: Multiplexor, Comparator, Shifters, Programmable Logic Arrays. Memories: 1T, 3T Dynamic RAM Cell, 6T Static RAM Cell. NOR and NAND based ROM Memory Design.
Testing: Introduction to Testing, Fault models, Controllability, Observability.

Text Books:

1. Samir Palnitkar, "Verilog HDL: A guide to Digital design and synthesis", 2/e, Pearson Education, 2008.
2. Kamran Eshraghian, Douglas A. Pucknell, SholehEshraghian, "Essentials of VLSI circuits and systems", PHI, 2011.
3. Neil H E Weste, David Harris, Ayan Banerjee "CMOS VLSI Design –A circuit and System Perspective", 3/e, Pearson Education, 2006.
4. S. M. Sze, VLSI Technology, McGraw-Hill, 2nd Edition, 1988.

Suggested Reading:

1. Michael D. Ciletti, "Advanced Digital Design with Verilog HDL", PHI, 2005.
2. John P. Uyemura, "Introduction to VLSI Circuits and systems", John Wiley & Sons, 2011.
3. Sung-Mo Kang & Yusuf Leblebici, CMOS Digital Integrated Circuits Analysis and Design, McGraw-Hill, 1998.

18EC E15

CRYPTOGRAPHY AND BLOCKCHAIN TECHNOLOGY

(Program Elective-IV)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Data Structures and Algorithms, Introduction to Programming.

Course Objectives:
This course aims to:
1. Provide conceptual understanding of basic concepts of cryptography.
2. Describes the Blockchain technology and its applications.
3. Introduce cryptocurrency transactions using Blockchain technology.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Comprehend the key concepts of fundamental cryptography techniques which are required for Blockchain Technology.
2. Describe the key concepts and compare various models of Blockchain Technology.
3. Understand consensus mechanism in Blockchain.
4. Acquire knowledge regarding cryptocurrency transactions and their validation.
5. Apply the concepts of Blockchain technology in real world scenario.

Unit-I

Overview of Cryptography: Introduction to Cryptography, History and development of cryptography; Cryptanalysis; Classical cryptosystems: shift, substitution and Vigenere ciphers; Attacks on shift, substitution and Vigenere ciphers; Designing a provably secure system, One -Time pads.

Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography: RSA Algorithm, Elliptical Curve Cryptography, A basic Cryptocurrency and example.

Unit-II

Introduction to Blockchain Technology:

Introduction to client-server architecture, distributed computing and their limitations. Evolution of Blockchain and how it is changing the landscape of digitalization, Block in a Blockchain, Working principles of blockchain technology.

Types of Blockchain: Public, Private and Consortium, Permissioned Model of Block chain, Public Ledgers, Smart Contracts, Transactions, Mining Mechanism, Consensus.

Unit-III

Introduction to digital wallet and types of wallets: Desktop, mobile and Meta mask/Browser based wallets.

Introduction to Bitcoin Blockchain, Working with Consensus in Bitcoin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW), HashcashPoW, Bitcoin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

Unit-IV

Bitcoin versus Ethereum, Ethereum and Smart Contracts, The Turing Completeness of Smart Contract Languages and verifications, using smart contracts to enforce legal contracts, Introduction to Hyperledger and Truffle.

Unit-V

Applications: Blockchain Technologies for IoT, Supply Chain Management in Agriculture using Blockchain and IoT.

Suggested Books

1. Paar Christof, Pelzl Jan, "Understanding Cryptography A Textbook for Students and Practitioners", Springer, 2010.
2. Joseph J. Bambara, Paul R. Allen, "Blockchain A Practical Guide to Developing Business, Law, and Technology Solutions", 1st Edition, Mc. Graw Hill, 2018.
3. Daniel Drescher, "Block Chain Basics", Apress; 1st edition, 2017.
4. Shiho Kim, Ganesh Chandra Deka, "Advanced Applications of Blockchain Technology", Springer, 2020.

Additional Reading

1. Imran Bashir, "Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Packt Publishing, 2018.
2. Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Block Chain", Packt Publishing, 2018.

18EC E16

DSP PROCESSORS AND ARCHITECTURES

(Program Elective-IV)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Knowledge of Digital Signal Processing**.**

Course Objectives:
This course aims to:

1. Learn the architectural differences between DSP and General-purpose processor.
2. Study the fixed point.
3. Study the various applications of DSP Processors.

Course Outcomes:
Upon completion of this course, students will be able to:

1. Classify the differences between DSP Processor and General-Purpose processor.
2. Understand the basic architectural needs of Programmable DSPs
3. Explain the architecture features of TMS320C55XX processor.
4. Develop on interface with TMS320C55XX processor to external peripherals.
5. Design and implement of various signal processing algorithms using 55xx processor.

UNIT- I

Introduction to DSP Processors: Differences between DSP and other microprocessor architectures. Number formats- Fixed point, Floating point and block Floating point formats, IEEE-754 Floating point, Dynamic range and precision, Relation between data word size and instruction word size, Q-notation. Basic elements of real time DSP systems, DSP Hardware

UNIT-II

Fundamentals of Programmable DSPs: Multiplier and Multiplier Accumulator, Modified Bus structures and memory access in PDSPs – Multiple access memory, multiport memory, SIMD, VLIW Architectures, Pipelining, Special addressing modes in PDSPs, On-chip peripherals.

UNIT-III

Overview of TMS320C55X: Architecture of TMS320C55X Processor, Buses, Memory map, addressing modes, Instruction set, Pipeline and parallelism, Mixed C and Assembly language programming and on-chip peripherals.

UNIT-IV

Interfacing Memory and Parallel I/O Peripherals to Programmable DSP Devices: Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct Memory Access (DMA). Software Development Tools-Code Composer Studio (CCS), C compiler, Assembler and Linker.

UNIT-V

Application Programs: Implementation of algorithms on DSP processors – Sine wave generators, Convolution, Correlation, FFT, FIR filter, IIR filter, Decimation and Interpolation and sub band coding of signals.

Text Books:

1. Sen M. Kuo and WoonSergGan, “Digital Signal Processors Architectures, Implementation and Application”, Pearson Practice Hall, 2013.
2. Avatar Singh and S. Srinivasan, “Digital Signal Processing Implementations Using DSP Microprocessors”, Thomson Brooks, 2012.

Suggested Reading:

1. B.Ventakaramani, M. Bhaskar, “Digital Signal Processors Architecture Programming and Applications”, Tata McGraw Hill, 10th reprint,2015.
2. RulphChassaing, “Digital Signal Processing and Application with the C6713 and C6416 DSK”, A John Wiley & sons, Inc, Publication,2005.
3. Sen M. Kuo, Bob H. Lee, Wenshun Tian, "Real Time Digital Signal Processing: Implementations and Applications”, Second Edition, John Wiley and sons ltd, 2006.

18EC E21

DIGITAL IMAGE PROCESSING

(Program Elective-V)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

This course aims to:

1. Understand the image formation and its digital representation.
2. Learn representation of images in frequency domain and enhancement techniques.
3. Students would be able to solve the problems related to image compression and restoration.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Describe basic concepts of image processing system.
2. Summarize and compare various digital image transform techniques.
3. Demonstrate and survey digital image enhancement in practical applications.
4. Analyse the case study related to various techniques of image restoration.
5. Apply compression techniques on digital image.

UNIT – I

Elements of Digital Image Processing Systems, Digital image representation, elements of visual perception, Image sampling and Quantization, Basic Relationships between pixels.

UNIT – II

Properties and Applications of Fourier Transform: FFT, Discrete cosine transform, Hadamard transform, Haar transform, Slant transform, DWT and Hotelling transform.

UNIT – III

Spatial Enhancement Techniques: Histogram equalization, direct histogram specification, Local enhancement. Frequency domain techniques: Low pass, High pass and Homomorphic Filtering, Image Zooming Techniques.

UNIT – IV

Image Degradation model, Algebraic approach to restoration, inverse filtering, Least mean square filter, Constrained least square restoration and interactive restoration. Speckle noise and its removal techniques.

UNIT – V

Redundancies for image compression, Huffman Coding, Arithmetic coding, Bit- plane coding, loss less and lossy predictive coding. Transform coding techniques: Zonal coding and Threshold coding.

Text Books:

1. Gonzalez R.C. and Woods R.E., "Digital Image Processing" 2/e, PHI, 2005.
2. A.K.Jain, "Fundamentals of Digital Image processing", PHI, 1989.

Suggested Reading:

1. Madhuri A, Joshi, "Digital Image Processing: An algorithmic Approach", PHI, 2006.
2. U Qidwai, C.H.Chen, "Digital Image Processing",CRC Press, (Taylor & Francis), YesdeePublications,First Indian Reprint 2013.
3. S.Jayaraman, S.Esakkirajan and T.Veerakumar, "Digital Image Processing", Tata McGraw Hill publishers, 2009

18ECE22

EMBEDDED SYSTEMS

(Program Elective-V)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisites: Computer Architecture, Microprocessors and Microcontrollers.

Course Objectives:

This course aims to:

1. Learn about fundamentals of the embedded systems
2. Understand the hardware and software details of the embedded systems.
3. Acquire knowledge on the serial, parallel and network communication protocols.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Understand the fundamentals of the embedded systems
2. Analyze the hardware and software details of the embedded systems.
3. Design interfacing of the systems with other data handling / processing systems.
4. Evaluate the performance of an embedded system using various debugging tools.
5. Apply embedded design approach for various applications.

UNIT – I

Introduction to Embedded Systems: Embedded systems versus General Computing Systems, History of embedded systems, classifications, applications areas, characteristics and quality attributes of embedded systems, Design metrics and challenges in embedded system design.

UNIT – II

Embedded Hardware and Software: Processor embedded into a system, Processor selection for embedded system, embedded hardware units and devices in a system, embedded software in a system and an overview of programming languages, challenges and issues related to embedded software development.

UNIT – III

Communication Protocols: I^2C, CAN, Firewire-IEEE 1394 Bus standard, advanced serial high-speed buses. Parallel Bus device protocols: ISA, PCI, PCI-X, Internet Enabled Systems-Network protocols: Ethernet.

UNIT – IV

Embedded Software Development Process: Embedded System design and co-design issues in system development process, Design cycle in the development phase for an Embedded Systems.Embedded software development tools: Host and Target Machines, Linker/Locators for embedded software, Embedded Software into the Target system. Issues in hardware and software design and co-design

UNIT – V

Testing, Debugging Techniques and Applications: Integration and testing of embedded hardware, testing methods, debugging techniques, Laboratory tools and target hardware debugging: Logic Analyzer, simulator, emulator and In-circuit emulator, IDE Case Study: Embedded Systems design for automatic vending machines and digital camera.

Text Books:

1. Raj Kamal, "Embedded Systems-Architecture, Programming and Design",3/e, McGraw Hill Education,2015.
2. J.W. Valvano, "Embedded Microcomputer System: Real Time Interfacing", Brooks/Cole, 2000.

Suggested Reading:

1. Shibu K V, "Introduction to Embedded systems", 1/e McGraw Hill Education,2009.
2. David E.Simon, "An Embedded software primer", Pearson Education,2004.

18EC E24

5G COMMUNICATIONS

(Program Elective-V)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Knowledge of Mobile Cellular Communication.

Course Objectives:

This course aims to:

1. Understand the requirements & concepts of 5G.
2. Expose the architecture and radio access technologies of 5G.
3. Learn Massive MIMO concepts.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Recall the requirements and used cases of 5G technology.
2. Illustrate the architecture of 5G.
3. Apply the 5G concepts to D2D communications.
4. Compare various Radio-Access Technologies.
5. Explain the concept of massive MIMO.

Unit-I

Overview of 5G: An Overview of 5G Requirements, 5G frequency bands: below 6GHz and above 6GHz, Spectrum Sharing for 5G: Introduction, Spectrum sharing scenario. Use cases and requirements: Autonomous vehicle control, Emergency communication, High-speed train, Shopping mall, Stadium, Smart city. 5G system concept: Extreme mobile broadband, Massive machine-type communication, Ultra-reliable machine-type communication.

Unit-II

5G Architecture: Introduction: NFV and SDN. Basics about RAN architecture, High-level requirements for the 5G architecture. Functional architecture and 5G flexibility: Functional split criteria, Functional split alternatives, Functional optimization for specific applications, Integration of LTE and new air interface to fulfill 5G requirements, Enhanced Multi-RAT coordination features. Physical architecture and 5G deployment: Deployment enablers, Flexible function placement in 5G deployments.

Unit-III

Device-to-device (D2D) communications:D2D: from 4G to 5G. Radio resource management for mobile broadband D2D.Multi-hop D2D communications for proximity and emergency services. Multi-operator D2D communication.

Unit - IV

5G Radio-Access Technologies: Access design principles for multi-user communications,Multi-carrier with filtering: a new waveform,Non-orthogonal schemes for efficient multiple access: NOMA, SCMA & IDMA.Radio access for dense deployments,Radio access for V2X communication,Radio access for massive machine-type communication.

Unit-V

Massive Multiple-Input Multiple-Output (MIMO) Systems: Introduction,Theoretical background: single user and multi-user MIMO, capacity of massive MIMO,Resource allocation and transceiver algorithms for massive MIMO,Fundamentals of baseband and RF implementations in massive MIMO.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Text Books:

1. Wei Xiang, Kan Zheng, Xuemin (Sherman) Shen, "5G Mobile Communications", Springerpublications-2016.
2. AfifOsseiran, Jose F. Monserrat, Patrick Marsch, "5G Mobile and Wireless Communications Technology" Cambridge University Press-2016.

Suggested Reading:

1. Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks" first edition, John Wiley & Sons, 2015.
2. Saad Z. Asif, "5G Mobile Communications Concepts and Technologies" CRC Press, 2019.
3. Angeliki Alexiou, "5G Wireless Technologies", IET Publications, 2017.

18ME O04

ENTREPRENEURSHIP

(Open Elective-II)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

This course aims to:

1. Concept and procedure of idea generation.
2. The nature of industry and related opportunities and challenges.
3. Elements of business plan and its procedure.
4. Project management and its techniques.
5. Behavioral issues and Time management.

Course Outcomes:

Upon completion of this course, the student will be able to:

1. Understand the concept and essence ofentrepreneurship.
2. Identify business opportunities and natureof enterprise.
3. Analyze the feasibility of newbusiness plan.
4. Apply project management techniques like PERT and CPM for effective planning and executionofprojects.
5. Use behavioural, leadership and time management aspects inentrepreneurialjourney

UNIT-I

Entrepreneurship: Definition, functions of entrepreneurship, qualities of entrepreneurs, identification and characteristics of entrepreneurs, entrepreneur vs. intrapreneur, first generation entrepreneurs, women entrepreneurs, conception and evaluation of ideas and their sources.

UNIT-II

Indian industrial environment: Competence, opportunities and challenges, entrepreneurship and economic growth, small scale industry in India, objectives, linkage among small, medium and heavy industries, types of enterprises, corporate social responsibility.

UNIT-III

Business plan: Introduction, elements of business plan and its salient features, business model canvas, technical analysis, profitability and financial analysis, marketing analysis, feasibility studies, executive summary, selection of technology and collaborative interactions.

UNIT-IV

Project Management: During construction phase, project organization, project planning and control using CPM, PERT techniques, Human aspects of project management, Assessment of tax burden

UNIT-V

Behavioral Aspects of Entrepreneurs: Personality, determinants, attributes and models, Leadership concepts and models, Values and attitudes, Motivation aspects,Time Management: Approaches of time management, their strengths and weaknesses. Time management matrix and the urgency addiction.

Text Books:

1. Vasant Desai, "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House, 1997.
2. Prasanna Chandra, "Project-Planning, Analysis, Selection, Implementation and Review", Tata McGrawHill Publishing Company Ltd. 1995.
3. S.S. Khanka, "Entrepreneurial Development", S. Chand & Co. Pvt. Ltd., New Delhi

Suggested Reading:

1. Robert D. Hisrich, Michael P. Peters, "Entrepreneurship", 5/e, Tata Me Graw Hill Publishing Company Ltd., 2005
2. Stephen R. Covey and A. Roger Merrill, "First Things First", Simon and Schuster Publication, 1994.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

18CS O06

FUNDAMENTALS OF DBMS

(Open Elective-II)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: File Structures.

Course Objectives:
This course aims to:
1. Learn data models, conceptualize and depict a database system using E-R diagram.
2. Understand the internal storage structures in a physical DB design.
3. Know the fundamental concepts of transaction processing techniques.

Course Outcomes:
Upon completion of this course, the student will be able to:
1. Classify the difference between FMS and DBMS; describe the roles of different users and the structure of the DBMS. Design the database logically using ER modeling
2. Outline the schema of the relational database and key constraints. Develop queries using DDL, DML and DCL of SQL.
3. Identify the inference rules for functional dependencies and apply the principles of normal forms to decompose the relations in a database.
4. Summarize the concepts of dense, sparse, ISAM and B+ tree indexing and get familiar with states and properties of transactions.
5. Interpret the locking, time stamp, graph and validation-based protocols for concurrency control.
6. Summarize log-based recovery techniques to increase the robustness of the database, identify to resolve the deadlocks in the transactions.

UNIT - I

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Database Users and Administrators Database System Architecture, Application Architectures.

Database Design and E-R Model: Basic concepts, Constraints, E-R Diagrams, E-R Design Issues, Extended E-R Features, Specialization and Generalization.

UNIT - II

Relational Model: Structure of Relational Databases, Database Schema, Keys.

Structured Query Language: Overviews, SQL Data Types, SQL Queries, Data Manipulation Language Set Operations, Aggregate Functions, Data Definition Language, Integrity Constraints, Null Values, Views, Join Expression. Index Definition in SQL.

UNIT - III

Relational Database Design: Undesirable Properties in Relational Database Design, Functional Dependencies, Trivial and Nontrivial Dependencies, Closure of Set of Functional Dependencies, Closure of Set of Attributes, Irreducible Set of Functional Dependencies, Normalization – 1NF, 2NF, and 3NF, Dependency Preservation, BCNF, Comparison of BCNF and 3NF.

UNIT - IV

Indexing: Basic concepts, Dense and Sparse Indices, Secondary Indices, Tree-Structured Indexing, Indexed Sequential Access Method (ISAM), B+ Tree Index Files.

Transaction Management: Transaction Concept – ACID Properties, States of Transaction, Implementation of Atomicity and Durability, Serializability, Recoverability.

UNIT - V

Concurrency Control: Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols.

Deadlocks Handling: Deadlock Prevention, Deadlock Detection and Recovery.

Recovery System: Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery.

Text Books:

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, "Database System Concepts", Sixth Edition, McGraw-Hill International Edition, 2011.
2. Date CJ, Kannan A, Swamynathan S, "An Introduction to Database Systems", Eight Edition, Pearson Education, 2006.

Suggested Reading:

1. Raghu Ramakrishnan, JohnnesGehrke, "Database Management Systems", Third Edition, McGraw Hill, 2003.
2. RamezElmasri, Durvasul VLN Somayazulu, Shamkant B Navathe, Shyam K Gupta, "Fundamentals of Database Systems", Fourth Edition, Pearson Education,2006.

18IT O02

PYTHON PROGRAMMING

(Open Elective-II)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

This course aims to:

1. Facilitate learning to use lists, tuples and dictionaries in Python programs.
2. Familiarize with Python file handling.
3. Impart knowledge of exception handling in Python.
4. Introduce GUI Programming.
5. Familiarize with data visualization.

Course Outcomes:

Upon completing this course, students will be able to:

1. Understand the fundamental concepts and control structures of python programming.
2. Write user defined iterative & recursive functions, identify appropriate predefined functions and perform file handling Operations.
3. Use suitable data structures such as sequences, dictionaries and sets in python programming.
4. Apply concepts of OOP, exception handling and build regular expressions using Python.
5. Design and Develop GUI based applications and visualize the data.

UNIT-I

Introduction to Python Programming: Using Python, The IDLE Programming Environment, Input and Output Processing, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, More About Data Output: New line, Item Separator, Escape Characters, Formatting parameters.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables.

Repetition Structures: Introduction, while loop, for loop, Sentinels, Input Validation Loops, Nested Loops.

UNIT-II

Functions: Introduction, Defining and Calling a Function, designing a Program to Use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Value-Returning Functions Generating Random Numbers, Writing Our Own Value-Returning Functions, the math Module, Random Module, Time Module and Storing Functions in Modules.

Python File Input-Output: Opening and closing file, various types of file modes, reading and writing to files, manipulating directories

UNIT-III

Lists and Tuples: Sequences, Introduction to Lists, List slicing, Finding Items in Lists with the in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists, Two-Dimensional Lists, Tuples.

Strings: Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings.

Dictionaries and Sets: Dictionaries, Sets, Serializing Objects.

Recursion: Introduction, Problem Solving with Recursion, Examples of Recursive Algorithms.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

UNIT-IV

Classes and Object-Oriented Programming: Procedural and Object-Oriented Programming, Classes, Working with Instances, Techniques for Designing Classes

Exception Handling: What is exception, various keywords to handle exception such try, catch, except, else, finally, raise

Regular Expressions: The match() Function, The search() Function, The sub() Function, The findall() and finditer() Functions, Flag Options

UNIT-V

GUI Programming: Graphical User Interfaces, Using the tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons.

Introduction to Plotting in Python – Basic Plots- Line and Scatter Plot, box plot, bar plots, Histograms and plotting data contained in files.

Text Book:

1. Tony Gaddis, “Starting Out with Python”, 3rd Edition, Pearson, 2015.

Suggested Reading:

1. ReemaThareja “Python Programming”, Oxford Press, 2017
2. Kenneth A. Lambert, “Fundamentals of Python”, Delmar Cengage Learning, 2013.
3. Fabio Nelli, “Python Data Analytics (With Pandas, NumPy, and Matplotlib)”, Apress, 2nd Edition, 2018.
4. James Payne, “Beginning Python using Python 2.6 and Python 3”, wrox programmer to programmer, 2010.
5. Paul Gries, “Practical Programming: An Introduction to Computer Science using Python”, 3rd Edition, 2016.

Web Resource:

1. https://www.python.org/

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

18EC C28

COMPUTER NETWORKS LAB

Instruction	2 P Hours per Week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Prerequisite: Knowledge on Digital communications and familiarity with anyone programming language like C.

Course Objectives:
This course aims to:
1. Understand Link layer concepts.
2. Understand routing algorithms in Network layer.
3. Understand the network simulator environment and visualize a network topology and observe its performance.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Apply fundamental principles of computer networking.
2. Examine the performance of design issues of Link layer.
3. Construct a network and measure its performance with different routing algorithms.
4. Create a wired and wireless Network using NS-2.
5. Analyze performance of various Network protocols using NS-2

List of Experiments

1. Implement the data link layer framing methods such as character, character stuffing and bit stuffing.
2. Implementation of Error Detection / Error Correction Techniques.
3. Construct Dijkstra's algorithm to compute the shortest path through a graph.
4. Create a subnet graph with weights indicating delay between the nodes and find routing table for any one node using link state routing algorithm.
5. Construct a broadcast tree using a subnet.
6. Create a wired network and data transmission between the nodes with at least four nodes using NS2.
7. Implementation of Stop & Wait Protocol using NS2
8. Implementation of Go Back N Protocol using NS2
9. Implementation of Selective Reject/Repeat Protocol using NS2
10. Implementation of Distance Vector Routing Protocol using NS2
11. Creation of a wireless network and data transmission between the nodes with at least four nodes using NS2.
12. Simulation of the data transfer between the nodes using TCP/UDP using for loop in NS2.

Additional Experiments based on

Structured Inquiry

13. Evaluate the performance of Data link/Network/Transport layer protocols.

Open-ended Inquiry

14. Design a Wireless Ad hoc Network and evaluate its performance.

Suggested Reading:

1. Behrouz A. Forouzan, "Data Communication and Networking", 4thEdition, McGraw-Hill Forouzan Networking Series, McGraw-Hill, 2007.
2. S. Keshav, "An Engineering Approach to Computer Networking", 2ndEdition, Addison-Wesley Professional Pearson Education, 2001.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

18EC C29

ELECTRONIC DESIGN AND AUTOMATION LAB

Instruction	2 P Hours per Week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Prerequisite: Digital design fundamentals and synthesis & simulation concepts

Course Objectives:
This course aims to:
1. Simulate and synthesize combinational and sequential logic circuits
2. Simulate switch level modules
3. Learn implementation procedure for any design on FPGA and to study the speed, power and area constraints of FPGA/CPLD

Course Outcomes:
Upon completion of this course, students will be able to:
1. Demonstrate the process steps required for simulation /synthesis
2. Develop HDL codes/scripts with appropriate syntax
3. Apply an appropriate modelling style to describe various combinational and sequential circuits in Verilog HDL
4. Examine the successful execution of the codes/ schematic using various Simulation Tools
5. Build various digital circuits on hardware boards like FPGA.

List of Experiments

Part A

Write VERILOG Code, Simulate and Implement the following on FPGA:

1. Code Converters.
2. Encoders, Decoders, Priority Encoder and Comparator.
3. Registers/Counters.
4. Sequence Detector using Mealy and Moore type state machines.
5. Any application of UDP.
6. Tasks and Functions.

Note:
1. All the codes should be implemented appropriately using Gate level, Dataflow and Behavioural Modelling.
2. All the programs should be simulated using test benches.

.

Part B

Switch Level Modelling of CMOS circuits:

1. Basic Logic Gates: Inverter, NAND and NOR.
2. Half Adder and Half Subtractor.
3. 4x1 Multiplexer.
4. 2x4 Decoder.
5. Design of NAND Gate using Simulation tool.
6. Design of NOR Gate using Simulation tool.
7. Design and layout of Inverter using Simulation tool.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Structured Enquiry Program:

1. Design and simulate a high-speed adder using Verilog HDL

Open- ended Enquiry:

1. Simulate a design using System Vivado and implement the same on Zynq Evaluation Development Board.

Suggested Reading:

1. Michal D.Ciletti, "Advanced digital design with Verilog HDL", Pearson Edition, 2011.
2. Samir Palnitkar, "Verilog HDL-A Guide to Digital Design and Synthesis",Pearson 2nd edition, 2003.
3. Cadence Design Systems (Ireland) Ltd., "Cadence manual", 2013.

18EC C30

ELECTRONICS MEASUREMENT AND SIMULATION LAB

Instruction	2 P Hours per Week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Prerequisite: Concepts of Electronic Instrumentation and expected to have logical and programming skills.

Course Objectives:
This course aims to:
1. Demonstrate various Bridges & transducers using hardware set ups.
2. Understand the importance and applications of virtual instrumentation
3. Develop real time applications using LabVIEW.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Understanding of the operational features of various analog and digital test and measurement equipment.
2. Analysis of various standard bridges and ability to measure temperature
3. Learn how to develop basic applications in the LabVIEW graphical programming environment.
4. Develop ability for programming in LabVIEW using various data structures, program structures, plotting the graphs and charts for system monitoring, processing and controlling.
5. Apply knowledge of mathematics and engineering to formulate and study or solve engineering problems, including problems at the interface of engineering.

List of Experiments

1. Designing DC bridge for Resistance measurement (Quarter, Half and Full bridge).
2. Designing of AC bridge circuit for capacitance measurement.
3. Designing of signal conditioning circuit for Temperature measurement
4. Experimental study for the characteristics of ADC and DAC.
5. Familiarization with LabVIEW simulation tool.
6. Loops, Structures and Math-script in LabVIEW.
7. Implementation of Combinational circuits (Multiplexer and Demultiplexer) using my RIO.
8. Design of Sequential circuits (Flip flops and counters) with LabVIEW.
9. FIR and IIR Filter design in LabVIEW.
10. Implementation of Analog modulation and Demodulation schemes (AM and FM) using myRIO.
11. Digital carrier modulation and demodulation schemes (ASK, FSK and PSK) with LabVIEW
12. State variable analysis with LabVIEW.
13. Frequency domain analysis (Nyquist and Bode plots) with LabVIEW.
14. Sensor data acquisition using myDAQ.
15. Voltage / Current Sweep generation using myDAQ.

Additional Experiments based on
Structured enquiry
a) Digital IIR Notch filter design / ALU design / PLL design using LabVIEW

Open-ended enquiry
b) Develop any application in Control Systems/Signal Processing/ Communication Systems using LabVIEW

Suggested Reading:
1. Nakra B.C, and Chaudhry K.K, "Instrumentation Measurement and analysis", Tata McGraw Hill Publications, 2013.
2. Jeffrey Travis, Jim Kring, "LabVIEW for Everyone: Graphical programming Made Easy and Fun", 3rd Edition, Prentice Hall, 2007.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

18ECC31

PROJECT:PART - 1

Instruction	4 P Hours per Week
Duration of SEE	--
SEE	--
CIE	50 Marks
Credits	2

Prerequisite: Knowledge of preparing slides by using power point presentations, Capable of searching for suitable literature and Presentation skills.

Course Objectives:
This course aims to:

1. The student takes up investigative study in the broad field of Engineering / Technology, either fully theoretical/practical or involving both theoretical and practical.
2. The work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor.
3. This is expected to provide a good initiation for the student(s) towards R&D.

Course Outcomes:
Upon completion of this course, students will be able to:

1. List the various approaches to the selected problem.
2. Interpret the advantages and disadvantages of various approaches.
3. Apply the selected approach for simulating / modelling / designing the problem.
4. Analyse and write a report on the results of the simulation / modelling of the problem selected.
5. Justify and present the results of the simulation / model / design before the departmental committee.

The objective of Project Part-1 is to enable the student take up investigative study in the broad field of Engineering/Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) towards R&D. The work shall include:

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminary Analysis/Modelling/Simulation/Experiment/Design/Feasibility;
4. Preparing a Written Report on the Study conducted for Presentation to the Department;
5. Final Seminar, as oral Presentation before a departmental Committee.

Guidelines for the award of Marks: Max. Marks: 50

Evaluation by	Max. Marks	Evaluation Criteria / Parameter
Supervisor	20	Project Status / Review
	5	Report
Departmental Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Preparation

18EC C32

INDUSTRIAL VISIT

Instruction	Industrial Visits
Sessional/Examination	*Grade

Course Objectives:
The objective of the Course is to:

1. Physically see the process of manufacturing procedure and steps involved.
2. Collect the information in respect of materials, sources and supply.
3. Understand the sequential stages involved in manufacturing process.
4. Understand the procedure to write the ‘industry visit’ technical report by compiling all the information collected during the visit.
5. Understand the safety procedures and precautions followed in industry, confidentiality of the process and man power required.

Course Outcomes:
Upon completion of this course, students will be able to:

1. Know the importance of visiting an engineering industry from the point of view of process of manufactory procedures and setup.
2. Summarize the required information with regard to materials, source of supply in respect to the product.
3. Know the stages in manufactory of a product.
4. Prepare the ‘industry visit’ technical report covering the details of visit and its importance.
5. Visualize the safety precautions to be followed in industry, confidentiality of the product processing as the man power required.

Students are expected to visit at least two industries during the semesters 4th and 7th and submit a detailed technical report on the study visit to the department. The department should evaluate the report through a Committee consisting of Head of the Department and two more faculty members to award the Grades *.

*Satisfactory/Unsatisfactory.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

18ECE25

IOT AND ITS APPLICATIONS

(Program Elective-VI)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Knowledge on Programming and Problem Solving, Computer Organization and Embedded systems.

Course Objectives:

This course aims to:

1. Provide an overview of Internet of Things, building blocks of IoT and the real-world applications.
2. Introduce Python Programming language and packages.
3. Introduce Raspberry Pi device, its interfaces and Django Framework.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Understand the terminology, enabling technologies and applications of IoT
2. Apply the concept of M2M and understand the basics of modern networking with the concepts of SDN and NFV.
3. Understand the basics of Python Scripting Language which is used in many IoT devices.
4. Describe the steps involved in IoT system design methodology.
5. Design simple IoT systems using Raspberry Pi board with sensors, actuators and develop web applications using python-based framework called Django.

UNIT-I

Introduction and Concepts: Introduction to Internet of Things, Definitions and Characteristics of IoT, Physical Design of IoT: Things in IoT, IoT Protocols, Logical Design of IoT, IoT Functional Blocks, IoT Communication Models, IoT Communication APIs, IoT Enabling Technologies, Wireless Sensor Networks, Cloud Computing, Communication Protocols, IoT Levels & Deployment Templates.

UNIT-II

Domain Specific IoTs: IoT applications for Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

IoT and M2M: Introduction, M2M, Differences between IoT and M2M, Software Defined Networking, Network Function Virtualization.

UNIT-III

Introduction to Python: Motivation for using Python for designing IoT systems, Language features of Python, Data types: Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions, Data Structures: Control of flow-if, for, while, range, break/continue, pass, functions, modules, packaging, Python packages of Interest for IoT: JSON, XML, HTTPLib, URLLib, SMTPLib.

UNIT-IV

IoTPlatforms Design Methodology: Introduction, IoT Design Methodology Steps-Purpose and Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device and Component Integration, Application Development, Case Study on IoT System for Weather Monitoring.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

UNIT-V

IoTPhysical Devices and End Points: Basic building blocks of an IoT device, Raspberry Pi- about the Raspberry Pi board, Raspberry Pi interfaces, Serial, SPI, I2C.

IoT Physical Servers and Cloud Offerings: Introduction to cloud storage models and Communication APIs, WAMP: AutoBahn for IoT, Xivelycloud for IoT.

Python Web Application Framework: Django Framework-Roles of Model, Template and View

Text Books:

1. ArshdeepBahga and Vijay Madisetti, "Internet of Things - A Hands-on Approach",Universities Press, 2015.
2. Tony Gaddis, "Starting out with Python", 3rd edition, Pearson, 2015.

Suggested Reading:

1. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st edition, press Publications, 2013.
2. Matt Richardson, Shawn Wallace, O'Reilly, "Getting Started with Raspberry Pi", SPD, 2014.
3. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", 1st edition, 2017

18ECE27

PRINCIPLES OF WIRELESS SENSOR NETWORKS

(Program Elective-VI)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: The student must have taken a course on data communication and computer networks.

Course Objectives:
This course aims to:

1. Obtain a broad understanding about the network architecture of wireless sensor network, characteristics of wireless sensor networks and sensor nodes.
2. Understand different constraints of wireless sensor network, like coverage, power management etc. and the principles of data transmission, clustering algorithm and routing protocols.
3. Design and development of new network architecture and MAC protocols.

Course Outcomes:
Upon completion of this course, students will be able to:

1. Recall the features, characteristics, Technology, Data transmission, protocols and design issues of wireless Sensor networks.
2. Illustrate the function of Network architecture, Routing, Protocol structure, and node problems
3. Apply the appropriate protocols and routing algorithms to solve issues in Network.
4. Analyze data processing, aggregation and routing, Protocol overheads, Throughput, Security challenges in a WSN.
5. Compare the performance of WSN in terms of topologies, technology, protocols, design principles, and security

UNIT–I
Introduction to Wireless Sensor Networks.: Features, Design challenges, Network architecture, Applications, Sensor deployment mechanism, Topologies and characteristics of Wireless Sensor Networks, Advantages of WSN.

UNIT–II
Network and Component Technologies: Mobile Adhoc Networks (MANETs)**,** Sensors, Coverage, Physical layer, Sensor platforms, Reliable data transport, Radio energy consumption model, Power management, Synchronization, Localization.

UNIT–III
Data Transmission and Routing: Data processing and aggregation, Data storage, Node discovery algorithms, Wireless sensor network routing, Proactive and Reactive routing.

UNIT–IV
Protocols: Frame structure, Network clustering protocols, Medium access control protocols, Multi-hop communication protocols, Congestion control and rate control protocols, Protocol overheads.

UNIT–V
Dependability Issues: Collisions, Collision avoidance mechanism, Hidden node and exposed node problems, Data congestions, Throughput, Security challenges. Design Principles of WSNs, Concepts of Gateway.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

Text Books:

1. Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", Wiley-2011.
2. Yan Zhang, Jijun Luo, Honglin Hu, "Wireless Mesh Networking, Architecture, Protocols and Standards", 1st edition, Auerbach Publications, 2006.
3. Edgar H. Callaway Jr. and Edgar H. Callaway, "Wireless Sensor Networks: Architectures and Protocols", 1st edition, Auerbach Publications, 2003.

Suggested Reading:

1. Yang, Shuang-Hua, "Wireless Sensor Networks Principles, Design and Applications", Springer, 2014.
2. KazemSohraby, Daniel Minoli, TaiebZnati, "Wireless Sensor Networks: Technology, Protocolsand Applications", Wiley, 2007.
3. Mohammad S. Obaidat, SudipMisra, "Principles of Wireless Sensor Networks", Cambridge University Press, 2014.

18EGO02

GENDER SENSITIZATION

(Open Elective-III)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives

This course aims to:

1. Sensibility regarding issues of gender in contemporaryIndia.
2. A critical perspective on the socialization of men and women.
3. Popular debates on the politics and economics of work while helping them reflect critically on gender violence.

Course Outcomes

Upon completion of this course, the student will be able to:

1. Understand the difference between “Sex” and “Gender” and be able to explain socially constructed theories of identity.
2. Recognize shifting definitions of “Man” and “Women” in relation to evolving notions of “Masculinity” and “Femininity”.
3. Appreciate women’s contributions to society historically, culturally and politically.
4. Analyze the contemporary system of privilege and oppressions, with special attention to the ways gender intersects with race, class, sexuality, ethnicity, ability, religion, and nationality.
5. Demonstrate an understanding of personal life, the workplace, the community and active civic engagement through classroom learning.

UNIT- I

Understanding Gender:
Gender: Why Should We Study It? (Towards a World of Equals: Unit -1)
Socialization: Making Women, Making Men (Towards a World of Equals: Unit -2)
Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT- II

Gender and Biology:
Missing Women: Sex Selection and Its Consequences (Towards a World of Equals: Unit -4)
Declining Sex Ratio. Demographic Consequences.
Gender Spectrum: Beyond the Binary (Towards a World of Equals: Unit -10) Two or Many? Struggles with Discrimination.

UNIT- III

Gender and Labour:
Housework: The Invisible Labour (Towards a World of Equals: Unit -3)
“My Mother doesn’t Work.” “Share the Load.”
Women’s Work: Its Politics and Economics (Towards a World of Equals: Unit -7)
Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT-IV

Issues of Violence
Sexual Harassment: Say No! (Towards a World of Equals: Unit -6)
Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: “Chupulu”.
Domestic Violence: Speaking Out (Towards a World of Equals: Unit -8)
Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading:New Forums for Justice.
Thinking about Sexual Violence (Towards a World of Equals: Unit -11)
Blaming the Victim - “I Fought for my Life….” - Additional Reading: The Caste Face ofViolence.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

UNIT – V
Just Relationships: Being Together as Equals (Towards a World of Equals: Unit -12)
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers.
Additional Reading: Rosa Parks-The Brave Heart.

TextBooks:

1. A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote,VasudhaNagaraj, AsmaRasheed, GoguShyamala, DeepaSreenivas and Susie Tharu "Towards a World of Equals: A Bilingual Textbook on Gender" published by Telugu Akademi, Hyderabad, Telangana State, 2015.

Suggested Reading:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012.
2. Abdulali Sohaila. "I Fought for My Life…and Won. "Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

Web Resources:

1. https://aifs.gov.au/publications/gender-equality-and-violence-against-women/introduction
2. https://theconversation.com/achieving-gender-equality-in-india

Note: Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fieldsof English Literature or Sociology or Political Science or any other qualified faculty who hasexpertise in this field from engineering departments.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

18CS O10

MACHINE LEARNING USING PYTHON

(Open Elective-III)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

This course aims to:

1. Get an idea of Machine Learning algorithms to solve real world problems.
2. Study various machine learning algorithms.
3. Analyze data using machine learning techniques.

Course Outcomes:

Upon completion of this course, the student will be able to:

1. Define the basic concepts related to Python and Machine Learning
2. Describe the feature engineering methods, regression techniques and classification methods
3. Apply Python packages for data visualization. text and time series data analysis using NLP toolkit
4. Evaluate and interpret the results of the various machine learning techniques
5. Solve real world problems using deep learning framework

UNIT - I

Introduction to Machine Learning: Introduction, Machine Learning process.

Introduction to Python: Features, sources and installation of Python, IDEs, Basics of Python, Data Structures and loops.

UNIT - II

Feature Engineering: Introduction to Features and need of feature Engineering, Feature extraction and selection, Feature Engineering Methods, Feature Engineering with Python.

Data Visualization: Various charts, histograms, plots.

UNIT - III

Regression: Simple and multiple regressions, Model assessment, various types of errors, errors, ridge regression, Lasso regression, non-parameter regression.

Classification: Linear classification, logistic regression, Decision Trees, Random Forest, Naïve Bayes.

UNIT - IV

Unsupervised Learning: Clustering, K-Means clustering, Hierarchical clustering.

Text Analysis: Basic text analysis with Python, regular expressions, NLP, text classification.

Time Series Analysis: Date and time handling, window functions, correlation, time series forecasting.

UNIT - V

Neural Network and Deep Learning: Neural network- gradient descent, activation functions, parameter initialization, optimizer, loss function, deep learning, deep learning architecture, memory, deep learning framework.

Recommender System: Recommendation engines, collaborative filtering.

Text Books:

1. Abhishek Vijavargia "Machine Learning using Python", BPB Publications, 1st Edition, 2018
2. Tom Mitchel "Machine Learning", Tata McGraw Hill, 2017
3. Reema Thareja "Python Programming", Oxford Press, 2017.

Suggested Reading:

1. Yuxi Liu, Python Machine Learning by Example, 2^{nd} Edition, PACT, 2017.

Online Resources:

1. https://www.guru99.com/machine-learning-tutorial.html
2. https://www.tutorialspoint.com/machine_learning_with_python/index.htm
3. https://www.tutorialspoint.com/python/
4. https://docs.python.org/3/tutorial/
5. https://www.geeksforgeeks.org/machine-learning/

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

18EC C33

TECHNICAL SEMINAR

Instruction	3 P Hours per Week
Duration of SEE	--
SEE	--
CIE	50 Marks
Credits	1

Prerequisite: Student must have completed Project: Part - 1

Course Objectives:

1. To introduce students to critical reading, understanding, summarizing, explaining and preparing report on state-of-the-art topics in a broad area of his/her specialization.
2. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.
3. Documenting the seminar report in a prescribed format.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Collect, Organize, Analyze and Consolidate information about emerging technologies from the literature.
2. Exhibit effective communication skills, stage courage, and confidence.
3. Demonstrate intrapersonal skills.
4. Explain new innovations/inventions in the relevant field.
5. Prepare and experience in writing the Seminar Report in a prescribed format.

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state-of-the-art topics in a broad area of his/ her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

The seminar must be clearly structured and the power point presentation shall include following aspects:
1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Each student is required to:
1. Submit a one-page synopsis of the seminar talk for display on the notice board.
2. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes in PowerPoint, followed by Question and Answers session for 10 minutes.
3. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by the department.

Seminars are to be scheduled from 3rd week to the last week of the semester and any change in schedule shall be discouraged.

For the award of sessional marks, the students are judged by three (3) faculty members and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation.

Note: Topic of the seminar shall be preferably from any peer reviewed recent Journal publications.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Guidelines for awarding marks (CIE): Max. Marks: 50		
S.No	**Description**	**Max. Marks**
1	Contents and relevance	10
2	Presentation skills	10
3	Preparation of PPT slides	05
4	Questions and answers	05
5	Report in a prescribed format	20

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

18ECC34

PROJECT: PART-2

Instruction	10 PHours per Week
Duration of SEE	Viva Voce
SEE	100 Marks
CIE	100 Marks
Credits	10

Prerequisite: Student must have earned the credit of 'Project: Part - 1'.

Course Objectives:
1. The object of Project: Part2 is to enable the student extend further the investigative study, either fully theoretical/practical or involving both theoretical and practical work.
2. The work shall be carried out under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry.
3. Preparing an Action Plan for conducting the investigation, including team work;

Course Outcomes:
Upon completion of this course, students will be able to:
1. Recall the details of the approach for the selected problem.
2. Interpret the approach to the problem relating to the assigned topic.
3. Determine the action plan to conduct investigation.
4. Analyze and present the model / simulation /design as needed.
5. Evaluate, present and report the results of the analysis and justify the same.

The objective of 'Project: Part-2' is to enable the student extend further the investigative study taken up, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned;
2. Review and finalization of the Approach to the Problem relating to the assigned topic;
3. Preparing an Action Plan for conducting the investigation, including team work;
4. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed;
5. Final development of product/process, testing, results, conclusions and future directions;
6. Preparing a paper for Conference presentation/ Publication in Journals, if possible;
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar presentation before Departmental Committee.

Guidelines for awarding marks in CIE: (**Max. Marks: 100**)

Evaluation by	Max. Marks	Evaluation Criteria / Parameter
Department Review Committee	10	Review 1
	15	Review 2
	25	Submission
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	10	Quality of the work which may lead to publications
	10	Report Preparation
	10	Analytical / Programming / Experimental Skills

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Guidelines for awarding marks in **SEE**: (**Max. Marks: 100**)

Evaluation by	**Max. Marks**	**Evaluation Criteria / Parameter**
External and Internal Examiners together	20	Power Point Presentation
	40	Thesis Evaluation
	20	Quality of the project • Innovations • Applications • Live Research Projects • Scope for future study • Application to society
	20	Viva-Voce

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20EC C102

ADVANCED DIGITAL SIGNAL PROCESSING

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: The knowledge of DSP is required.

Course Objectives:
This course aims to:
1. Analyze digital IIR and FIR filters for the given specifications.
2. Understand the basic concepts of Multirate digital signal processing.
3. Learn the various parametric and non-parametric spectral estimation methods.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Design digital filters for the given specifications.
2. Interpret the concepts of Multirate digital signal processing.
3. Understand the concepts of linear prediction filters.
4. Analyze various Power Spectral Estimation methods for random signals
5. Develop the various applications of Digital signal processing.

UNIT-I
Review of Digital Filters: FFT Algorithms, review of digital filter design and structures-Basic FIR/IIR filter design &structures, design techniques of linear phase FIR filters, IIR filters by impulse invariance, bilinear transformation, Cascaded, lattice structures and parallel realization of FIR and IIR filters.

UNIT-II
Multirate DSP: Introduction, Decimator and Interpolator, Sampling rate conversion, multistage decimator and interpolator,polyphase filters, Uniform digital filter banks, two channel Quadrature Mirror Filter bank- perfect reconstruction conditions.

UNIT-III
Linear Prediction &Optimum Linear Filters: Introduction to discrete random signals, Power Density spectrum, Ergodic process. Forward-backward linear prediction filters, solution of normal equations, AR Lattice and ARMA Lattice-Ladder Filters, FIR and IIR Wiener filters.

UNIT-IV
Power Spectrum Estimation: Estimation of Spectra from Finite-Duration Observations of Signals, NonparametricMethods for Power Spectrum Estimation-Bartlett and Welch methods. Parametric methods for Power Spectrum Estimation-Yule Walker method and Burg method. Minimum-Variance Spectral Estimation, Eigen analysis Algorithms for Spectrum Estimation, Piserenko method and MUSIC algorithm.

UNIT-V
Applications of Digital Signal Processing: Dual-Tone Multi frequency Signal Detection, Spectral analysis of sinusoidal signals, Non-stationary signals and Random signals, sub band coding of speech signals, JPEG-2000, Trans multiplexers, Introduction to wavelets.

Text Books:

1. J.G.Proakis and D.G.Manolakis, "Digital signal processing: Principles, Algorithm andApplications", 4th Edition, Prentice Hall, 2007.
2. Sanjit. K. Mitra, "Digital signal processing", 3rd edition, McGraw Hill,2006.

Suggested Reading:

1. Emmanuel Ifeachor, Barrie W.Jervis, "Digital signal Processing, A Practical Approach", 2nd edition, Pearson, 2011.
2. Roberto Cristi, "Modern Digital signal Processing", Cengage learning, 2012.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20EC C104

WIRELESS AND MOBILE COMMUNICATION

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Requires concepts of Electromagnetic theory, Antennas and Wave propagation and Digital Communication.

Course Objectives:
This course aims to:
1. Facilitate the understanding of the basics of Cellular System design Fundamentals and Large-scale propagation models
2. Provide the concepts of small-scale fading and Equalization.
3. Build knowledge on multiple access techniques, GSM and Cellular Standards.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Understand and apply frequency-reuse concept in mobile communications, and to analyze its effects on interference, system capacity, handoff techniques.
2. Analyze path loss and interference for wireless telephony and their influences on a mobile-communication system's performance.
3. Distinguish various multiple-access techniques for mobile communications and their advantages and disadvantages.
4. Evaluate GSM and CDMA systems by functioning with knowledge of forward and reverse channel details, advantages and disadvantages of using these technologies.
5. Devising the higher generation Cellular standards 3G, 4G & 5G.

UNIT-I
The Cellular Concept System Design Fundamentals: Frequency reuse, Frequency management, Channel Assignment Strategies, Handoff Strategies, Co-channel Interference, Adjacent channel interference, Power control for Reducing Interference, Cell Splitting and Sectoring.

UNIT-II
Mobile Radio Propagation Large Scale Path Loss: Free space propagation model, Reflection, Ground Reflection (Two-Ray) model, Diffraction: Knife – edge Diffraction Model, Scattering, Practical link budget design using path loss models: Log Normal Shadowing, Determination of percentage of coverage area, Outdoor propagation models: Okumura and Hata models, Indoor propagation models: Partition losses (same floor), Partition losses between floors, Signal penetration into buildings.

UNIT-III
Mobile Radio Propagation Small Scale Fading and Multipath: Impulse response model, Spread Spectrum Sliding Correlator Channel Sounding, Parameters of Mobile Multipath Channels, Types of Small-Scale Fading: Flat Fading, Frequency selective Fading, Fast Fading and Slow Fading.

UNIT-IV
Equalization: Fundamentals of Equalization, Training a Generic Adaptive Equalizer, Equalizers in Communication Receiver, Linear Equalizers, Non-Linear Equalizers: Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for Adaptive Equalization: Zero Forcing Algorithm and Least Mean Square Algorithm.

UNIT-V

Multiple Access Techniques: FDMA, TDMA and CDMA. Comparison of these technologies based on their signal separation, Advantages and Disadvantages.

GSM System: Architecture and Interfaces, Subsystems, Logical channels, HSCSD, GPRS and EDGE.

IS-95 System: Architecture, Air interface, Physical and Logical channels, Evolution of CDMA One to CDMA 2000.

Higher Generation Cellular Standards: 3G, 4G, VoLTE, UMTS, Introduction to 5G.

Text Books:

1. T.S.Rappaport, "Wireless Communications Principles and Practice", 2nd edition, PHI,2002.
2. William C.Y.Lee, "Mobile Cellular Telecommunications Analog and Digital Systems", 2ndedition, TMH, 1995.
3. V.K.Garg and J.E.Wilkes, "Principle and Application of GSM", Pearson Education, 5th edition, 2008.

Suggested Reading:

1. V.K.Garg, "IS-95 CDMA & CDMA 2000", Pearson Education, 4th edition, 2009.
2. AshaMehrotra, "A GSM system Engineering" Artech House Publishers Boston, London,1997.

20ME M103

RESEARCH METHODOLOGY AND IPR

(Mandatory Course)

Instruction	2 L Hours per Week
Duration of SEE	2 Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

Course Objectives:
This course aims to:
1. Motivate to choose research as career
2. Formulate the research problem, prepare the research design
3. Identify various sources for literature review and data collection report writing
4. Equip with good methods to analyze the collected data
5. Know about IPR copyrights

Course Outcomes:
Upon completion of this course, students will be able to:
1. Define research problem, review and asses the quality of literature from various sources
2. Improve the style and format of writing a report for technical paper/ Journal report, understand and develop various research designs
3. Collect the data by various methods: observation, interview, questionnaires
4. Analyze problem by statistical techniques: ANOVA, F-test, Chi-square
5. Understand apply for patent and copyrights

UNIT-I
Research Methodology: Research Methodology: Objectives and Motivation of Research, Types of Research, research approaches, Significance of Research, Research Methods verses Methodology, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India, Benefits to the society in general. Defining the Research Problem: Selection of Research Problem, Necessity of Defining the Problem

UNIT-II
Literature Survey Report Writing: Literature Survey: Importance and purpose of Literature Survey, Sources of Information, Assessment of Quality of Journals and Articles, Information through Internet. Report writing: Meaning of interpretation, layout of research report, Types of reports, Mechanics of writing a report. Research Proposal Preparation: Writing a Research Proposal and Research Report, Writing Research Grant Proposal

UNIT-III
Research Design: Research Design: Meaning of Research Design, Need of Research Design, Feature of a Good Design, Important Concepts Related to Research Design, Different Research Designs, Basic Principles of Experimental Design, Developing a Research Plan, Steps in sample design, types of sample designs.

UNIT-IV
Data Collection and Analysis: Data Collection: Methods of data collection, importance of Parametric, non-parametric test, testing of variance of two normal population, use of Chi-square, ANOVA, F-test, z-test

UNIT-V
Patents and Copyright: Patent: Macro economic impact of the patent system, Patent document, how to protect your inventions. Granting of patent, Rights of a patent, how extensive is patent protection. Copyright: What is copyright. What is covered by copyright? How long does copyright last? Why protect copyright? Related Rights: what are related rights? Enforcement of Intellectual Property Rights: Infringement of intellectual property rights, Case studies of patents and IP Protection

Text Books:

1. C.R Kothari, "Research Methodology, Methods & Technique"; New Age International Publishers, 2004
2. R. Ganesan, "Research Methodology for Engineers", MJP Publishers, 2011
3. Y.P. Agarwal, "Statistical Methods: Concepts, Application and Computation", Sterling Publs., Pvt., Ltd., New Delhi, 2004.

Suggested Reading:

1. AjitParulekar and Sarita D' Souza, "Indian Patents Law – Legal & Business Implications"; Macmillan India ltd, 2006
2. B. L.Wadehra; "Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications"; Universal law Publishing Pvt. Ltd., India 2000.
3. P. Narayanan; "Law of Copyright and Industrial Designs"; Eastern law House, Delhi 2010

20EC E103

GLOBAL NAVIGATION SATELLITE SYSTEMS

(Program Elective)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: A prior knowledge of fundamental concepts of satellite communication is required.

Course Objectives:

This course aims to:

1. Explain the basic principles of various positioning techniques and introduce GPS operating principle, signal structure.
2. Make the students to understand errors affecting GNSS performance and analyze various parameters of RINEX data.
3. Make the students appreciate the significance of other GNSS systems, principle of DGPS and augmentation systems.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Apply the concepts of satellite communications in understanding the principle of operation of various navigation systems and GPS fundamentals.
2. Analyze GPS signal structure and receiver functioning and compare coordinate systems and datum.
3. Interpret the effect of various error sources and satellite geometry on the performance of GNSS and explain the necessity of GPS modernization and importance of integration aspects.
4. Develop data processing methods using observation and navigation data for GPS and DGPS.
5. Compare other global and regional navigational systems and assess the performance of various augmentation systems.

UNIT-I:

GPS Fundamentals: INS, Trilateration, Hyperbolic navigation, Transit, GPS principle of operation, architecture, operating frequencies, orbits, Keplerian elements.Solar and Sidereal days, GPS and UTC Time.

UNIT-II:

GPS Signals: Signal structure, C/A and P-Code, ECEF and ECI coordinate systems and WGS 84 and Indian Datums, Important components of receiver and specifications, link budget.

UNIT-III:

GPS Error Models: Ionospheric error, Tropospheric error, Ephemeris error, Clock errors, Satellite and receiver instrumental biases, Antenna Phase center variation, multipath; estimation of Total Electron Content (TEC) using dual frequency measurements, Various DOPs, UERE. Spoofing and Anti-spoofing: Future GPS satellites, new signals and their benefits GPS integration – GPS/GIS, GPS/INS, GPS/pseudolite, GPS/cellular.

UNIT-IV:

GPS Data Processing, DGPS and Applications: RINEX Navigation and Observation formats, Code and carrier phase observables, linear combination and derived observables, Ambiguity resolution, cycle slips, Position estimation. Principle of operation of DGPS, architecture and errors.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

UNIT-V:

Other Constellations and Augmentation Systems: Other satellite navigation constellations: GLONASS, Galileo, Beidou and QZSS.

IRNSS: Architecture, signals, advantages and limitations,

SBAS and GBAS: Relative advantages of SBAS and GBAS, Wide area augmentation system (WAAS) architecture, GAGAN, EGNOS and MSAS. Local area augmentation system (LAAS) concept.

Text Books:

1. B.HofmannWollenhof, H.Lichtenegger, and J.Collins, "GPS Theory and Practice", Springer Wien, New York, 2000.
2. PratapMisra and Per Enge, "Global Positioning System Signals, Measurements, and Performance", Ganga-Jamuna Press, Massachusetts, 2001.

Suggested Reading:

1. Ahmed El-Rabbany, "Introduction to GPS", Artech House, Boston, 2002.
2. Bradford W. Parkinson and James J. Spilker, "Global Positioning System: Theory and Applications", Volume II, American Institute of Aeronautics and Astronautics, Inc., Washington, 1996.

20EC E112

SOFTWARE DEFINED AND COGNITIVE RADIO

(Program Elective)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: A prior knowledge of signal processing, Communication and spectral knowledge is required.

Course Objectives:
This course aims to:
1. Make the students understand the difference between Superhetrodyne Radio and Software defined Radio
2. Differentiate between Cognitive Radio (CR) and SDR and study their architectures.
3. Make the students know about the CR signal processing Techniques and applications.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Explain the difference between the super-heterodyne receiver, Software Defined Radio and Cognitive Radio.
2. Analyze the different architectures of SDR and CR used for real time systems.
3. Evaluate and choose the various spectrum sensing methods based on application.
4. Implement various signal processing techniques for CR networks.
5. Choose the USRP and WARP boards based on the facilities required for a CR application.

UNIT-I
Introduction to SDR: What is Software-Defined Radio, The Requirement for Software-Defined Radio, Legacy Systems, The Benefits of Multi-standard Terminals, Economies of Scale, Global Roaming, Service Upgrading, Adaptive Modulation and Coding, Operational Requirements, Key Requirements, Reconfiguration Mechanisms, Handset Model, New Base-Station and Network, Architectures, Separation of Digital and RF, Tower-Top Mounting, BTS Hoteling, Smart Antenna Systems, Smart Antenna System Architectures.

UNIT-II
Basic Architecture of a Software Defined Radio: Software Defined Radio Architectures, Ideal Software Defined Radio Architecture, Required Hardware Specifications, Digital Aspects of a Software Defined Radio, Digital Hardware, Alternative Digital Processing Options for BTS Applications, Alternative Digital Processing Options for Handset Applications, Current Technology Limitations, A/D Signal-to-Noise Ratio and Power Consumption, Impact of Superconducting Technologies on Future SDR Systems.

UNIT-III
Signal Processing Devices and Architectures: General Purpose Processors, Digital Signal Processors, Field Programmable Gate Arrays, Specialized Processing Units, Tilera Tile Processor, Application-Specific Integrated Circuits, Hybrid Solutions, Choosing a DSP Solution. GPP-Based SDR, Non real time Radios, High-Throughput GPP-Based SDR, FPGA-Based SDR, Separate Configurations, Multi-Waveform Configuration.

UNIT-IV
Cognitive Radio: Techniques and signal processingHistory and background, Communication policy and Spectrum Management, Cognitive radio cycle, Cognitive radio architecture, SDR architecture for cognitive radio, Spectrum sensing Single node sensing: energy detection, cyclo-stationary and wavelet-based sensing- problem formulation and performance analysis based on probability of detection versus SNR. Cooperative sensing: different fusion rules, wideband spectrum sensing- problem formulation and performance analysis based on probability of detection versus SNR.

UNIT-V

Cognitive Radio: Hardware and Applications: Spectrum allocation models. Spectrum handoff, Cognitive radio performance analysis.Hardware platforms for Cognitive radio (USRP and WARP), details of USRP board, Applications of Cognitive radio

Text Books:

1. Peter B. Kenington,"RF and Baseband Techniques for Software Defined Radio", Artech House, Inc © 2005.
2. Eugene Grayver,"Implementing Software Defined Radio", Springer, New York Heidelberg Dordrecht London, ISBN 978-1-4419-9332-8 2013.
3. Bruce A. Fette, "Cognitive Radio Technology", Elsevier, ISBN 10: 0-7506-7952-2, 2006.

Suggesting Reading:

1. Hüseyin Arslan, "Cognitive Radio, Software Defined Radio and Adaptive Wireless Systems", Springer, ISBN 978-1-4020-5541-6 (HB), 2007.

20EGA101

ENGLISH FOR RESEARCH PAPER WRITING

(Audit Course)

Instruction	2 L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	--
Credits	Non-Credit

Course Objectives:
This course aims to:
1. To the various purposes of Research Papers and help them infer the benefits and limitations of research.
2. To developing the content, formulating a structure and illustrating the format of writing a research paper.
3. In differentiating between qualitative and quantitative research types.
4. To constructing paragraphs and developing thesis statement.
5. To producing original research papers while avoiding plagiarism.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Illustrate the nuances of research paper writing and draw conclusions about the benefits and limitations of research.
2. Classify different types of research papers and organize the format and citation of sources.
3. Review the literature and categorize between different types of research.
4. Draft paragraphs and write thesis statement in a scientific manner.
5. Develop an original research paper while acquiring the knowledge of how and where to publish their papers.

UNIT-I
Academic Writing
Meaning & Definition of a research paper– Purpose of a research paper – Scope – Benefits – Limitations – outcomes.

UNIT-II
Research Paper Format
Title – Abstract – Introduction – Discussion – Findings – Conclusion – Style of Indentation – Font size/Font types – Indexing – Citation of sources.

UNIT-III
Research Methodology
Methods (Qualitative – Quantitative) Review of Literature. Criticizing, Paraphrasing & Plagiarism.

UNIT-IV
Process of Writing a Research Paper
Choosing a topic - Thesis Statement – Outline – Organizing notes - Language of Research – Word order, Paragraphs – Writing first draft–Revising/Editing - The final draft and proof reading.IEEE Style.

UNIT-V
Research Paper Publication
Reputed Journals – National/International – ISSN No, No. of volumes, Scopus Index/UGC Journals – Freepublications - Paid Journal publications – /Advantages/Benefits

Text Book:
1. C. R Kothari, Gaurav, Garg, Research Methodology Methods and Techniques, New Age International Publishers. 4th Edition.

Suggested Reading:

1. Day R, "How to Write and Publish a Scientific Paper", Cambridge University Press, 2006.
2. MLA "Hand book for writers of Research Papers", East West Press Pvt. Ltd, New Delhi, 7th Edition.
3. Lipson, Charles(2011), Cite Right: A Quick Guide to Citation Styles; MLA, APA, Chicago,The Sciences, Professions, and more (2nd Edition). Chicago [u.a]: University of Chicago Press.

Online Resources:

1. NPTEL: https://onlinecourses.nptel.ac.in/noc18_mg13/preview
2. NPTEL: https://nptel.ac.in/courses/121/106/121106007/
3. https://www.classcentral.com/course/swayam-introduction-to-research-5221

20EC C106

ADVANCED DIGITAL SIGNAL PROCESSINGLAB

Instruction	4 P Hours per Week
Duration of SEE	--
SEE	--
CIE	50 Marks
Credits	2

Prerequisite: The knowledge of signal processing algorithms and MATLAB are required.

Course Objectives:
This course aims to:
1. Simulation of FFT, Multirate concepts using MATLAB.
2. Spectral analysis of noisy signals using MATLAB.
3. Implementation of digitalfilters using MATLAB.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Implement FFT algorithms for linear filtering and correlation using MATLAB.
2. Design and realize of the digital filters using MATLAB.
3. Experiment with multirate techniques using MATLAB.
4. Perform parametric and non-parametric estimation of PSD using MATLAB.
5. Design and Implement the adaptive filters using MATLAB.

List of Experiments:
1. FFT of input sequence and comparison with DFT.
2. Design of IIR Butterworth, Chebyshev type-I &II, Elliptic LPF, HPF, BPF &BSF and calculate Group delay.
3. Design of FIR LPF, HPF, BPF &BSF using windows. Multiband FIR filter and calculate Group delay.
4. State space matrix representation from difference equation
5. Solution of normal equation using Levinson Durbin
6. Decimation and Interpolation using rational factors
7. Design a Multistage decimator multirate filter
8. Maximally decimated analysis DFT filter bank
9. Cascade and parallel realization of digital IIR filter
10. Convolution and M fold Decimation.
11. Parametric Estimation of PSD
12. Nonparametric Estimation of PSD
13. Design of Adaptive filter using LMS algorithm.

Sample Mini Projects:

1. Design the best IIR band pass filter to meet the given specifications:
   Pass band cut off frequencies: [500 600] Hz
   Stop band cut off frequencies: [525 675] Hz
   Pass band ripple: ≤ 2dB
   Stop band attenuation: ≥ 60dB
   Phase response: Approximately linear in pass band Consider Butterworth, Chebyshev, Elliptic and Bessel filters
2. Design a three stage multirate filter to meet the given specifications:
   Pass band cut off frequency: 450 Hz
   Stop band cut off frequency: 500 Hz
   Pass band ripple: ≤ 3dB
   Stop band attenuation: ≥ 40dB
   Sampling frequency: 40 KHz
   Compare with single stage filter.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

3. Consider a clean speech signal of length 5000 samples and compute the Power Spectrum. Now add 0dB random noise. Compute the power spectrum using Welch and Eigen value Estimation method and also compare with the original spectrum.

4. Design a speech signal compression using octave filter banks and also calculate the compression ratio.

Suggested Reading:

1. Vinay K. Ingle and John G. Proakis, "Digital Signal Processing using MATLAB", 4^{th}edition, Cengage learning, 2011.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

20EC C108

WIRELESS AND MOBILE COMMUNICATION LAB

Instruction	4 P Hours per Week
Duration of SEE	--
SEE	--
CIE	50 Marks
Credits	2

Prerequisite: Requires concepts of Electromagnetic theory, Antennas & Wave propagation and Digital Communication.

Course Objectives:
This course aims to:
1. Facilitate the experimental setup for understanding the Cellular concepts and experiments using GSM and CDMA.
2. Provide the facility to learn AT commands in 3G networks andDSSS technique for CDMA to observe various spread spectrum parameters.
3. Build knowledge on concepts of software radio by studying building blocks such as Baseband and RF section.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Appraising Cellular concepts, GSM and CDMA networks.
2. Experimenting with GSM handset and fault insertion techniques.
3. Illustrate 3G communication system by means of various AT commands usage in GSM.
4. Testing on DSSS kit for implementing CDMA concept.
5. Develop concepts of Software Radio in real time environment

List of Experiments:

1. Study of DSSS technique for CDMA to observe effect of PN codes, Chip rate, Spreading factor and Processing gain.
2. Study of GSM handset for various signaling and Fault insertion techniques (Major GSM handset sections: clock, SIM card, charging, LCD module, Keyboard, User interface).
3. Study Transmitter and Receiver sections in Mobile Handset and also measure GMSK modulated signal.
4. Study various GSM AT Commands such as SMS and HTTP.
5. Study File system by AT commands in 3G network.
6. Establishing Call Setup, Estimation of Coverage area and Capacity in GSM and CDMA.
7. Develop concepts of Software radio by studying building blocks such as Baseband and RF section.
8. Develop Convolutional Encoder, Interleaver and De-Interleaver in Software Radio.
9. Study and analyze different modulation techniques in time and frequency domains using SDR Kit.
10. Estimation of GPS satellite position using RINEX data.
11. Estimation of key performance parameters of IRNSS L5 and S1 band signals.
12. Estimation of user position using GNSS Single Frequency receiver.

Suggested Reading:

1. T.S.Rappaport, "Wireless Communications Principles and Practice", 2nd edition, PHI, 2002.

20EC C101

ADVANCED COMMUNICATION NETWORKS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Students should have in depth knowledge of Computer Networks.

Course Objectives:
This course aims to:
1. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
2. Provide the student with knowledge of advanced networking concepts and techniques.
3. Provide the student with knowledge of Real Time Communications over Internet and Packet Scheduling.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Recall the concepts and Issues of Real Time Communications over Internet.
2. Classify protocols and algorithms for Communication Networks.
3. Identify the mechanisms for Quality of Service in networking.
4. Analyze IP addressing challenges and services in Internet
5. Explain the different versions of IP Protocols, IP switching and MPLS Protocols.

UNIT-I
Overview of Internet Concepts, Challenges and History: Overview of -ATM. TCP/IPCongestion and Flow Control in Internet; Throughput analysis of TCP congestion control, TCP for high bandwidth delay networks and Fairness issues in TCP.

UNIT-II
Issues of Real Time Communications over Internet: Adaptive applications, Latency and throughput, Integrated Services Model (IntServ), Resource reservation Protocol. Characterization of Traffic by LinearlyBounded Arrival Processes (LBAP), Leaky bucket algorithm and its properties.

UNIT-III
Packet Scheduling Algorithms-Requirements and Choices: Scheduling guaranteed service Connections, GPS, WFQ and Rate proportional algorithms, High speed scheduler design; Theory of Latency Rate servers and delay bounds in packet switched networks for LBAP traffic; Active Queue Management - RED, WRED and Virtual clock, Control theoretic analysis of active queue management.

UNIT-IV
IP Address Lookup-Challenges: Packet classification algorithms and Flow Identification, Grid of Tries, Cross producting and controlled prefix expansion algorithm.Admission control in Internet: Concept of Effective bandwidth, Measurement based admission control; Differentiated Services in Internet (DiffServ), DiffServ architecture and framework.

UNIT-V
IPV4, IPV6, IP tunneling, IP switching and MPLS, Overview of IP over ATM and its Evolution to IP switching; MPLS architecture and framework, MPLS Protocols, Traffic Engineering issues in MPLS.

Text Books:

1. J.F. Kurose & K.W. Ross, “Computer Networking- A top down approach featuring the internet”, Pearson, sixth edition, 2013.
2. Nader F. Mir, “Computer and Communication Networks”, second edition, 2015.

Suggested Reading:

1. Anurag Kumar, D. Manjunath and Joy Kuri, “Communication Networking: An Analytical Approach”, Morgan Kaufman Publishers, 2004.
2. Jean Wairand and PravinVaraiya, “High Performance Communications Networks”, 2nd edition, 2000.

20EC C103

ANTENNAS AND RADIATING SYSTEMS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Students should have prior knowledge of Electromagnetic waves.

Course Objectives:
This course aims to:
1. The basic principles of an antenna and its parameters for characterizing its performance.
2. The fundamental concepts of various types of antennas, arrays for customizing the pattern parameters.
3. The concept of aperture and microstrip antennas.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Understand the radiation parameters of an antenna.
2. Apply the concept of current distribution to analyze the antennas.
3. Analyze the linear arrays for uniform distribution.
4. Appraise the characteristics of broad side, end fire arrays and non-uniform arrays.
5. Learn the aperture antennas using Huygen's principle, image theory and Microstrip antennas.

UNIT-I
Radiation Mechanism, Fundamental Parameters of Antennas: Radiation Pattern, Radiation Power Density, Radiation Intensity, Directivity, Gain, Antenna efficiency, Beam efficiency, Bandwidth, Polarization, Input Impedance, Region separation, Antenna Temperature, Antenna vector effective length, Friis Transmission equation, Significance of current distribution.

UNIT-II
Infinitesimal dipole, Analysis of Finite length dipole, half wave dipole, Ground effects, Small Circular loop, Circular loop with non-uniform current distribution.

UNIT-III
Linear Arrays: Two element array, N-Element array: Uniform Amplitude and spacing, Broadside and End fire arrays, Super directivity, planar array, Design consideration, Introduction to linear arrays with non-uniform distributions: Binomial and Tschebyscheff distribution.

UNIT-IV
Aperture Antennas: Huygen's Field Equivalence principle, Image theory, radiation equations, Rectangular Aperture. Horn Antennas: E-Plane, H-plane horns and Pyramidal horn antennas.

UNIT-V
Reflector Antennas: Plane reflector, parabolic reflector, Efficiency calculation of parabolic reflector antenna, Cassegrain reflectors.
Microstrip Antennas: Basic Characteristics, feeding mechanisms, Rectangular Patch design using TL method and Circular Patch design using cavity model method.

Text Books:

1. Constantine A. Balanis, "Antenna Theory: Analysis and Design," 4thEdition, John Wiley, 2016
2. Edward C. Jordan and Kenneth G. Balmain, "Electromagnetic Waves and Radiating Systems," 2ndEdition, PHI, 2009
3. John D. Krauss, Ronald J. Marhefka& Ahmad S. Khan, "Antennas and Wave Propagation," 4thEdition, TMH, 2010

Suggested Reading:

1. Dennis Roody and John Coolen, "Electronic Communications", 4th Edition, Prentice Hall, 2008.
2. R.C.Johnson and H.Jasik, "Antenna Engineering hand book", Mc-Graw Hill, 1984.
3. I.J.Bhal and P.Bhartia, "Micro-strip antennas", Artech house, 1980.

20EC E111

SIGNAL INTELLIGENCE SYSTEMS

(Program Elective)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Basic knowledge of Radar, Communication and Antenna concepts are required.

Course Objectives:

This course aims to:

1. Elucidate the concepts of electronic intelligence using the fundamentals of radar and localization techniques with necessary mathematical analysis.
2. Explain the operating principles of COMINT Systems based on various localization and position fixing techniques.
3. Provide salient features of EW Systems and Electronic Jamming.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Apply the knowledge of Communication and Antenna concepts in understanding the operating principles of Radar and Drones.
2. Discuss the salient features of EW Systems and identify the type of Electronic Jamming.
3. Analyze the intricacies of ELINT Systems.
4. Estimate the DF and position of ELINT/COMINT Systems for simple cases.
5. Interpret the type of modulation of COMINT systems.

UNIT-I

Principles of RADAR and DRONES: Radar Range equation, probability of false alarm, probability of detection, Radar cross section fluctuations, Blind speed, Pulse Repetition Frequency (PRF), Unambiguous range, Principles and Classification of Drones and their applications.

UNIT-II

Communication EW Systems and Techniques for Electronic Jamming: Introduction, Information warfare, Electronic warfare: Electronic support, Electronic attack, Electronic Protect. Typical EW System Configuration. Electronic attack: A General Description of the Basic Elements of Electronic Jamming, Communication jamming, jammer deployment, narrow band/partial-band jamming, barrage jamming, follower jammer, jamming LPI targets. Spoofing: Spoofing generation, detection and anti-spoofing.

UNIT-III

Electronic Intelligent (ELINT) Systems: Electronic Intelligence Defined, The Importance of Intercepting and Analyzing Radar Signals, Limitations Due to Noise, Probability of Intercept Problems. Inferring Radar Capabilities from observed Signal Parameters, Receivers for Radar Interception, Major ELINT Signal Parameters, the Impact of LPI Radar on ELINT.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

UNIT-IV

Direction Finding: Direction Finding, Instantaneous Direction Finding. Amplitude Comparison AOA Measurement, Phase Interferometers.

Position Fixing Position fixing algorithms: Eliminating Wild Bearings, Stansfield Fix Algorithm, Mean-Squared Distance Algorithm. Single-site location techniques: Fix accuracy, fix coverage. Time of Arrival, Time difference of Arrival: Position-Fixing using TDOA Measurements, Differential Doppler.

UNIT-V

Communication Intelligent (COMINT) Systems: Encryption: Cryptologic Architectures, Pretty Good Privacy, Digital Signatures, Decryption, Recognition of Modulation: Analogue Modulated Signal Recognition Algorithms (AMRAs): Classification of each segment, Classification of a signal frame, Digitally Modulated Signal Recognition Algorithms (DMRAs): Classification of each segment, Classification of a signal frame.

Text Books:

1. Richard G. Wiley, “ELINT: The Interception and analysis of Radar Signals”, Artech House Inc., 2006.
2. Richard A. Poisel, “Introduction to Communication Electronic Warfare Systems”, 2nd edition, Artech house, Inc., 2008.

Suggested Reading:

1. Sergei A. Vakin, Lev N. Shustov, Robert H. Dunwell “Fundamentals of Electronic Warfare”, Artech House, Inc., 2001.
2. ElsayedElsayedAzzouz, Asoke Kumar Nandi, “Automatic Modulation Recognition of Communication Signals”, Springer Science+Business Media, B.V, 1996.

20EC E106

INTERNET OF THINGS

(Program Elective)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Knowledge onProgramming and Problem Solving, Computer Organization and embedded systems.

Course Objectives:
This course aims to:
1. Provide an overview of Internet of Things, building blocks of IoT and the real-world applications.
2. Introduce Python Programming language and packages.
3. Introduce Raspberry Pi device, its interfaces and Django Framework.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Understand the terminology, enabling technologies and applications of IoT
2. Apply the concept of M2M and understand the basics of modern networking with the concepts of SDN and NFV.
3. Understand the basics of Python Scripting Language which is used in many IoT devices.
4. Describe the steps involved in IoT system design methodology.
5. Design simple IoT systems using Raspberry Pi board with sensors, actuators and develop web applications using python-based framework called Django.

UNIT-I
Introduction and Concepts: Introduction to Internet of Things, definitions and characteristics of IoT, physical design of IoT-Things in IoT, IoT Protocols, Logical Design of IoT-IoT Functional Blocks, IoT Communication Models, IoT Communication APIs, IOT Enabling TechnologiesWireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IoT Levels & Deployment Templates.

UNIT-II
Domain Specific IoTs: IoT applications for Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle
IoT and M2M: Introduction, M2M, Differences between IoT and M2M, Software Defined Networking, Network Function Virtualization.

UNIT-III
Introduction to Python: Motivation for using Python for designing IoT systems, Language features of Python, Data types- Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions, Data Structures: Control of flow-if, for, while, range, break/continue, pass, functions, modules, packaging, file handling, data/time operations, classes, Exception handling, Python packages of Interest for IoT - JSON, XML, HTTPLib, URLLib and SMTPLib.

UNIT-IV
IoT Platforms Design Methodology: Introduction, IoT Design Methodology Steps-Purpose and Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device and Component Integration, Application Development, Case Study on IoT System for Weather Monitoring.

UNIT-V

IoT Physical Devices and End Points: Basic building blocks of an IoT device, Raspberry Pi-About theRaspberry Pi board, Raspberry Pi Interfaces-Serial, SPI, I2C, Other IoT Devices-pcDuino, BeagleBone Black, Cubieboard

IoT Physical Servers and Cloud Offerings: Introduction to cloud storage models and Communication APIs, WAMP-AutoBahn for IoT, Xivelycloud for IoT

Python Web Application Framework: Django Framework-Roles of Model, Template and View

Text Books:

1. ArshdeepBahga and Vijay Madisetti, “Internet of Things - A Hands-on Approach, Universities Press", 2015.
2. Bill Lubanovic "Introducing Python: Modern Computing in Simple Packages", O’Reilly Media, Inc, USA, 2015.

Suggested Reading:

1. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st edition, Apress Publications, 2013.
2. Matt Richardson andShawn Wallace O'Reilly, “Getting Started with Raspberry Pi”, SPD, 2014.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20EC A101

VALUE EDUCATION

(Audit Course)

Instruction	2 L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	--
Credits	Non-Credit

Course Objectives:
This course aims to
1. Understand the need and importance of Values for self-development and for National development.
2. Imbibe good human values and Morals
3. Cultivate individual and National character.

Course outcomes:
After completion of the Course, Students will be able to
1. Summarize classification of values and values for self-development.
2. Identify the importance of values in personal and professional life.
3. Apply the importance of social values for better career and relationships.
4. Compile the values from holy books for personal and social responsibility.
5. Discuss concept of soul and reincarnation, values Dharma, Karma and Guna.

UNIT-I
Human Values, Ethics and Morals: Concept of Values, Indian concept of humanism, human values; Values for self-development, Social values, individual attitudes; Work ethics, moral and non- moral behavior, standards and principles based on religion, culture and tradition.

UNIT-II
Value Cultivation, and Self-Management: Need and Importance of cultivation of values such as Sense-of Duty, Devotion to work, Self-reliance, Confidence, Concentration, Integrity & discipline, and Truthfulness.

UNIT-III
Spiritual Outlook and Social Values: Personality and Behavior, Scientific attitude and Spiritual (soul) outlook; Cultivation of Social Values Such as Positive Thinking, Punctuality, Love & Kindness, avoiding fault finding in others, Reduction of anger, forgiveness, Dignity of labour, True friendship, Universal brotherhood and religious tolerance.

UNIT-IV
Values in Holy Books : ** Self-management and Good health; **and internal & external Cleanliness, Holy books versus Blind faith, Character and Competence, Equality, Nonviolence, Humility, Role of Women.

UNIT-V
Dharma, Karma and Guna: Concept of soul; Science of Reincarnation, Character and Conduct, Concept of Dharma; Cause and Effect based Karma Theory; The qualities of Devine and Devilish; Satwic, Rajasic and Tamasicgunas.

Text Books:
1. Chakroborty, S.K. "Values & Ethics for organizations Theory and practice", Oxford University Press, New Delhi, 1998.
2. Jaya DayalGoyandaka, "Srimad Bhagavad Gita", withSanskrit Text, Word meaning and Prose meaning, Gita Press, Gorakhpur, 2017.

20EC C105

ADVANCED COMMUNICATION NETWORKS LAB

Instruction	4 P Hours per Week
Duration of SEE	--
SEE	--
CIE	50 Marks
Credits	2

Prerequisite: Students should have in depth knowledge of Computer Networks.

Course Objectives:
This course aims to:
1. Provide the student with knowledge sub-netting and routing mechanisms.
2. Provide the student with knowledge of basic routing protocols for Network design and implementation.
3. Provide the student with knowledge configuring User Datagram Protocol.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Identify the different types of network devices and their functions within a network.
2. Understand and build the skills of sub-netting and routing mechanisms.
3. Understand basic protocols of computer networks, and how they can be used to assist in Network design and implementation.
4. Configure a network using Linux and a mail server for IMAP/POP protocols
5. Design and configure UDP Client Server

List of Assignments:
1. Study of Networking Commands (Ping, Tracert, TELNET, nslookup, netstat, ARP, RARP) and Network Configuration Files.
2. Linux Network Configuration.
   a. Configuring NIC's IP Address.
   b. Determining IP Address and MAC Address using if-config command.
   c. Changing IP Address using if-config.
   d. Static IP Address and Configuration by Editing.
   e. Determining IP Address using DHCP.
   f. Configuring Hostname in /etc/hosts file.
3. Design TCP iterative Client and Server application to reverse the given input sentence.
4. Design a TCP concurrent Server to convert a given text into upper case using multiplexing system call "select".
5. Design UDP Client Server to transfer a file.
6. Configure a DHCP Server to serve contiguous IP addresses to a pool of four IP deviceswitha default gateway and a default DNS address. Integrate the DHCP server with aBOOTP demon to automatically serve Windows and Linux OS Binaries based on clientMAC address.
7. Configure DNS: Make a caching DNS client, and a DNS Proxy; implement reverseDNS and forward DNS, using TCP dump/Wire shark characterize traffic when theDNS server is up and when it is down.
8. Configure a mail server for IMAP/POP protocols and write a simple SMTP client inC/C++/Java client to send and receive mails.
9. Configure FTP Server on a Linux/Windows machine using an FTP client/SFTP clientCharacterize file transfer rate for a cluster of small files 100k each and a video file of700mb.Use a TFTP client and repeat the experiment.
10. Signaling and QoS of labeled paths using RSVP in MPLS.
11. Find shortest paths through provider network for RSVP and BGP.
12. Understand configuration, forwarding tables, and debugging of MPLS.

Suggested Reading:

1. J.F. Kurose & K.W. Ross, "Computer Networking- A top down approach featuring the internet", Pearson, Sixth Edition, 2013.
2. Nader F. Mir, Computer and Communication Networks, second edition, 2015.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20EC C107

ANTENNAS AND RADIATING SYSTEMS LAB

Instruction	4 P Hours per Week
Duration of SEE	--
SEE	--
CIE	50 Marks
Credits	2

Prerequisite: The knowledge of antennas is essential.

Course Objectives:
This course aims to:
1. Understand the characteristics and radiation pattern of Infinitesimal antenna.
2. Simulate various antennas.
3. Study the effect of change in different parameters on antenna arrays.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Determine specifications, design, construct and test antenna.
2. Explore and use tools for designing, analyzing and testing antennas.
3. Apply the concept of current distribution to find the field patterns.
4. Estimate the effect of the height of the monopole antenna on the radiation characteristics.
5. Study the effect of the variation of phase difference 'beta' between the elements of the array and case studies.

List of Experiments:
1. Simulation of half wave dipole antenna.
2. Simulation of change of the radius and length of dipole wire on frequency of resonance ofantenna.
3. Simulationofquarterwave, fullwaveantennaandcomparisonoftheir parameters.
4. Simulation ofmonopole antenna with and without groundplane.
5. Study the effect of the height of the monopole antenna on the radiation characteristics of the antenna.
6. Simulation of a half wave dipole antennaarray.
7. Study the effect of change in distance between elements of array on radiation pattern of dipole array.
8. Study the effect of the variation of phase difference 'beta' between the elements of the array on the radiation pattern of the dipole array.

Note: The above experiments are to be carried out by using any appropriate simulation software.

Suggested Reading:
1. Li Ming Yang,"HFSS antenna design", 2nd edition,Electronic Industry Press, 2014.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20EC C109

MINI PROJECT WITH SEMINAR

Instruction	4 P Hours per Week
Duration of SEE	--
SEE	--
CIE	50 Marks
Credits	2

Prerequisite: Knowledge of preparing slides by using power point presentations, Capable of searching for suitable literature and Presentation skills.

Course Objectives:
This course aims to:
1. The mini-project shall contain a clear statement of the research objectives, background of work, literature review, techniques used, prospective deliverables, and detailed discussion on results, conclusions and references.
2. To expose and practice of searching and referring the required literature.
3. This is expected to provide a good initiation for the student(s) towards R&D.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Familiarize in searching the suitable literature in the chosen field.
2. Develop skills to understand and summarize the contents from the literature.
3. Ability to synthesize knowledge/ skills previously gained and applied in execution of a chosen technical problem.
4. Enhance oral presentation skills through power point presentations.
5. Learn and present the findings of their technical solution in a written report.

Guidelines:
1. As part of the curriculum in the II - Semester of the Program each student shall do a mini project, generally comprising about three to four weeks of prior reading, twelve weeks of active research, and finally a presentation of their work for assessment.
2. Each student will be allotted to a faculty supervisor for mentoring.
3. Mini projects should present students with an accessible challenge on which to demonstrate competence in research techniques, plus the opportunity to contribute something more original.
4. Mini projects shall have inter-disciplinary/ industry relevance.
5. The students can select a mathematical modeling based/Experimental investigations or Numerical modeling.
6. All the investigations are clearly stated and documented with the reasons/explanations.
7. The mini-project shall contain a clear statement of the research objectives, background of work, literature review, techniques used, prospective deliverables, detailed discussion on results, conclusions and references.

Departmental Committee: Supervisor and two faculty coordinators

Guidelines forawarding Marks inCIE:	Max. Marks: 50	
Evaluation by	**Max. Marks**	**Evaluation Criteria / Parameter**
Supervisor	20	Progress and Review
	05	Report
Departmental Committee	05	Relevance of the Topic
	05	PPT Preparation
	05	Presentation
	05	Question and Answers
	05	Report Preparation

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20EC E108

MIMO WIRELESS COMMUNICATIONS

(Program Elective)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Knowledge on communication systems, antenna and wave propagation.

Course Objectives:
This course aims to:
1. Understand the basic principles and need of MIMO systems
2. Analyze the MIMO system in terms of space-time coding and various beam forming methodologies.
3. Channel estimation for single carrier and multiple carrier systems.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Recall Concepts of MIMO, Diversity, generic MIMO problem and Channel Estimation in wireless communication system.
2. Compare the diversity techniques, Propagation channels, Channel dispersion and Channel Estimation techniques.
3. Apply Diversity Techniques and Pre-Coding techniques in MIMO
4. Analyze channel modeling and propagation, MIMO Capacity, space-time coding.
5. Explain the MIMO in LTE and Channel Estimation techniques.

UNIT-I
Introduction to Multiantenna Systems, Motivation, Types of Multi-Antenna Systems: Switched beam, Adaptive Array, MIMO vs. Multi-Antenna Systems.

UNIT-II
Diversity, exploiting multipath diversity, receive diversity, transmit diversity, Delay diversity, Space time codes, The Alamouti scheme, the rake receiver, combining techniques, Spatial Multiplexing, Spectral efficiency and capacity, Transmitting independent streams in parallel, Mathematical notation.

UNIT-III
The generic MIMO problem, Eigenvalues and eigenvectors, Pre-coding and combining in MIMO systems, Advantages and Disadvantages of pre-coding and combining, Codebooks for MIMO, Beam forming, Beam forming principles, Interference cancellation, Switched beam former, Adaptive beam former, Narrowband beam former, Wideband beam former.

UNIT-IV
MIMO in LTE, Pre-coding for spatial multiplexing, Pre-coding for transmit diversity, Propagation Channels, Time & frequency channel dispersion, AWGN and multipath propagation channels, Delay spread values and time variations, Fast and slow fading environment, Narrowband and wideband channels, MIMO channel models.

UNIT-V
Channel Estimation, Channel estimation techniques, Estimation and tracking, Training Based channel estimation, Blind channel estimation, MMSE channel estimation, Channel estimation in single carrier systems.

Text Books:

1. Claude Oestges and Bruno Clerckx, "MIMO Wireless Communications: From Real-worldPropagation to Space-time Code Design", Academic Press, 1st edition, 2010.
2. MohinderJanakiraman, “Space - Time Codes and MIMO Systems”, Artech House Publishers, 2004.

Suggested Reading:

1. Jerry R.Hampton, “Introduction to MIMO Communications”, Cambridge university press, 1st Edition, 2014.
2. Joseph C.Liberti and Jr. Bellcore, Theodore S. Rappaport “Smart Antennas for Wireless Communications”, IS-95 and third generation CDMA applications,Prentice Hall, 1st Edition, 1999.

20CS O101

BUSINESS ANALYTICS

(Open Elective)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
This course aims to:
1. Understanding the basic concepts of business analytics and applications
2. Study various business analytics methods including predictive, prescriptive and prescriptive analytics
3. Prepare the students to model business data using various data mining, decision making methods

Course Outcomes:
Upon completing this course, students will be able to:
1. Identify and describe complex business problems in terms of analytical models.
2. Apply appropriate analytical methods to find solutions to business problems that achieve stated objectives.
3. Interpret various metrics, measures used in business analytics
4. Illustrate various descriptive, predictive and prescriptive methods and techniques
5. Model the business data using various business analytical methods and techniques
6. Create viable solutions to decision making problems

UNIT-I
Introduction to Business Analytics: Introduction to Business Analytics, need and science of data driven (DD) decision making, Descriptive, predictive, prescriptive analytics and techniques, Big data analytics, Web and Social media analytics, Machine Learning algorithms, framework for decision making, challenges in DD decision making and future.

UNIT-II
Descriptive Analytics: Introduction, data types and scales, types of measurement scales, population and samples, measures of central tendency, percentile, decile and quadrille, measures of variation, measures of shape-skewness, data visualization

UNIT-III
Forecasting Techniques: Introduction, time-series data and components, forecasting accuracy, moving average method, single exponential smoothing, Holt's method, Holt-Winter model, Croston's forecasting method, regression model for forecasting, Auto regression models, auto-regressive moving process, ARIMA, Theil's coefficient

UNIT-IV
Decision Trees: CHAID, Classification and Regression tree, splitting criteria, Ensemble and method and random forest. **Clustering**: Distance and similarity measures used in clustering, Clustering algorithms, K-Means and Hierarchical algorithms, **Prescriptive Analytics**- Linear Programming (LP) and LP model building,

UNIT-V
Six Sigma: Introduction, introduction, origin, 3-Sigma Vs Six-Sigma process, cost of poor quality, sigma score, industry applications, six sigma measures, DPMO, yield, sigma score, DMAIC methodology, Six Sigma toolbox

Text Books:

1. U Dinesh Kumar, "Data Analytics", Wiley Publications, 1st Edition, 2017
2. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, "Business analytics Principles, Concepts, and Applications with SAS", Associate Publishers, 2015.

Suggested Reading:

1. S. Christian Albright, Wayne L. Winston, "Business Analytics - Data Analysis and Decision Making", 5th Edition, Cengage, 2015.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc18-mg11/preview
2. https://nptel.ac.in/courses/110105089/

20EC C110

Industrial Project /Dissertation Phase I

Instruction	20 P Hours per Week
Duration of SEE	--
SEE	--
CIE	100 Marks
Credits	10

Prerequisite: Preferably, student must have completed ‘Mini Project with Seminar successfully.

Course Objectives:
This course aims to:
1. The Dissertation Phase-I (Project work) will preferably be a problem with research potential and should involve scientific research, design, generation/collection and analysis of data, determining solution and must preferably bring out the student contribution(s).
2. To expose and learn the required simulation software/experimental techniques.
3. To carry out the work in a research environment or in an industrial environment

Course Outcomes:
Upon completion of this course, students will be able to:
1. Survey the literature such as books, national/international refereed journals and contact resource persons for the selected topic of research/project field.
2. Consolidate the literature survey and will be motivated to define the title of the project, able to decide the aim(s), objectives and design specifications of the project.
3. Learn the required software/ computational/analytical tools for implementations.
4. Document a report comprising of summary of literature survey, detailed objectives, project specifications, or computer aided design, proof of concept/functionality, part of results if any.
5. Get aquatinted to work in a research environment or in an industrial environment

Guidelines:

1. The Project work will preferably be a problem with research potential and should involve scientific research, design, generation/collection and analysis of data, determining solution and must preferably bring out the individual contribution.
2. Seminar should be based on the area in which the candidate has undertaken the dissertation work.
3. The CIE shall include reviews and the preparation of report consisting of a detailed problemstatement and a literature review.
4. The preliminary results (if available) of the problem may also be discussed in the report.
5. The work has to be presented in front of the committee consists of Head, Chairperson-BoS, Supervisor and Project coordinator.
6. The candidate has to be in regular contact with his supervisor and the topic of dissertation must be mutually decided by the guide and student.

Guidelines for awarding Marks in CIE:		Max. Marks: 100
Evaluation by	**Max. Marks**	**Evaluation Criteria / Parameter**
Supervisor	30	Project Status / Review(s)
	20	Report
Departmental Review Committee	10	Relevance of the Topic
	10	PPT Preparation(s)
	10	Presentation(s)
	10	Question and Answers
	10	Report Preparation

Note: Departmental Review Committee has to assess the progress of the student for every two weeks.

20EC C111

Industrial Project /Dissertation Phase II

Instruction	32 PHours per Week
Duration of SEE	Viva - Voce
SEE	100 Marks
CIE	100 Marks
Credits	16

Prerequisite: Student must have earned the credit of 'Industrial project/Dissertation phase 1'.

Course Objectives:
This course aims to:
1. Industrial project/Dissertation phase 2 is the continuation of Industrial project/Dissertation phase 1
2. Implementation of Project objectives.
3. Presentation of periodic reviews of the objectives and preparing of Dissertation in a prescribed format

Course Outcomes:
At the end of the course:
1. Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
2. Plan experiments for a critical comparison of outputs or to verify the obtained analytical/simulation results with the experimental results available in the literature.
3. Develop attitude of lifelong learning and will develop interpersonal skills to deal with people working in diversified field.
4. Learn to write technical reports and research papers to publish at national and international level.
5. Develop strong communication skills to defend their work in front of technically qualified audience.

Guidelines:
1. It is a continuation of Project work started in semester III.
2. The student has to submit the report in prescribed format and also present a seminar.
3. The dissertation should be presented in standard format as provided by the department.
4. The candidate has to prepare a detailed project report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology (experimental set up or numerical details as the case may be) of solution and results and discussion.
5. The report must bring out the conclusions of the work and future scope for the study. The work has to be presented in front of the examiners panel consisting of an approved external examiner, an internal examiner (HoD and BoS Chair Person) guide/co-guide.
6. The candidate has to be in regular contact with his/her guide/co-guide.

Guidelines for awarding marks in CIE:		Max. Marks: 100
Evaluation by	**Max. Marks**	**Evaluation Criteria / Parameter**
Departmental Review Committee	05	Review 1
	10	Review 2
	10	Review 3
	15	Final presentation with the draft copy of the report
	10	Submission of the report in a standard format
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	10	Quality of the work which may lead to publications
	10	Analytical / Programming / Experimental Skills Preparation
	10	Report preparation in a standard format

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Guidelines for awarding marks in SEE:		Max. Marks: 100
Evaluation by	**Max. Marks**	**Evaluation Criteria / Parameter**
External and Internal Examiner(s) together	20	Power Point Presentation
	40	Quality of thesis and evaluation
	20	Quality of the project • Innovations • Applications • Live Research Projects • Scope for future study • Application to society
	20	Viva-Voce

Note: Departmental Review Committee has to assess the progress of the student for every two weeks

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

20ECC201

ANALOG AND DIGITAL CMOS VLSI DESIGN

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-requisites: Analog and Digital design concepts.

Course Objectives:
This course aims to:

1. Characteristic behavior of MOSFET, CMOSFET, FINFET, TFET, Meta Gate Technology.
2. Physical design concepts.
3. Design of Analog and digital circuits.

Course Outcomes:
Upon completion of this course, students will be able to:

1. Understand MOS structure, it's Behavior & fabrication process, various step in physical design flow of CMOScircuits, second order effects in MOS &ESD Models.
2. Design various types of combinational logic circuits and sequential logic circuits
3. Recall various advanced technologies in VLSI industry, the scaling issues, etc.
4. Analyze various analog amplifiers, Current mirror circuits and OP AMP
5. Design Basic Amplifiers, Current Mirrors, basic OPAMP, OP-AMP with different compensations

UNIT-I
Technology Scaling and Road map, Scaling issues, Standard 4 mask NMOS Fabrication process, Review: Basic MOS structure and its static behavior, Stick diagram and Layout, Inverter: Static CMOS inverter, Switching threshold and noise margin concepts and their evaluation of dynamic behavior, Power consumption.

UNIT-II
Physical Design Flow: Floor planning, Placement, Routing, CTS, Power analysis and IR drop estimation-static and dynamic ESD protection-human body model, Machine model, Combinational logic: Static CMOS design, Logic effort, Ratioed logic, Pass transistor logic, Dynamic logic Speed and power dissipation in dynamic logic Cascading dynamic gates, CMOS transmission gate logic.

UNIT-III
Sequential Logic: Static latches and registers, MUX based latches, Static SR flip-flops, Master-slave edge-triggered register, Dynamic latches and registers, advanced technologies: Giga-scale dilemma, Short channel effects, High–k, Metal Gate Technology.

UNIT-IV
Introduction to Analog Design, Second order effects MOS small signal model, Single Stage Amplifier: Common Source Amplifier, CS Stage with Source Degeneration, Common Drain Amplifier & Common Gate Stage (resistive load) Current Mirrors: Basic Current Mirrors, Cascode Mirrors, Special Current Mirror, Single Stage Amplifier: Common Source Amplifier with Current source load, Triode load,CM Load, Frequency response of CS stage, Source follower, Common gate stage, Gilbert cell.

UNIT-V

MOS Difference Pair (One Stage OPAMP), Operational Amplifiers: Two stage OPAMP, Fully differential amplifiers, Slew rate, PSRR, Compensation of two- stage OPAMP, op-amp based comparator, switched capacitor. Introduction to data converters-specifications.

Text Books:

1. J P Rabaey, A P Chandrakasan, B Nikolic, "Digital Integrated circuits: A design perspective", Prentice Hall electronics and VLSI series, 2nd edition 2003
2. David Johns, Ken Martin, "Analog Integrated Circuit Design", John Wiley & sons. 2004
3. Jacob Baker.R.et.al., "CMOS Circuit Design", IEEE Press, Prentice Hall, India, 2000

Suggested Reading:

1. Paul. R. Gray & Robert G. Major, "Analysis and Design of Analog Integrated Circuits", John Wiley & sons. 2004
2. Kang, S. and Leblebici, Y., "CMOS Digital Integrated Circuits, Analysis and Design", TMH, 3rdEdition 2003
3. BehzadRazavi, "Design of Analog CMOS Integrated Circuits", Tata McGraw Hill. 2002

20ECC203

MICROCONTROLLERS AND PROGRAMMABLE DIGITAL SIGNAL PROCESSORS

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Microprocessor and its interfacing

Course Objectives:
This course aims to:
1. LearnaboutARMMicrocontrollerarchitecturalfeatures
2. UnderstandtheARM'C'Programmingforvariousapplications
3. Study the DSP processor fundamentals and its developmenttools

Course outcomes:
Upon completion of this course, students will be able to:
1. Compare and select ARM processor core based on requirements of embeddedapplication
2. AnalyzevariousfeaturesofARMCortex-M SeriesProcessor
3. AbletointerfacevariousI/OdevicestoARM7microcontrollers.
4. UnderstandthebasicarchitecturalneedsofProgrammableDSPs
5. ApplysmallapplicationsonDSPprocessor-basedplatform

UNIT-I

BackgroundofARMandARMArchitecture:ABriefhistory,Architecture Versions, Registers, pipeline, exception, interrupts and the vector table; core extensions, Introduction to ARM instruction set, Introduction to Thumb instructions,IntroductiontoARMCProgramming.

UNIT-II

LPC21XX Microcontroller: Salient features of LPC 21XX, Pin description, ArchitecturalOverview.Peripherals: DescriptionofGeneral-PurposeInput/Output(GPIO)ports,PincontrolBlock.Features,Pindescription,Registerdescription andoperationofPLL,Timers,PWM,Interfacing:LED,Relay,Buzzer,LCD,DAC,DCmotor.Communicationprotocols:Brie foverviewonI2C,SPIandCAN.

UNIT-III

ARM Cortex-M3 Processor: The Thumb-2 Technology and Instruction Set Architecture,Programmingmodel-Registers,Operationmodes,ExceptionsandInterrupts,VectorTables,MemoryMap,Applications.

UNIT-IV

ProgrammableDSP(P-DSP)Processors: Basicarchitecturalfeatures-VLIWarchitecture,DSPcomputationalbuildingblocks,BusandMemoryarchitecture, Address generation unit, speed issues, Fixed and Floating-point data paths, IntroductiontoTIDSPProcessorfamily.IntroductiontoFPGAbasedDSPsystem design.

TMS320C67XX: Features of C67XX Processors, Internal Architecture, Functional units and operation, Data paths, Cross paths, Control Register File.

UNIT-V

TMS320C67XX Assembly Language Instructions: Functional Unit and its Instructions, Addressing modes, Fixed point Instructions, Conditional Operations, Parallel Operations, Floating point instructions.

TMS320C67XX Application Development Tools: Code composer studio (CCS), Application programs in C67XX Code development in both C and Assembly language.

Text Books:

1. JosephYiu,"ThedefinitiveguidetoARMCortex-M3",Elsevier,2nd Edition,2010
2. Andrew N. SLOSS, Domonic Symes, Chris Wright "ARM System Developers Guide-Designingand optimizing system software" ELSEVIER1st Edition2004.
3. Avatar Singh and S. Srinivasan, "Digital Signal Processing Implementations Using DSP Microprocessors", Thomson Brooks, 2004.

Suggested Reading:

1. B. Ventakaramani, M. Bhaskar, "Digital Signal Processes, Architecture Processing and Applications", Tata McGraw Hill, 2002.
2. RulphChassing, "Digital Signal Processing and Applications with the C6713 and C6416 DSK" A John Wiley & Sons, Inc., Publications.

20ME M103

RESEARCH METHODOLOGY AND IPR

(Mandatory Course)

Instruction	2L Hours per week
Duration of SEE	2 Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

Course Objectives:
This course aims to:

1. Motivate to choose research as career
2. Formulate the research problem, prepare the research design
3. Identify various sources for literature review and data collection report writing
4. Equip with good methods to analyze the collected data
5. Know about IPR copyrights

Course Outcomes:
Upon completion of this course, students will be able to:

1. Define research problem, review and asses the quality of literature from various sources
2. Improve the style and format of writing a report for technical paper/ Journal report, understand and develop various research designs
3. Collect the data by various methods: observation, interview, questionnaires
4. Analyze problem by statistical techniques: ANOVA, F-test, Chi-square
5. Understand apply for patent and copyrights

UNIT-I

Research Methodology: Research Methodology: Objectives and Motivation of Research, Types of Research, research approaches, Significance of Research, Research Methods verses Methodology, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India, Benefits to the society in general. Defining the Research Problem: Selection of Research Problem, Necessity of Defining the Problem

UNIT-II

Literature Survey Report Writing: Literature Survey: Importance and purpose of Literature Survey, Sources of Information, Assessment of Quality of Journals and Articles, Information through Internet. Report writing: Meaning of interpretation, layout of research report, Types of reports, Mechanics of writing a report. Research Proposal Preparation: Writing a Research Proposal and Research Report, Writing Research Grant Proposal

UNIT-III

Research Design: Research Design: Meaning of Research Design, Need of Research Design, Feature of a Good Design, Important Concepts Related to Research Design, Different Research Designs, Basic Principles of Experimental Design, Developing a Research Plan, Steps in sample design, types of sample designs.

UNIT-IV

Data Collection and Analysis: Data Collection: Methods of data collection, importance of Parametric, non-parametric test, testing of variance of two normal population, use of Chi-square, ANOVA, F-test, z-test

UNIT-V

Patents and Copyright: Patent: Macro economic impact of the patent system, Patent document, How to protect your inventions. Granting of patent, Rights of a patent, how extensive is patent protection. Copyright: What is copyright. What is covered by copyright? How long does copyright last? Why protect copyright? Related Rights: what are related rights? Enforcement of Intellectual Property Rights: Infringement of intellectual property rights, Case studies of patents and IP Protection

Text Books:

1. C.R Kothari, "Research Methodology, Methods & Technique"; New Age International Publishers, 2004
2. R. Ganesan, "Research Methodology for Engineers", MJP Publishers, 2011
3. Y.P. Agarwal, "Statistical Methods: Concepts, Application and Computation", Sterling Publs., Pvt., Ltd., New Delhi, 2004

Suggested Reading:

1. AjitParulekar and Sarita D' Souza, "Indian Patents Law – Legal & Business Implications"; Macmillan India ltd, 2006
2. B. L.Wadehra; "Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications"; Universal law Publishing Pvt. Ltd., India 2000.
3. P. Narayanan; "Law of Copyright and Industrial Designs"; Eastern law House, Delhi 2010.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20ECE201

ADVANCED COMPUTER ORGANIZATION

(Program Elective)

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Fundamentals of Computer architecture.

Course Objectives:
This course aims to:
1. Learn about processor design for computer system
2. Understand the memory organization of the computer
3. Study the I/O organization and parallel computer systems

Course Outcomes:
Upon completion of this course, students will be able to:
1. Analyze the computer arithmetic operations.
2. Design of control unit of the computer
3. Understand the memory organization of the computer
4. Interface various I/O modules to the computer system
5. Analyze the multiprocessor environment and various buses for the computer system

UNIT– I:
Processor Design: CPU Organization, Data Representation, Instruction Formats, Data Path Design: Fixed Point Arithmetic and Floating-Point Arithmetic, Instruction Pipelining, Super Scalar techniques, linear pipeline processors, Super scalar and super pipeline design, Multi vector and SIMD computers.

UNIT– II:
Control Unit Design:
Basic Concepts: Basic control unit of the computer system. Hardwired Control Unit Designapproach, Micro-programmed Control Unit- Design Approach, Micro program sequencer, Case studies based on both the approaches.

UNIT – III:
Memory Organization:
Internal memory, computer memory system overview, the memory Hierarchy, Random access memories, Cache memory, Elements of cache design, Virtual memory- protection and examples of virtual memory, Replacement Policies.

UNIT– IV:
I/O Organization: Accessing I/O Devices, Programmed I-O, Interrupts, DMA, Bus Arbitration; Synchronous bus and asynchronous bus, Interface circuits, Parallel port, Serial port, standard I/O interfaces, IO Processor, PCI bus, SCSI bus, USB busprotocols.

UNIT– V:

Parallel Computer Systems:

Instruction Level Parallelism (ILP) – Concept and Challenges, Dynamic Scheduling, Limitations on ILP, Thread Level Parallelism, Multi-processors – Characteristics, Symmetric and Distributive Shared Memory Architecture, Vector Processors and Supercomputers.

Text Books:

1. Carl Hamacher, Vranesic, Zaky, "Computer Organization", 5th edition, MGH, 2010
2. William Stallings, "Computer Organization and Architecture designing for Performance", 7th edition, PHI, 2007.

Suggested Reading:

1. John L. Hennessy and David A. Patterson, "Computer Architecture", A quantitative Approach, 3rd Edition, Elsevier, 2005.
2. Hayes John P, "Computer Architecture and organization" 3rd Edition, MGH, 1998.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20ECE213

VLSI TECHNOLOGY AND PHYSICAL DESIGN AUTOMATION

(Program Elective)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Basic knowledge on semiconductor physics and MOS transistors followed by analog and digital Fundamentals is required.

Course Objectives:

This course aims to:

1. Model passive and active devices suiting advances in IC fabrication technology.
2. Create learning, development and testing environment to meet ever challenging needs in the field of Chip Design.
3. Communicate effectively and convey ideas using innovative engineering using appropriate EDA tools

Course outcomes:

Upon completion of this course, students will be able to:

1. Explain various technology aspects of VLSI Physical design.
2. Demonstrate CMOS IC fabrication process.
3. Apply Design rules in the construction of layouts of a given design.
4. Choose appropriate Automation algorithm for partitioning, floor planning, placement and routing.
5. Identify EDA/CAD tools for Automation of VLSI Physical design automation.

UNIT-I

Introduction to VLSI Technology and Fabrication Process: Various layers of IC, Wafer preparation and crystal growth, Oxidation, CVD, Lithography, Etching, Ion implantation, Diffusion techniques.

UNIT-II

Concepts and Scope of Physical Design: Typical structures of passive and active components, CMOS fabrication process- n-Well, P-Well and Twin Tub, CMOS parasitic- Latch-up and its prevention.

UNIT-III

Cell Concepts and Design Rules: Cell based layout design, fabrication errors, alignment sequence and alignment inaccuracy, Interconnects, Contacts, Vias, SCMOS design rules, Lambda based design rules, Stick diagrams, Hierarchical stick diagrams, Layouts.

UNIT-IV

General Purpose Methods for Combinational Optimization: Partitioning, Placement, Discrete methods of global and local placements, Routing, local and Global routing via minimization, Over the cell routing, Single layer and two-layer routing, Clock and power routing.

UNIT-V

EDA/CAD Tools: Layout editors, Circuit extractors, Automatic layout tools, Modeling and extraction of circuit Parameters from physical layout, Compaction algorithms, physical automations of FPGAs.

Text Books:

1. J.D.Plummer, M.D.Deal and P.B.Griffin, "The Silicon VLSI Technology Fundamentals", Practice and modeling, Pearson Education 2009.
2. N.A. Sherwani, "Algorithms for VLSI Physical Design Automation", 2002.

Suggested Reading:

1. Modern VLSI Design (System on Chip), Woyne Wolf, Pearson Education, 2002.
2. S.H. Gerez, "Algorithms for VLSI Design Automation", 1998.

20EG A101

ENGLISH FOR RESEARCH PAPER WRITING

(Audit Course)

Instruction	2L Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	--
Credits	Non-Credit

Course Objectives:
This course aims to:
1. To the various purposes of Research Papers and help them infer the benefits and limitations of research.
2. To developing the content, formulating a structure and illustrating the format of writing a research paper.
3. In differentiating between qualitative and quantitative research types.
4. To constructing paragraphs and developing thesis statement.
5. To producing original research papers while avoiding plagiarism.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Illustrate the nuances of research paper writing and draw conclusions about the benefits and limitations of research.
2. Classify different types of research papers and organize the format and citation of sources.
3. Review the literature and categorize between different types of research.
4. Draft paragraphs and write thesis statement in a scientific manner.
5. Develop an original research paper while acquiring the knowledge of how and where to publish their papers.

UNIT-I
Academic Writing
Meaning & Definition of a research paper– Purpose of a research paper – Scope – Benefits – Limitations – outcomes.

UNIT-II
Research Paper Format
Title – Abstract – Introduction – Discussion – Findings – Conclusion – Style of Indentation – Font size/Font types – Indexing – Citation of sources.

UNIT-III
Research Methodology
Methods (Qualitative – Quantitative) Review of Literature. Criticizing, Paraphrasing & Plagiarism.

UNIT-IV
Process of Writing a Research Paper
Choosing a topic - Thesis Statement – Outline – Organizing notes - Language of Research – Word order, Paragraphs – Writing first draft–Revising/Editing - The final draft and proof reading. IEEE Style.

UNIT-V
Research Paper Publication
Reputed Journals – National/International – ISSN No, No. of volumes, Scopus Index/UGC Journals – Free publications - Paid Journal publications – /Advantages/Benefits

Text Book:

1. C. R Kothari, Gaurav, Garg, Research Methodology Methods and Techniques, New Age International Publishers. 4^{th} Edition.

Suggested Reading:

1. Day R, "How to Write and Publish a Scientific Paper", Cambridge University Press, 2006.
2. MLA "Hand book for writers of Research Papers", East West Press Pvt. Ltd, New Delhi, 7^{th} Edition.
3. Lipson, Charles (2011), Cite Right: A Quick Guide to Citation Styles; MLA, APA, Chicago, The Sciences, Professions, and more (2^{nd} Edition). Chicago [u.a] : Univ of Chicago Press.

Online Resources:

1. NPTEL: https://onlinecourses.nptel.ac.in/noc18_mg13/preview
2. NPTEL: https://nptel.ac.in/courses/121/106/121106007/
3. https://www.classcentral.com/course/swayam-introduction-to-research-5221

20ECC205

ANALOG AND DIGITAL CMOS VLSI DESIGN LAB

Instruction	4P Hours per week
Duration of SEE	--
SEE	--
CIE	50 Marks
Credits	2

Pre-requisites: Analog and Digital design concepts.

Course Objectives:
This course aims to:
1. Understand Characteristics behavior of MOSFET.
2. Analyze performance of Differential amplifiers
3. Verify layout of basic digital circuits

Course Outcomes:
Upon completion of this course, students will be able to:
1. Verify the characteristics of MOSFET and design entry in the tool.
2. Understand and evaluate the design specs and library files of tool.
3. Apply the concept of theory and design in the lab implementation.
4. Analyze and calculation, power and delay from the graphs.
5. Compare performance of different circuits with the simulation results.

List of Experiments:

1. Characteristics of MOSFET.
2. Calculation of rise time and fall time for CMOS inverter.
3. To build a three stage and five stage ring oscillator circuit in 0.18um and 0.13um technology and compare its frequencies and time period.
4. NMOS Common Source Amplifier.
5. Design of Differential Amplifier.
6. Design of Operational Amplifier.
7. Draw the layout of Inverter Circuit.

Suggested Reading:

1. Cadence Design Systems (Ireland) Ltd., "Cadence manual", 2013.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20ECC206

MICROCONTROLLERS AND PROGRAMMABLE DIGITAL SIGNAL PROCESSORS LAB

Instruction	4P Hours per week
Duration of SEE	--
SEE	--
CIE	50 Marks
Credits	2

Prerequisite: Programming in‘C’ and basics of ARM Microcontroller.

Course Objectives:
This course aims to:
1. Write the ARM ‘C’ programming for applications
2. Understand the interfacing of various modules with ARM 7/ ARM Cortex-M3
3. Develop assembly and C Programming for DSP processors

Course Outcomes:
Upon completion of this course, students will be able to:
1. Install, configure and utilize tool sets for developing applications based on ARM processorcore.
2. DesignanddeveloptheARM7 basedembeddedsystemsforvarious applications.
3. DevelopapplicationprogramsonARMandDSPdevelopmentboards both in assembly and C.
4. DesignandImplementthedigitalfiltersonDSP6713processor.
5. Analyze the hardware and software interaction andintegration.

List of Assignments:

Part A

ExperimentstobecarriedoutonARM7/Cortex-M 3 developmentboards

1. BlinkanLEDwithsoftwaredelay,delaygeneratedusingtheSysTicktimer.
2. Systemclockreal-timealterationusingthePLLmodules.
3. ControlintensityofanLEDusingPWMimplementedinsoftwareandhardware.
4. ControlanLEDusingswitchbypollingmethod,byinterruptmethod and flash the LED once every five switchpresses.
5. UART EchoTest.
6. Take analog readings on rotation of rotary potentiometer connected to an ADCchannel.
7. TemperatureindicationonanRGBLED.
8. Mimic light intensity sensed by the light sensor by varying the blinkingrateofanLED.
9. Evaluate the various sleep modes by putting core in sleep and deep sleep modes.
10. System reset using watchdog timer in case something goeswrong.
11. Sample soundusingamicro-phoneanddisplaysoundlevelsonLEDs.

20ECC202

EMBEDDED SYSTEM DESIGN USING RTOS

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisites: The prior knowledge on the basics of operating systems.

Course Objectives:
This course aims to:
1. Understand the basic concepts of the UNIX operating system and POSIX Standards.
2. Know the importance of hard/soft Real-Time Systems and to familiarize the cases for tasks, semaphores, queues, pipes, and event flags.
3. Study the basics of the kernel objects and memory management in VxWorks and to know about real-time applications development tools.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Understand the concepts of UNIX operating system and process management.
2. Describe the POSIX standards for real time systems and compare hard and soft real time systems.
3. Analyze various scheduling algorithms and application to real time systems.
4. Illustrate the concepts of real time operating system and VxWorks.
5. Elucidate the concepts software development tools and RTOS comparison.

UNIT-I:
Brief Review of UNIX Operating Systems: UNIX Kernel File system concepts of Process Concurrent Execution &Interrupts. Process management – forks & execution. Programming with system calls, Process Scheduling, Shell programming and filters.Portable Operating system Interface (POSIX) IEEE Standard 1003.13 & POSIX real time profile. POSIX versus traditional Unix Signals.Overheads and timing predictability.

UNIT-II:
Hard versus Soft Real-time systems: Examples, Jobs & Processors, Hard and Soft timing constraints, Hard Real –time systems, SoftReal time systems. Classical Uniprocessor Scheduling algorithms –RMS, Preemptive EDF, Allowing for Preemptive and Exclusion condition.

UNIT-III:
Concept of Embedded operating systems, Differences between Traditional OS and RTOS, Real time system concepts, RTOS Kernel & Issues in Multitasking Task Assignment, Task switching, Foreground ISRs and Background Tasks, critical section, Reentrant Functions, Inter-process Communication (IPC)- IPC through Semaphores, Mutex, Mailboxes, Message queues or pipes and Event Flags.

UNIT-IV:
VxWorks –POSIX Real Time Extensions, timeout features, Task Creation, Semaphores (Binary, Counting), Mutex, Mailbox, Message Queues, Memory Management – Virtual to Physical Address Mapping.

UNIT-V:

Debugging tools and cross development environment, Software Logic analyzer, ICEs. Comparison of RTOS – VxWorks, µC/OS-II and RT Linux for Embedded Applications.

Text Books:

1. Jane W.S.Liu,"Real Time Systems", Pearson Education, Asia, 2001.
2. Wind River Systems, "VxWorks Programrs Guide", Wind River Systems Inc.1997.
3. Jean. J. Labrose, "MicroC/OS-II", The CMP Books, 2002.

Suggested Reading:

1. Betchof, D.R., "Programming with POSIX threads", Addison Wesley Longman, 1997.
2. C.M.Krishna and G.Shin, "Real Time Systems", McGraw-Hill Companies Inc., McGraw Hill International Editions, 1997

20EC C204

VLSI DESIGN VERIFICATION AND TESTING

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-requisite: Knowledge on Analog and Digital CMOS VLSI Design, C and C++ Language concepts.

Course Objectives:
This course aims to:
1. The concepts of verification and testing.
2. Data types and OOPs concepts.
3. Randomization in System Verilog.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Recipe of front-end design verification techniques and create reusable test bench environments.
2. Understanding various data types used in System Verilog
3. Demonstrating OOPs concepts to System Verilog verification
4. Application of Randomization concept in System Verilog
5. Interface a System Verilog testbench with System C

UNIT-I
Verification Guidelines: Verification Process, Basic test bench functionality, directed testing, Methodology basics, Constrained-Random stimulus, Functional coverage, test bench components, Layered test bench, Building layered test bench, Simulation environment phases, Maximum code reuse, test bench performance.

UNIT-II
Data Types: Built-in data types, Fixed-size arrays, Dynamic arrays, Queues, Associative Arrays, Linked lists, Array methods, choosing a storage type, creating new types with typedef, Creating user-defined structures, Type conversion, Enumerated types, Constants strings, Expression width. Procedural statements and routines: Procedural statements, tasks, functions and void functions, Routine arguments, returning from a routine, local data storage, Time values.

UNIT-III
Basic OOPS: Introduction, think of nouns, not verbs, your first class, where to define a class, OOP terminology, creating new objects, Object de-allocation, using objects, Static variables vs. Global variables, Class methods, defining methods outside of the class, scoping rules, Using one class inside another.

UNIT-IV
Connecting the test bench and design: Separating the test bench and design, Interface constructs, Stimulus timing, Interface driving and sampling, connecting it all together, Top-level scope Program Module interactions. System Verilog Assertions, understanding dynamic objects, copying objects, Public vs. Local, straying off course building a test bench.

UNIT-V

Randomization: Introduction, What to randomize, Randomization in System Verilog, Constraint details solution probabilities, Controlling multiple constraint blocks, Valid constraints, In-line constraints, The pre randomize and post randomize functions, Random number functions, Constraints tips and techniques, Common randomization problems, Iterative and array constraints, Atomic stimulus generation vs. Scenario generation, Random control, Random number generators, Random device configuration.

Text Books:

1. Chris Spears, "System Verilog for Verification", Springer, 2nd Edition 2006.
2. M. Bushnell and V. D. Agrawal, "Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits", Kluwer Academic Publishers 2002.

Suggested Reading:

1. Writing test benches using System Verilog By Janick Bergeron Edition: illustrated Published by Birkhäuser, 2006 ISBN 0387292217, 9780387292212
2. System Verilog for Verification: A Guide to Learning the Test bench Language Features by Chris Spear Edition: 2, Published by Springer, 2008 ISBN 0387765298, 9780387765297

20EC E205

LOW POWER VLSI DESIGN

(Program Elective)

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-requisites: Students should have prior knowledge of Analog and Digital CMOS VLSI Design.

Course Objectives:

This course aims to:

1. Know the sources of power dissipation and need for low power designs for emerging technologies.
2. Understand the concepts of Low power design techniques for digital circuits.
3. Analyze the power dissipations of memory and processor systems and able to adopt suitable methods for power reduction.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Identify sources of power dissipation in a given VLSI Circuit
2. Analyze and apply various low power circuit techniques for combinational and sequential circuits
3. Demonstrate understanding of clock distribution for Low Power
4. Explain power minimization techniques for arithmetic and memory subsystem
5. Elaborate Microprocessor Design System concepts for Low Power

UNIT-I:

Technology & Circuit Design Levels: Sources of power dissipation in digital ICs, degree of freedom, recurring themes in low-power, emerging low power approaches, dynamic dissipation in CMOS, effects of V_{dd}&V_t on speed, constraints on Vt reduction, transistor sizing & optimal gate oxide thickness, impact of technology scaling, technology innovations.

UNIT-II:

Low Power Circuit Techniques: Power consumption in circuits, flip-flops & latches, high capacitance nodes, energy recovery, reversible pipelines, high performance approaches.

UNIT-III:

Low Power Clock Distribution: Power dissipation in clock distribution, single driver Versus distributed buffers, buffers & device sizing under process variations, zero skew vs Tolerable skew, chip & package co-design of clock network.

UNIT-IV:

Logic Synthesis for Low Power estimation techniques: Power minimization techniques, Low power arithmetic components-circuit design styles, adders, multipliers. Low Power Memory Design: Sources & reduction of power dissipation in memory subsystem, sources of power dissipation in DRAM & SRAM.

UNIT-V:

Low Power Microprocessor Design System: power management support, architectural tradeoffs for power, choosing the supply voltage, low-power clocking, implementation problem for low power, comparison of microprocessors for power & performance.

Text Books:

1. Jan M. Rabaey and MassoudPedram, "Low Power Design Methodologies", Kluwer Academic, 1996
2. Kaushik Roy, Sharat Prasad, "Low power CMOS VLSI circuit design", John Wiley sons, Inc., 2000.

Suggested Reading:

1. J.B.Kulo and J.H Lou, "Low voltage CMOS VLSI Circuits", Wiley, 1999.
2. Gary Yeap, "Practical low power digital VLSI design", Kluwer, 1998.
3. A.P.Chandrasekaran and R.W.Broadersen, "Low power digital CMOS design", Kluwer,1995

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

20EC E210

SOC DESIGN

(Program Elective)

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-requisites: Concept of Embedded Systems, Microprocessors, microcontrollers and ASIC.

Course Objectives:
This course aims to:

1. Introduce students to various approaches of SoC design, ADLs and GNR.
2. Introduce various techniques used for Low power SoC Design
3. Demonstrate various simulation methods and synthesis techniques for SoCs.

Course Outcomes:
Upon completion of this course, students will be able to:

1. Understand the conceptsrelated to SoC like NISC, ASIP, ADL, GNR, Reconfiguration, Clock Gating, DVS etc.
2. Differentiate between various design strategies like ASIC and SOC etc.
3. Distinguish between various types of Processors like CISC, RISC, NISC and ASIP.HDL and ADL
4. Design a simple SOC for reconfigurability / low power / ASIP / NISC etc. and synthesize simple blocks using Graph Theory.
5. Simulate and synthesize the Design using various simulation models.

UNIT 1
ASIC and NISC Overview: Overview-Overview of ASIC types, design strategies, CISC, RISC and NISC approaches for SOC architectural issues and its impact on SoC design methodologies, Application Specific Instruction Processor (ASIP) concepts, NISC-NISC Control Words methodology, NISC Applications and Advantages.

UNIT 2
ADL (for ASIP&NISC) and GNR: Architecture Description Languages (ADL) for design and verification of Application Specific Instruction-set Processors (ASIP), NISC-design flow, modeling NISC architectures and systems,
Generic Netlist Representation -A formal language for specification, compilation and synthesis of embedded processors.

UNIT 3
Low power SoC design: Low power SoC design / Digital system, Low power system perspective-power gating, clock gating, adaptive voltage scaling (AVS), Static voltage scaling, Dynamic clock frequency and voltage scaling (DCFS), building block optimization, power down techniques, power consumption verification.

UNIT 4
Simulation: Different simulation modes, behavioral, functional, static timing, gate level,switch level, transistor/circuit simulation, design of verification vectors.FPGA, Reconfigurable systems, SoC related modeling of data path design and control logic, Minimization of interconnects impact, clock tree design issues.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

UNIT 5

Synthesis: Role and Concept of graph theory and its relevance to synthesizable constructs, Walks, trails paths, connectivity, components, mapping/visualization, nodal and admittance graph. Technology independent and technology dependent approaches for synthesis, optimization constraints, Synthesis report analysis. HDL coding techniques for minimization of power consumption.Designof NISC for DCT application.

Text Books:

1. Michael J. Flynn and Wayne Luk, “Computer System Design: Systemon-Chip”. Wiley, 2011.
2. B. Al Hashimi, “System on chip-Next generation electronics”, The IET, 2006.

Suggested Reading:

1. Hubert Kaeslin, “Digital Integrated Circuit Design: From VLSI Architectures to CMOS Fabrication”, CambridgeUniversity Press, 2008.
2. RochitRajsuman, “System-on- a-chip: Design and test”, Advantest America R & D Center, 2000.
3. P Mishra and N Dutt, “Processor Description Languages”, Morgan Kaufmann, 2008

20EC A101

VALUE EDUCATION
(Audit Course)

Instruction	2 L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	--
Credits	Non-Credit

Course Objectives:
This course aims to
1. Understand the need and importance of Values for self-development and for National development.
2. Imbibe good human values and Morals
3. Cultivate individual and National character.

Course outcomes:
After completion of the Course, Students will be able to
1. Summarize classification of values and values for self-development.
2. Identify the importance of values in personal and professional life.
3. Apply the importance of social values for better career and relationships.
4. Compile the values from holy books for personal and social responsibility.
5. Discuss concept of soul and reincarnation, values Dharma, Karma and Guna.

UNIT-I
Human Values, Ethics and Morals: Concept of Values, Indian concept of humanism, human values; Values for self-development, Social values, individual attitudes; Work ethics, moral and non- moral behavior, standards and principles based on religion, culture and tradition.

UNIT-II
Value Cultivation, and Self-Management: Need and Importance of cultivation of values such as Sense-of Duty, Devotion to work, Self-reliance, Confidence, Concentration, Integrity & discipline, and Truthfulness.

UNIT-III
Spiritual Outlook and Social Values: Personality and Behavior, Scientific attitude and Spiritual (soul) outlook; Cultivation of Social Values Such as Positive Thinking, Punctuality, Love & Kindness, avoiding fault finding in others, Reduction of anger, forgiveness, Dignity of labor, True friendship, Universal brotherhood and religious tolerance.

UNIT-IV
Values in Holy Books : ** Self-management and Good health; **and internal & external Cleanliness, Holy books versus Blind faith, Character and Competence, Equality, Nonviolence, Humility, Role of Women.

UNIT-V
Dharma, Karma and Guna: Concept of soul; Science of Reincarnation, Character and Conduct, Concept of Dharma; Cause and Effect based Karma Theory; The qualities of Devine and Devilish; Satwic, Rajasic and Tamasic gunas.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Text Books:

1. Chakroborty, S.K. “Values & Ethics for organizations Theory and practice”, Oxford University Press, New Delhi, 1998.
2. Jaya DayalGoyandaka, “Srimad Bhagavad Gita”, withSanskrit Text, Word meaning and Prose meaning, Gita Press, Gorakhpur, 2017.

20ECC207

RTL SIMULATION AND SYNTHESIS WITH PLDs LAB

Instruction	4P Hours per week
Duration of SEE	--
SEE	--
CIE	50 Marks
Credits	2

Pre-requisites: Digital Design and Verilog HDL programming skills.

Course Objectives:
This course aims to:

1. The simulation of combinational and sequential circuits.
2. FSM based designs.
3. Implementation of DFT and FFTs.

Course Outcomes:
Upon completion of this course, students will be able to:

1. Demonstrate the process steps required for simulation /synthesis.
2. Design and simulate various combinational and sequential circuits using HDL.
3. Develop an RTL code for various real time applications.
4. Synthesize an RTL code for several digital designs.
5. Build a prototype for various digital circuits with PLDs.

Design entry by Verilog, Programmable Logic Devices, Introduction to ASIC Design Flow, FPGA, SoC, Floor planning, Placement, Clock tree synthesis, Routing, Physical verification, Power analysis, ESD protection. Static Timing analysis, Meta-stability, Clock issues, Need and design strategies for multi-clock domain designs, IP and Prototyping, Design for testability.

List of Experiments:

1. Verilog implementation of 8:1 Mux/Demux, Full Adder, 8-bit Magnitude comparator,
2. Encoder/decoder, Priority encoder, D-FF, 4-bit Shift registers (SISO, SIPO, PISO, Bidirectional) 3-bit Synchronous Counters, Binary to Gray converter, Parity generator.
3. Sequence generator/detectors, Synchronous FSM – Mealy and Moore machines.
4. Vending machines - Traffic Light controller, ATM, elevator control.
5. PCI Bus & arbiter and downloading on FPGA.
6. UART/ USART implementation in Verilog.
7. Realization of single port SRAM in Verilog.
8. Verilog implementation of Arithmetic circuits like serial adder/subtractor, parallel adder/subtractor, serial/parallel multiplier.
9. Discrete Fourier transform/Fast Fourier Transform algorithm in Verilog.

Suggested Reading:

1. Samir Palnitkar, "Verilog HDL, a guide to digital design and synthesis", Prentice Hall 2003.
2. Doug Amos, Austin Lesea, Rene Richter, "FPGA based prototyping methodology manual", Xilinx, 2011.
3. Bob Zeidman, "Designing with FPGAs & CPLDs", CMP Books, 2002.

20ECC208

RTOS AND VLSI DESIGN VERIFICATION LAB

Instruction	4P Hours per week
Duration of SEE	--
SEE	--
CIE	50 Marks
Credits	2

Pre-requisites: Basics of operating system,basics of embedded systemand verification concepts.

Course Objectives:
This course aims to:
1. Understand the concepts of RTOs
2. Illustrate the concept of task scheduling
3. Verify layout of basic digital circuits

Course Outcomes:
Upon completion of this course, students will be able to:
1. Verify a few important OOPs concepts
2. Compile and Run various design constructs using CAD tool
3. Develop self-checking test benches using SystemVerilog
4. Understand the programming concepts of RTOS
5. Analyze Multitasking, IPC and scheduling concepts

RTOS programming:

1. Introduction to RTOS (VxWorks) and its basic functions
2. RTOS Timer programming (VxWorks)
3. RTOS Task function programming (VxWorks)
4. Multitasking using round robin scheduling
5. IPC using message queues
6. IPC using semaphore
7. IPC using mail box
8.

Verification (Mentor Graphics Tools)

1. Sparse memory
2. Semaphore
3. Mail box
4. Classes
5. Polymorphism
6. Coverage
7. Assertions

Suggested reading:

1. Silberschatz, Galvin, Gange"Operating Systems Concepts" 8/e , Wiley Education, 2007.
2. Wind River Systems Inc., "VxWorks Programmers Guide", 1997.

20EC C209

MINI PROJECT WITH SEMINAR

Instruction	4 P Hours per Week
Duration of SEE	--
SEE	--
CIE	50 Marks
Credits	2

Prerequisite: Knowledge of preparing slides by using power point presentations, Capable of searching for suitable literature and Presentation skills.

Course Objectives:
This course aims to:

1. The mini-project shall contain a clear statement of the research objectives, background of work, literature review, techniques used, prospective deliverables, and detailed discussion on results, conclusions and references.
2. To expose and practice of searching and referring the required literature.
3. This is expected to provide a good initiation for the student(s) towards R&D.

Course Outcomes:
Upon completion of this course, students will be able to:

1. Familiarize in searching the suitable literature in the chosen field.
2. Develop skills to understand and summarize the contents from the literature.
3. Ability to synthesize knowledge/ skills previously gained and applied in execution of a chosen technical problem.
4. Enhance oral presentation skills through power point presentations.
5. Learn and present the findings of their technical solution in a written report.

Guidelines:

1. As part of the curriculum in the II - Semester of the Program each student shalldo a mini project, generally comprising about three to four weeks of prior reading, twelve weeks of active research, and finally a presentation of their work for assessment.
2. Each student will be allotted to a faculty supervisor for mentoring.
3. Mini projects should present students with an accessible challenge on which to demonstrate competence in research techniques, plus the opportunity to contribute something more original.
4. Mini projects shall have inter-disciplinary/ industry relevance.
5. The students can select a mathematical modeling based/Experimental investigations or Numerical modeling.
6. All the investigations are clearly stated and documented with the reasons/explanations.
7. The mini project shall contain a clear statement of the research objectives, background of work, literature review, techniques used, prospective deliverables, and detailed discussion on results, conclusions and references.

Departmental committee: Supervisor and two faculty coordinators

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Guidelines for awardingmarks in CIE: Max. Marks: 50		
Evaluation by	**Max. Marks**	**Evaluation Criteria / Parameter**
Supervisor	20	Progress and Review
	05	Report
Departmental Committee	05	Relevance of the Topic
	05	PPT Preparation
	05	Presentation
	05	Question and Answers
	05	Report Preparation

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20ECE204

FPGA AND CPLD ARCHITECTURES

(Program Elective)

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-requisites: Knowledge of Digital design using Multiplexers and Look-up tables.

Course Objectives:
This course aims to:

1. Study various PLD, CPLDs and FPGA Architectures and its features.
2. Understand the different programming technologies, placement and routing.
3. Study the design tools for FPGA and ASICs.

Course Outcomes:
Upon completion of this course, students will be able to:

1. Explain the concepts of PLDs, CPLDs and FPGAs.
2. Analyze and compare the various architectures of CPLD and FPGA and its programming technologies.
3. Implement various logic functions on PLDs, CPLDs and FPGAs.
4. Understand the concepts of placement and routing algorithms and classifying ASICs.
5. Demonstrate VLSI tool flow for CPLDs and FPGAs.

UNIT-I:
Programmable Logic Devices: Introduction, Evolution: Programmable read only memory (PROM), programmable logic array (PLA) and programmable array logic (PAL). Implementation with PLDs, Programming technologies. Design flow for CPLDs & FPGAs.

UNIT-II:
CPLDs: Complex Programmable Logic Devices: Architecture and features of Altera max 7000 series CPLD, AMD Mach 4 and Xilinx 9500 series.
FPGAs: Field Programmable Gate Arrays: Logic blocks, routing architecture and features of Xilinx XC4000, Spartan II, Virtex II and Actel Act1, Act2, Act3 FPGAs.

UNIT-III:
Advance FPGAs: Architectures and Features of Xilinx Spartan- 6, Virtex-6, and AlterasStartix FPGAs. Introduction to Xilinx Zynq board.

UNIT-IV:
Placement: objectives, placement algorithms: Min-cut-Based placement, Iterative Improvement placement, Simulated Annealing.Routing: objectives, Segmented Channel Routing, Maze Routing, Routability estimation, computing signal delay in RC tree networks.

UNIT-V:

Digital Front End and back End tools for FPGAs and ASICs, FPGA implementation steps.Verification: introduction, logic simulation, design validation, timing verification.Testing concepts: failures, mechanisms and faults, fault coverage, ATPG methods and programmability failures.

Text Books:

1. S. Brown, R. Francis, J. Rose, Z.Vransic, "Field Programmable Gate array", BSP,2007.
2. P.K. Chan & S. Mourad, "Digital Design Using Field Programmable Gate Array", Pearson Education 2009.

Suggested Reading:

1. S. Trimberger, Edr., "Field Programmable Gate Array Technology", Kluwer Academic Publications, 1994.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20CS O101

BUSINESS ANALYTICS

(Open Elective)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
This course aims to:

1. Understanding the basic concepts of business analytics and applications
2. Study various business analytics methods including predictive, prescriptive and prescriptive analytics
3. Prepare the students to model business data using various data mining, decision making methods

Course Outcomes:
Upon completing this course, students will be able to:

1. Identify and describe complex business problems in terms of analytical models.
2. Apply appropriate analytical methods to find solutions to business problems that achieve stated objectives.
3. Interpret various metrics, measures used in business analytics
4. Illustrate various descriptive, predictive and prescriptive methods and techniques
5. Model the business data using various business analytical methods and techniques
6. Create viable solutions to decision making problems

UNIT-I

Introduction to Business Analytics: Introduction to Business Analytics, need and science of data driven (DD) decision making, Descriptive, predictive, prescriptive analytics and techniques, Big data analytics, Web and Social media analytics, Machine Learning algorithms, framework for decision making, challenges in DD decision making and future.

UNIT-II

Descriptive Analytics: Introduction, data types and scales, types of measurement scales, population and samples, measures of central tendency, percentile, decile and quadrille, measures of variation, measures of shape-skewness, data visualization

UNIT-III

Forecasting Techniques: Introduction, time-series data and components, forecasting accuracy, moving average method, single exponential smoothing, Holt's method, Holt-Winter model, Croston's forecasting method, regression model for forecasting, Auto regression models, auto-regressive moving process, ARIMA, Theil's coefficient

UNIT-IV

Decision Trees: CHAID, Classification and Regression tree, splitting criteria, Ensemble and method and random forest. Clustering: Distance and similarity measures used in clustering, Clustering algorithms, K-Means and Hierarchical algorithms, Prescriptive Analytics- Linear Programming (LP) and LP model building,

UNIT-V

Six Sigma: Introduction, introduction, origin, 3-Sigma Vs Six-Sigma process, cost of poor quality, sigma score, industry applications, six sigma measures, DPMO, yield, sigma score, DMAIC methodology, Six Sigma toolbox

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Text Books:

1. U Dinesh Kumar, “Data Analytics”, Wiley Publications, 1st Edition, 2017
2. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, “Business analytics Principles, Concepts, and Applications with SAS”, Associate Publishers, 2015.

Suggested Reading:

1. S. Christian Albright, Wayne L. Winston, “Business Analytics - Data Analysis and Decision Making”, 5th Edition, Cengage, 2015.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc18-mg11/preview
2. https://nptel.ac.in/courses/110105089/

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

20EC C210

INDUSTRIAL PROJECT /DISSERTATION PHASE I

Instruction	20 P Hours per Week
Duration of SEE	
SEE	--
CIE	100 Marks
Credits	10

Prerequisite: Preferably, student must have completed 'Mini Project with Seminar' successfully.

Course Objectives:
This course aims to:

1. The 'Industrial project/Dissertation Phase 1(Project work) will preferably be a problem with research potential and should involve scientific research, design, generation/collection and analysis of data, determining solution and must preferably bring out the student contribution(s).
2. To expose and learn the required simulation software/experimental techniques.
3. To carry out the work in a research environment or in an industrial environment

Course Outcomes:
Upon completion of this course, students will be able to:

1. Survey the literature such as books, national/international refereed journals and contact resource persons for the selected topic of research/project field.
2. Consolidate the literature survey and will be motivated to define the title of the project, able to decide the aim(s), objectives and design specifications of the project.
3. Learn the required software/ computational/analytical tools for implementations.
4. Document a report comprising of summary of literature survey, detailed objectives, project specifications, or computer aided design, proof of concept/functionality, and part of results if any.
5. Get aquatinted to work in a research environment or in an industrial environment

Guidelines:

1. The Project work will preferably be a problem with research potential and should involve scientific research, design, generation/collection and analysis of data, determining solution and must preferably bring out the individual contribution.
2. Seminar should be based on the area in which the candidate has undertaken the dissertation work.
3. The CIE shall include reviews and the preparation of report consisting of a detailed problem statement and a literature review.
4. The preliminary results (if available) of the problem may also be discussed in the report.
5. The work has to be presented in front of the committee consists of Head, Chairperson-BoS, Supervisor and Project coordinator.
6. The candidate has to be in regular contact with his supervisor and the topic of dissertation must be mutually decided by the guide and student.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

Guidelines for awarding Marks in CIE:
Max. Marks: 100

Evaluation by	Max. Marks	Evaluation Criteria / Parameter
Supervisor	30	Project Status / Review(s)
	20	Report
Departmental Review Committee	10	Relevance of the Topic
	10	PPT Preparation(s)
	10	Presentation(s)
	10	Question and Answers
	10	Report Preparation

Note: Departmental Review committee has to assess the progress of the student for every two weeks.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075

20EC C211

INDUSTRIAL PROJECT /DISSERTATION PHASE II

Instruction	32 P Hours per Week
Duration of SEE	Viva - Voce
SEE	100 Marks
CIE	100 Marks
Credits	16

Prerequisite: Student must have earned the credit of 'Industrial project/Dissertation Phase 1'.

Course Objectives:
This course aims to:
1. Industrial project/Dissertation Phase 2 is the continuation of Industrial project/Dissertation Phase 1
2. Implementation of Project objectives.
3. Presentation of periodic reviews of the objectives and preparing of Dissertation in a prescribed format.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
2. Plan experiments for a critical comparison of outputs or to verify the obtained analytical/simulation results with the experimental results available in the literature.
3. Develop attitude of lifelong learning and will develop interpersonal skills to deal with people working in diversified field.
4. Learn to write technical reports and research papers to publish at national and international level.
5. Develop strong communication skills to defend their work in front of technically qualified audience.

Guidelines:
1. It is a continuation of Project work started in semester III.
2. The student has to submit the report in prescribed format and also present a seminar.
3. The dissertation should be presented in standard format as provided by the department.
4. The candidate has to prepare a detailed project report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology (experimental set up or numerical details as the case may be) of solution and results and discussion.
5. The report must bring out the conclusions of the work and future scope for the study.
   The work has to be presented in front of the examiners panel consisting of an approved external examiner, an internal examiner (HoD and BoSChair Person) guide/co-guide.
6. The candidate has to be in regular contact with his/her guide/co-guide.

Guidelines for awarding marks in CIE:
Max. Marks: 100

Evaluation by	Max. Marks	Evaluation Criteria / Parameter
Departmental Review Committee	05	Review 1
	10	Review 2
	10	Review 3
	15	Final presentation with the draft copy of the report
	10	Submission of the report in a standard format
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	10	Quality of the work which may lead to publications
	10	Analytical / Programming / Experimental Skills Preparation
	10	Report preparation in a standard format

Guidelines for awarding marks in SEE: Max. Marks: 100

Evaluation by	Max. Marks	Evaluation Criteria / Parameter
External and Internal Examiner(s) together	20	Power Point Presentation
	40	Quality of thesis and evaluation
	20	Quality of the project • Innovations • Applications • Live Research Projects • Scope for future study • Application to society
	20	Viva-Voce

Note: Departmental Review committee has to assess the progress of the student for every two weeks.

HEAD
DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

20MBO201

E-BUSINESS

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To provide the basics of Electronic Commerce and understand Mobile Commerce Market.
2. To educate on the Current and emerging Business Models.
3. To focus on the need for security in e-commerce and to know various types of e-services.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand various concepts and developments of Physical, E-Commerce and M-Commerce.
2. Develop various models of E-commerce to gain Competitive Advantage.
3. Design and use appropriate Electronic Payment Systems.
4. Apply appropriate Network Security and Firewalls in E-Business activities.
5. Understand various types of e-services and Legal, Ethical and privacy issues associated with E-Business.

Unit I Introduction

Electronic Commerce and Physical Commerce, The Digital phenomenon, Different types of e-commerce Electronic Commerce Framework, Advantage and Disadvantages of e-commerce, Growth of the Internet, Emergence of the World Wide Web, Transition to e-commerce in India, e-commerce Opportunities for Industries. Mobile Commerce - Overview of the Market and Leveraging Applications.

Unit II Consumer and Business-Oriented e-commerce

Consumer-Oriented e-commerce: Traditional retailing, e-retailing, benefits and features of e-retailing, Key success factors, Models of e retailing. Developing a Consumer-oriented e-commerce system: The emergent Business Model as the basis of e-commerce system development. Process-oriented e-commerce Development approach. Steps in the Development methodology. The PASS Model. Business-oriented e-commerce - Features of B2B e-commerce, Business Models.

Unit III Electronic Payment Systems

Introduction to Payment Systems, Electronic Cash: Blind signature, Payment by e-cash over the Internet. Smart Cards and Electronic Payment Systems, e-check: Deposit-and-Clear, Cash-and-Transfer, Lockbox, Direct fund transfer. Risks associated in Electronic Payment Systems. Designing electronic Payment systems.

Unit IV Network Security and Firewalls

Client-Server Network Security, Emerging Client-server Security threats, Firewalls and Network Security, Data and Message security, Encrypted documents and Electronic mail. Digital Signatures, Security Protocols for Web Commerce.

Unit V E-Services and Legal and Privacy Issues

Categories of E-services, Web-enabled services, E-banking, E-stock trading, E-investing, E-education. Match making services: Travel services, E-employment, E-jobs. Information selling on the Web, E-entertainment. Auctions and other specialized services: C2C auction sites and B2B auctions.

Legal, Ethics and Privacy issues- Protection needs and methodology- Consumer protection, Cyber laws, Contracts and Warranties, Taxation and Encryption policies.

Text Books:

1. Henry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang, "E Commerce: Fundamentals and Applications", 1st edition, Wiley, 2007.
2. Ravi Kalakota, Andrew B. Whinston, "Frontiers of Electronic Commerce", Pearson, 2011.
3. P.T. Joseph, S.J. "E-Commerce: An Indian Perspective", PHI Learning, 5th edition, 2015.
4. Bharat Bhasker, Electronic Commerce - Framework, Technologies and Applications, 4th edition McGraw Hill Education, 2017.

Suggested Readings:

1. David Whiteley, "E-Commerce: Strategy, Technologies and Applications, 1st edition, McGraw Hill Education, 2017.
2. Harvey M.Deitel, Paul J.Deitel, Kate Steinbuhler, e-business and ecommerce for managers, Pearson, 2011.
3. Laudon and Traver, "E-Commerce: Business, technology and Society", 13th edition, Pearson education, 2018.
4. Sanjay Mohapatra, "E-Commerce Strategy- Text and Cases", 1st edition, Springer US, 2013.
5. Dayle M. Smith, "The E-Business Book: A Step by Step Guide to E-Commerce and Beyond" 1st edition, Bloomberg Press, 2001.
6. Janice Reynolds, "The complete E-commerce Book", 2nd edition, CRC Press, 2004.

CORE COURSES

20MBC101

MANAGEMENT AND ORGANIZATION BEHAVIOUR

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of this Course are:

1. To familiarize with the Fundamental principles of Management practice with emphasis on the roles and functions of Managers and to focus on the critical and challenging areas of Organizational Planning and Organizing.
2. To describe Motivation, Leadership, Communication and Controlling and to provide knowledge of Organization Behaviour concepts to understand and analyze how Organizations and the People within them work.
3. To understand the Nature of Power, Politics, Conflict, and the Negotiation process.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Practice the process of Management's functions and understand how Management Evolution affects future Managers.
2. Analyze the need of Planning and Decision Making and also assess the elements of Organizational structure and evaluate their impact on Employees.
3. Evaluate Motivational strategies, Leadership styles, Communication and Controlling processes used in a variety of Organizational settings.
4. Apply Organization Behaviour Concepts to real-world problems faced by Managers.
5. Evaluate how the Power and Politics help an organization, Sources of Conflict in an Organizational setting and execute the Negotiation process to manage Conflicts and resolve disputes.

UNIT-I Introduction to Management

Management- Definition, Nature, Purpose, Evolution of Management Thought-Scientific Management, Administrative Theory, Human Relations Approach, Hawthorne experiments, Theory X, Theory Y and Theory Z, Behavioural Approach, Systems Theory. Managerial Roles, Managerial Levels, Managerial Skills, Functions of Management, Administration vs. Management, Contemporary Management Issues and Challenges.

UNIT-II Planning and Organizing

Planning – Nature, Purpose, Process, Types of Plans, Management by Objectives (MBO). Decision Making – Types of Decisions, Decision Making Process, Decision Making under Certainty, Uncertainty and Risk. Organizing – Formal and Informal Organization, Process, Types of Organization structures, Line and Staff concepts, Span of Management – Factors, Delegation of Authority, Decentralization.

UNIT-III Leading and Controlling

Motivation- Early and Contemporary Theories of Motivation. Leadership - Leadership Behaviour and Styles. Communication - Purpose, Process, Barriers in Communication, Overcoming barriers to communication. Controlling- Basic Control Process, Critical Control Points, Standards, and Benchmarking, Control as a Feedback System, Requirements for effective controls.

UNIT-IV Organization Behaviour

Organization Behaviour – Nature, Levels, Challenges. Individuals in Organizations - Personality and Ability. Personality - Determinants, Personality and Situation, Big Five Model of Personality, Other Organizationally

Relevant Personality Traits. Ability - Cognitive Ability, Physical Ability, Emotional Intelligence. Nature. Perception - Nature, Characteristics of Perceiver, Target and Situation, Biases and Problems in Person Perception. Group Dynamics and Teams- Types of Work Groups, Group Development, Characteristics of Work Groups, Effective Work Groups and Teams.

UNIT-V Conflict and Negotiations

Nature of Power and Politics, Sources of Individual Power, Functional and Divisional Power. Organizational Politics - The use of Power. Organizational Conflict - Sources, Pondy's Model of Organizational Conflict, Negotiation: Resolving Conflict - Individual level conflict, Group level conflict and promoting Compromise.

Text Books:

1. Harold Koontz and Heinz Weihrich, "Essentials of management: An International & Leadership Perspective", 9th edition, Tata McGraw-Hill Education, 2012.
2. Charles W.L Hill and Steven L McShane, "Principles of Management", Special Indian Edition, McGraw Hill Education, 2007.
3. Jennifer George and Gareth Jones "Understanding and Managing Organizational Behavior", 6th Ed., Pearson Education Inc., 2012.
4. John Schermerhorn, Jr., James G. Hunt and Richard N. Osborn, "Organizational behaviour",10t edition, Wiley India Edition, 2009.

Suggested Readings:

1. Andrew J. Dubrin, "Essentials of Management", 9th Ed., Thomson Southwestern, 2012.
2. Stephen A Robbins, David A. Decenzo and Mary Coulter, "Fundamentals of Management", 7th Edition, Pearson Education, 2011.
3. Jon L Pierce and Donald G. Gardner, "Management and Organizational behavior", Cengage Learning India (P) Limited, 2001.
4. Richard Pettinger, "Organizational Behaviour", Routledge, 2013.
5. K. Aswathappa, "Organizational behavior", Himalaya Publishing House, 2013.

SCHOOL OF MANAGEMENT STUDIES
CBIT
Hyderabad

20MBC102

MANAGERIAL ECONOMICS

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To enable the Students to understand the basic Economic concepts, Demand and Supply functions in Decision-making.
2. To understand various Production and Cost functions and choose the optimal combination of Input factors.
3. To understand Price Output determination under different Market structures.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Comprehend and apply the basic Concepts and Economic principles in Decision-making.
2. Calculate Demand Elasticity from Demand Equations.
3. Analyze and Select the Least Cost combination of inputs through Production Function.
4. Examine the different Cost concepts and predict breakeven point.
5. Compare and Contrast the market structures and also Apply Pricing decisions across Industries.

Unit-I Introduction

Nature and Scope of Managerial Economics, Definition, Relation with other Disciplines, Fundamental Concepts of Managerial Economics - Opportunity Cost, Discounting Principle, Time Perspective, Incremental Cost/Reasoning, Equi-Marginal Concept. Objectives of Firm - Profit Maximization Theory, Profit Maximization by Total Revenue and Total Cost Approach, Baumol's Sales Revenue Maximization, Simon's Model of Satisfying Behaviour, Berle-Means-Galbraith Model of Corporate Power Structure, Penrose's Theory of Firm, Optimization Techniques.

Unit-II Demand and Supply Analysis

Theory of Demand, Demand Function, Law of Demand, Elasticity of Demand, Types and Significance of Elasticity of Demand, Demand Estimation – Market Research Approaches, Need for Forecasting and Forecasting Techniques, Supply Function, Law of Supply, Elasticity of Supply.

Unit-III Production Analysis

Production Function - Law of Variable Proportions, Isoquants, Returns to Scale, Cobb Douglas and CES Production Function, MRTS, Iso-Costs, Optimal Combination of input factors, Economies and Diseconomies of Scale.

Unit-IV Cost Analysis

Concepts of Costs, Determinants of Cost functions, Cost- Output Relationship in the Short and Long run, Recent Developments in Cost Theory. Estimation of Cost Function- The Cubic Cost Function, Engineering and Survival Techniques, Breakeven Analysis.

Unit-V Market Structure and Pricing Practices

Types of Market Structure – Price-Output Determination in Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly in short and long run. Pricing Methods in Practice: Price discrimination, Product Line Pricing, Skimming Pricing, Penetrating Pricing , Loss Leader Pricing, Pricing of Multiple Products, Peak load Pricing, Pricing of Innovative Products.

Text Books:

1. Dominik Salvatore, "Managerial Economics", 8th edition, Oxford University Press, Noida, 2014
2. P.L.Mehta.,"Managerial Economics - Analysis, Problems and Cases", Sultan Chand and Sons, NewDelhi, 2014.
3. V.L.Mote, S.Paul and G.S.Gupta, "Managerial Economics Concepts and Cases",11th Edition,Tata McGraw Hill Pvt. Ltd., New Delhi, 49th Reprint 2010.
4. Geethika, Piyoli Ghosh, and P.R.Chaudhary "Managerial Economics", Tata McGraw Hill, New Delhi, 2015.

Suggested Readings:

1. R.L.Varshney and K.L.Maheswari, "Managerial Economics", 22nd Edition, Sultan Chand and Sons, New Delhi, 2014.
2. Barry Keating and J.Holten Wilson, "Managerial Economics", 2nd Edition, Bizmantra, New Delhi, 2009.
3. Michael R. Baye and Jeffrey T.Prince,"Managerial Economics and Business Strategy", 9th Edition, Tata McGraw Hill, 2017.
4. Dominick Salvatore, Siddhartha K.Rastogi, "Managerial Economics: Principles and world wide Applications", Oxford University Press, 8th Edition, 2016.
5. Truet, "Managerial Economics: Analysis, Problems and cases", Wiley Publishers, 2007.
6. Mark Hirschey, "Managerial Economics", Cengage Publishers, 12th Edition, 2013.

20MBC103

FINANCIAL ACCOUNTING FOR MANAGEMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To understand the basic Accounting Concepts and practice Final Account applications in Business.
2. To acquaint the Students with the concepts of Depreciation, Valuation of Assets and critical evaluation of Financial Statements through Ratio Analysis and Cash Flow Statements.
3. To provide knowledge on basic Principles underlying the provisions of Direct and Indirect Tax laws and develop a broad understanding of the Tax laws and Accepted tax practices.

Course Outcomes: After Completion of the Course, Student will be able to:

1. Understand the basic concepts and principles of accounting and maintain the books of accounts.
2. Analyze and prepare the financial statements and understand the accounting standards.
3. Apply the different methods of depreciation and techniques of valuation of assets.
4. Analyze and interpret financial statements through ratio analysis and cash flow statements.
5. Handle Real life situations involving Taxation and equip themselves with techniques for taking Tax-Sensitive Decisions

Unit–I Introduction

Financial Accounting: Objectives, Accounting as a Business Information System; Parties interested in Accounting Information; Accounting Principles, Concepts and Conventions, Introduction to Book Keeping and Recording, Double Entry System, Books of Prime Entry, Subsidiary Books - Classification of Accounts-Accounting Cycle - Journal Proper, Ledger Posting, Preparation of Trial Balance, Suspense Account.

Unit- II Preparation of Final Accounts

Distinction between Capital and Revenue Expenditure - Preparation of Financial Statements -Trading, Profit and Loss account, Balance Sheet with Adjustments. Accounting Standards: Objectives, Scope, Applicability and Implementation of Accounting Standards -IAS- USGAAP International Financial Reporting Standards (IFRS).

Unit- III Valuation of Assets

Depreciation Accounting: Methods of providing Depreciation, Accounting Standards Depreciation Accounting (AS 6), Accounting for Fixed Asset-Application of AS 10.

Valuation: Basic Principles and Techniques of Valuation: DCF, Multiple Methods and Accounting Based Valuation. Asset Valuation: Earning Valuation, Cash flow Valuation. Valuation of Brands, Intangible Assets and Intellectual Property.

Unit –IV Financial Statement Analysis

Financial Statement Analysis: Ratio analysis, Rationale, Uses, Calculation and interpretation of Ratios-Liquidity Ratios- Profitability Ratios- Solvency Ratios-Leverage and Turnover ratios. Cash Flow Statement: Cash From Operations, Investment and Financing activities, Preparation of Cash Flow statement. Accounting Standards Cash Flow Statement (AS 3), Accounting Fraud and Governance.

Unit-V Corporate Taxation

Taxation: Types of Taxes: Direct Tax - Income Tax Act and Rules. Indirect Taxes- Central Excise and CENVAT - Customs Duty, Service Tax, Central Sales Tax and VAT - Primer on GST. Double Taxation Avoidance.

Text Books:

1. Jawaharlal and Seema Srivastava, "Financial Accounting Principles and Practices", 2nd Edition, S.Chand Publishing, 2014.
2. Aswath Damodaran, Investment Valuation: Tools and Techniques for Determining the Value of any Asset, 3rd (Wiley Finance) Edition, 2012.
3. Vinod K. Singhania, Monica Singhania, Taxmann's, Student Guide to Income Tax – including Service Tax/VAT.
4. Earl K Stice and James. D. Stice, "Financial Accounting – Reporting and Analysis", Cengage Learning, 2015.

Suggested Readings:

1. Ambrish Gupta, "Financial Accounting For Management – An Analytical Perspective", Pearson 6th Edition.
2. N. Ramachandran, Ram Kumar Kakani, "Financial Accounting For Management", 4th Edition, McGraw Hill, 2016.
3. Godiawala, Pathak et.al. "Business Taxation", 3rd Edition, Mc Graw Hill.
4. Dr. Jyothi Rattan, "Bharats Taxation Laws", 11th Edition, Bharats Law House, 2019.
5. Marco Vulpiani, "Special Cases of Business Valuation", 1st Edition Mc Graw Hill, 2014.
6. V.S. Datey (Taxmann's), Indirect Taxes Law and Practice, 42nd Edition, 2019.

20MBC104

MARKETING MANAGEMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To provide knowledge on Marketing Concepts and Principles in Theory and Practice.
2. To focus on how a Marketer can effectively utilize Segmentation, Targeting and Positioning; and the Marketing Mix elements to attract and retain the Customer.
3. To create awareness on principal factors that influence Consumers as individuals and Decision makers with an application to the Buying Decision process and focus on Contemporary issues of Marketing.

Course Outcomes: After Completion of the Course, Students should be able to:

1. Know the various Philosophies of Marketing, and apply them in different Business Scenarios.
2. Understand various Segmentation, Targeting and Positioning strategies to make their Products as Market leaders.
3. Effectively design the Marketing Mix effectively in order to achieve the Organizational goals and objectives.
4. Analyze the challenges that might influence the formulation of effective Marketing Strategies from a Consumer Behaviour perspective.
5. To understand the Contemporary issues and develop Marketing Strategies to sustain in this Competitive World.

Unit –I Introduction

Marketing, Market, Core Marketing Concepts, Marketing Management, Marketing Management Philosophies, Marketing vs. Selling, Marketing Mix, Expanded Marketing Mix, Marketing Program and Marketing Strategy, Managing Marketing effort, Marketing Environment - Micro and Macro environment, Environment scanning, Interface with other Functional areas, Models of B2B, B2C,B2G, G2C.

Unit –II Customer-Driven Strategy

Market Segmentation – Segmenting Consumer Markets, Business Markets, International Markets, requirements for effective Segmentation. Market Targeting- Evaluating Market Segments, Selecting Target Market Segments, Socially Responsible Target Marketing. Differentiation and Positioning - Positioning Maps, Choosing Differentiation and Positioning Strategy, Communicating and delivering chosen Position.

Unit-III Marketing Mix

Products, Services, Brands, New Product Development, Product Life cycle, Pricing – Factors and Strategies, Costing vs Pricing, Discounts, CAPEX vs OPEX Models. Marketing Channels, Promotion – Advertising, Public Relations, Personal Selling, Sales Promotion, Direct and Online Marketing, Digital marketing.

Unit-IV Consumer Markets

Model of Consumer Behaviour, Seven Os Structure, Factors Affecting Consumer Behaviour, Stages in the Adoption Process, Industrial Markets- Characteristic, Industrial Buyer Behaviour, Services Markets – Characteristics and Strategies.

Unit-V Extending Marketing

Creating Competitive Advantage – Competitor Analysis, Competitive Strategies, Balancing Customer and Competitor Orientations. Global Marketplace. Corporate Social Responsibility (CSR) in Marketing, Sustainable Marketing – Social Criticisms of Marketing, Consumer Actions to promote Sustainable Marketing, Business Action toward Sustainable Marketing, Contemporary Issues in Marketing.

MANAGEMENT STUDIES CBIT Hyderabad SCHOOL OF

Text Books:

1. Kotler,P.,Armstrong, G.,Agnihotri, P.K., and Haque, E., Principles of Marketing: A South Asian Perspective, 13th Edition, Pearson Education Prentice Hall of India, 2010.
2. Lamb,C., Hair, J.,Sharma, D., and McDaniel, C.Marketing- A South- Asian Perspective, 1st Edition, Cengage Learning, 2016.
3. Ramaswamy V.S. Namakumari S, Marketing Management: Indian Context Global Perspective, 6th Edition, Sage Publications India Pvt Ltd., 2018.
4. Kurtz and Boone, Principles of Marketing, 15th Edition, Cengage Publications, 2013.

Suggested Readings:

1. Best, Roger, Market-Based Management, 6th Edition, PHI Learning Pvt. Ltd., 2013.
2. Saxena, R, Marketing Management, 6th Edition, McGraw-Hill Education, 2019.
3. Kotler, P., Armstrong, G., Agnihotri, P.K., Principles of Marketing, 17th Edition, Pearson Education, 2018.
4. Iacobucci, D., and Vohra, A., MM: A South Asian Perspective, 1st Edition, Cengage Learning, 2019.
5. Kotler, P., and Keller, K., Marketing Management, 15th Edition, Pearson Education, 2017.
6. Pradhan, D., Marketing Management: A Casebook, 1st Edition, Cengage ,2012.

20MB C105

STATISTICS FOR MANAGEMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To provide an insight into Descriptive Statistics and Probability concepts.
2. To enable the Students to decide the appropriate Sampling techniques and facilitate formulation of Hypotheses and applying the Parametric Statistical tools to test the same and also interpret the results.
3. To enable the students to apply different Forecasting techniques for Business applications.

Course Outcomes: After Completion of the Course, the Students will be able to:

1. Understanding the concepts of statistics for business applications.
2. Analyze probability concepts with a view to ascertain the status of business position.
3. Apply the sampling theory in order to study the whole system.
4. Evaluate the statistic and parameter under various sampling conditions.
5. Apply the statistical concepts to forecast the trends in business outcomes.

Unit–I Descriptive Statistics

Statistics - An Overview, Its Applications - Descriptive Statistics: Measures of Central Tendency: Mean, Median, Mode, Measurement of Dispersion: Range and Quartile Deviation, Mean Deviation, Standard Deviation, Karl-Pearson's coefficient of Skewness and Kurtosis.

Unit-II Probability

i) Definitions and Rules of Probability. Additive and Multiplicative Law of Probability.
ii) Probability Distributions: Binomial Distribution, Poisson Distribution and Normal Distribution.

Unit-III Sampling and Estimation

Sampling theory: Sampling Procedures - Random and Non-Random Methods, Standard Error, Sampling Error. Statistical Estimations: Point and Interval Estimation, Properties of Good Estimator, Confidence Interval.

Unit-IV Inferential Statistics

i) Testing of Hypothesis: Type I and Type II Errors, Statistical Significance. Large Sample Tests- Test for One and Two Proportions, Test for One and Two Means, Test for Two Standard Deviations.
ii) Small sample tests: t- distribution- Properties and Applications, Testing for One and Two Means, Paired t- test.
iii) Analysis of Variance -One way and Two-way ANOVA (with and without interaction).
iv) Chi-square distribution: Test for goodness of fit, Test for independence of attributes.

Unit–V Correlation, Regression and Time Series

i) Correlation Analysis - Karl Pearson's Coefficient of Correlation-Spearman' Rank Correlation.
ii) Regression Analysis - Concept - Two lines of Regression - Properties of Regression Coefficients.
iii) Time Series Analysis - Trend Analysis - Free Hand Curve method - Method of Semi Averages - Method of Moving Averages - Least Squares Method.

Text Books:

1. Levin R.I., Rubin S. David, Siddiqui and Rastogi, "Statistics for Management", 8th Ed., Pearson, 2018.
2. S. C. Gupta, "Fundamental of Statistics", Himalaya, 2016.
3. J. K. Sharma, "Business Statistics", Pearson, 2015.
4. P N. Arora, Sumeet Arora, S. Arora , "Comprehensive Statistical Methods", S. Chand Co., 2015.

Suggested Readings:

1. Beri, G C, "Business Statistics", McGraw-Hill, 2015.
2. S. P. Gupta, "Statistical Methods", Sultan Chand and Sons, 2014.
3. Levine, Stephan, Szabat, "Statisics for Managers Using Microsoft Excel", 8th Ed., Pearson, 2018.
4. Anderson, Sweeney, Williams, "Statistics for Business and Economics",11th Ed., Cengage Learning, 2017.
5. Devore, "Probability and Statistics for Engineering and the Sciences", 9th Ed., Cengage Learning, 2016.
6. Ken Black, "Business Statistics for Decision Making", 6th Ed., Wiley, 2010.

20MBC106

DIGITAL TECHNOLOGY

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	3

Course objectives: The Objectives of the Course are:

1. To make the Students to improve the Skills in Digital Enterprise and learn the process of drafting various Business Correspondence.
2. To make the Students understand the development of Digital Enterprise Transformation.
3. To enable the Students to understand the importance of Digital Enterprise and it's functioning.

Course Outcomes: After Completion of the Course, Student will be able to:

1. Enhance competence in various Verticals of Business with Digital Transformation.
2. Compare and contrast the effective Business application in various Sectors with digital transformation.
3. Demonstrate the ability to effectively understand the Digital Enterprise from Company Leader's Perspective.
4. Familiarize with the Autonomous functioning of IT systems in various Business activities.
5. Familiarize with the concepts of Enterprise IOT.

UNIT-I Digital Enterprise Introduction

Building Digital Capabilities - Digital Mastery, Creating compelling Customer experience, exploiting the power of Core Operations, Reinventing Business Models. Domains of Digital Transformation: Customers, Competition, Data, Innovation and Value.
Case: How did Starbucks disrupt with their Mobile Order and Pay Service?

UNIT-II Digital Enterprise Transformation

Building Leadership Capabilities, Crafting your Digital Vision, Engaging the Organization at Scale, Governing the Transformation, Building Technology Leadership Capabilities. Business benefits of Reference Architectures, Design Patterns and Structures. Role of Context awareness in Interactive Digital experiences, Key Architectural considerations, Conceptual Model for Context - Aware Experiences.
Case: Context-aware Digital Employee Experience.

UNIT-III Leadership Perspective

A Leader's playbook for Digital Transformation: Framing the Digital challenge, Focusing Investment, Mobilizing the Organization, Sustaining the Digital Transformation. Build Platforms not just Products.
Case: How does Netflix Automation Platform help grow its Subscribers rapidly?

UNIT-IV Autonomous Systems

Autonomous IT Systems: Introduction, Reference Architecture, Maturity Model for Autonomous IT System, Design Patterns. Turn Data into Assets, Innovate by Rapid Experimentation.
Case: Autonomous Operation of a Customer, Partner, Employee Web Platform in an Enterprise.

UNIT-V Enterprise IoT

Enterprise IoT: Overview, Phenomenon of Internet connectivity, Phases of IoT evolution, Approach to Enterprise IoT, Reference Architecture for Enterprise IoT, Maturity Model for Enterprise IoT.

1. Case: Connected Mines
2. Case: Enterprise IoT Asset Management

Text Books:

1. Srikanth Narasimhan, Jagadish Chundury, "Enterprise Digitization Patterns Designing, Building and Deploying Enterprise Digital Solutions", Notion Press, 2018.
2. George Westerman,Didler Bonnet,Andrew McAfee "Leading Digital Turning Technology into Business Transformation", Harvard Business Review, 2014.
3. DavidL. Rogers, "The Digital Transformation Playbook Rethink your business for the Digital Age", Columbia Business School, 2016.
4. Amitabh P. Mishra, Ashish Ranjan, "A Modern Play book of Digital Transfromation", Sage Publishers, 2019 Edition.

Suggested Readings:

1. Lindsay Herbet, "Digtal Transformarion Build your Organization's Future for the Innovation Age", Bloomsbury Publishers, 2017.
2. Peter Weill, Stephanie L. Woerner, "What's your Digital Business Model?", Harvard Business Review, 2018.
3. George S.Day, Paul J. H.Schoemaker, "See Sooner, Act Faster: How Vigilant Leaders Thrive in an Era of Digital Turbulence (Management on the Cutting Edge)"The MIT Press,2019.
4. Thomas M. Siebel, "Digital Transformation: Survive and Thrive in an Era of Mass Extinction", Rosetta Books, 2019.
5. Tony Saldhanda, "Why Digital Transformations Fail: The Surprising Disciplines of How to Take Off and Stay Ahead", Brett Koehler Publishers, 2019.
6. Gerald C.Kane, Anh Nguyen Phillips, Jonathan R.Copulsky, "The Technology Fallacy: How People Are the Real Key to Digital Transformation (Management on the Cutting Edge)" MIT Sloan Management Review, 2019.

SCHOOL OF MANAGEMENT STUDIES
CBIT
Hyderabad

20MBC107

BUSINESS COMMUNICATION LAB

Instruction	4 Hour per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Course objectives: The Objectives of the Course are:

1. To improve the skills in Listening Comprehensions and learn the process of drafting various Business Correspondence.
2. To develop the Professional way of Presentation in different Business Situations.
3. To enable the Students to understand the importance of Social and Professional Etiquettes.

Course Outcomes: After Completion of the Course, Student will be able to:

1. Display Competence in various Business Communication patterns.
2. Construct effective written messages in various Formats to Audience.
3. Demonstrate the Ability to effectively deliver Formal presentations before a variety of Audiences.
4. Communicate competently in Groups and Organizations and demonstrate Appropriate and Professional Ethical behaviour.
5. Build Strong Relationships and promote positive Atmosphere at Workplace.

Unit 1 Listening and Feedback

Listening Comprehensions - Situational Awareness and Active Listening related exercises.

Unit 2 Writing Skills

Managerial Writing - Writing Emails, WhatsApp and SMS to communicate internally and externally, Business Letters, Internal Communication through-Notices, Circulars, Memos, Agenda and Minutes. Report Writing.

Unit 3 Speaking and Presentation Skills

Types of Managerial Speeches - Speech of Introduction, Speech of Thanks, Occasional Speech, Theme Speech. Presentation for Business, Sales and Training with the aid of Verbal and Multimedia, Handling day to day meetings, Effective ways of Presenting, Participating, Leading and making Decisions – in less Critical to Critical Meetings.

Unit 4 Non Verbal Communication

Techniques to Improve Non Verbal Communication through Role plays and Management Games with focus on Gestures, Para linguistics, Proxemics, Kinesics and Artifacts.

Unit 5 Social and Professional Etiquette

Telephone Etiquette - E-mail Etiquette - Meeting Etiquettes, Cubicle Manners - Table Manners -Dress Code - Greetings.

Text Books:

1. Rani. D. Sudha, "A Manual for English Language Laboratories", Pearson Education, 2014.
2. Suresh Kumar, "A Handbook for English Language Laboratories", Foundation Books, 2009.
3. Sanjay Kumar and Pushp Lata, "Communication Skills", Oxford University Press, 2nd edition, 2015.
4. Lesikar R V et al., "Business Communication: Connecting in a Digital World", McGraw Hill Education, 2015.

Suggested Readings:

1. Kumkum Bhardwaj, "Fundamentals of Business Communication", Wiley (Dreamtech Press), 1st Edition, 2019.
2. Julian Dakin, "The Language Laboratory and Language learning", Addison-Wesley-Longman Ltd, UK, 1973.
3. Simon Morton, "The Presentation Lab: Learn the Formula behind Powerful Presentations", Wiley; 1st edition, 2014.
4. Steve Duck, David T. McMahan, "The Basics of Communication- A Relational Perspective", Sage Publishers, 2nd Edition, 2012.
5. Penrose, Rasberry and Myers, "Business Communication for Managers", Cengage Learning, 2007.
6. U S Rai and S M Rai, "Business Communication", Himalaya Publications, 2014.

SCHOOL OF MANAGEMENT STUDIES CBIT Hyderabad

20MBC108

STATISTICS LAB

Instruction	2 Hour per week
Duration of Semester Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: The Objectives of the Course are:

1. To Understand Descriptive statistics and its usage in Decision making in different disciplines.
2. To Explain the concept of Hypothesis and Parametric Tests.
3. To understand the relationship between two or more variables by using Appropriate Statistical Analysis Techniques.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Apply the methods of descriptive statistics and analyze the data by using MS Excel.
2. Foster the practical understanding of parametric test and to reveal the right inferences about the population.
3. Analyze one variable experiment by using one Way ANOVA.
4. Calculate Correlation coefficient and Simple Regression to interpret theOutcomes.
5. Examine Time Series model and extract meaningful insights about theData.

Unit-I Introduction to Descriptive Statistics
Measures of Central Tendency - Mean, Median, and Mode; Measures of Dispersion - Range, Quartile deviation, Standard Deviation and Variance, Coefficient of Variation, Population Confidence Intervals.

Unit-II Parametric Tests and Analysis of Variance
One Sample Z and T test for the Population Mean, Two samples Z and T test for the Population Mean. Chi Square Tests - Independence of Attributes. Single-Factor Experiments: One-way ANOVA.

Unit -III Correlation, Simple Regression and Time Series Analysis Correlation Analysis: Scatter Plot, Covariance and Pearson's Correlation coefficient, r. Simple Regression analysis, Time Series analysis: Fitting a Straight Line using simple data, Forecasting methods: Moving average.

Text Books:

1. Glyn Davis &BrankoPecar "Business Statistics Using Excel" Oxford University Press, 2nd edition, 2014.
2. D P Apte, "Statistical Tools for Managers using MS Excel", Excel, 2012.
3. David M Levine, David. F. Stephan & Kathryn A. Szabat, "Statistics for Managers Using MS Excel", PHI, 2015.
4. Bruce Bowerman, "Business Statistics in Practice", 5th edition, TMH, 2015.

Suggested Readings:

1. John Walkenbach, "Excel 2010 Bible", John Wiley & Sons, 2010 Edition.
2. Rao and Tyagi, "Research Methodology with SPSS", Shree Niwas Publications, 2009.
3. Albright C. S., Winston Wayne L. and Zappe C. J., "Decision Making Using Microsoft Excel", 2009, India Edition, CengageLearning.
4. Ajai.S.Gaur, SanjayaS.Gaur, "Statistical Methods for Practice and Research Response", 2009.
5. Wayne L. Winston, "Microsoft Excel 2016- Data Analysis and Business Modeling", PHI Learning, 2017.
6. ConardCarlberg, "Business Analysis with MS Excel", Que Publishing, 3rdedition.

CORE COURSES

20MBC201

HUMAN RESOURCE MANAGEMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course objectives: The Objectives of this Course are to:

1. Provide the basic Concepts of Human Resource Management.
2. Enable the Students to understand the process of Recruitment and Selection and the Concept of Performance Management system in an Organization.
3. Understand the basics of Industrial Relations and knowledge of Labour laws and acquaint the Students with the Contemporary issues in Human Resource Management.

.**Course Outcomes:** After Completion of the Course, Students will be able to:

1. Understand and apply the knowledge of basic Concepts of Human Resource Management in Practical settings of an Organization.
2. Follow innovative practices in Recruitment and Selection.
3. Implement systematic Performance Management System in an Organisation.
4. Implement harmonious Industrial Relations and apply latest amended Labour Acts in an organization.
5. Execute new trends in Human Resource Management practices.

Unit-I Introduction

HRM - Definition, Evolution, Organization of HR department, Objectives, Scope and Functions of HRM - Role and Responsibilities of HR Manager - HR Policies and Procedures - Competitive Challenges of HRM - Competency Framework for HR Professionals - Stakeholders and Integrated Models of HRM.

Unit-II Human Resource Planning

Job Analysis- Meaning and Importance, Process, Methods of collecting Job Data, Writing Job Description and Job Specification - Job Design - Meaning, Factors, Approaches - Job Evaluation - Meaning and Methods- HR Planning - Gallagher HR Estimator - Recruitment- Yield-Ratio Analysis - Process of Selection - Types of Interview - Placement and Orientation - HRD Training Methods - Kirkpatrick and Pecuniary Utility Models of Training.

Unit-III Performance Appraisal

Performance Appraisal – Meaning, Importance and Methods - Potential Appraisal- Capacity building - Basic components of Compensation Management - Towers Perrin Model of Total Reward - Career planning - Greenhouse Career Development Model - Psychological Contract- Functions and Types.

Unit-IV Industrial Relations

Industrial Relations - Definition, Importance, Basics of Industrial Acts - Employee State Insurance Act 1948, Employee Provident Fund and Miscellaneous Act 1952, Industrial Disputes Act 1947, The Payment of Gratuity Act 1972 - Dunlop's IR Model – Quality of Work Life - Grievance Management - Collective Bargaining - Negotiations and Assertiveness Skills – Worker's Participation in Management – Absence Management – Brad factor.

Unit-V Contemporary Issues in Human Resources Management

Introduction to Change Management - HR Outsourcing, Work Life Integration - Introduction to International HRM, Strategic HRM in a Changing Environment- HRIS: Three Levels - Diversity Management - Succession Planning - Inter -personal Relations in the Workplace - Expanding Professional and Personal Networks - HR Research.

Text Books:

1. Gary Dessler, "Human Resources Management", Pearson, 2015.
2. Decenzo, "Human Resources Management", Wiley, 11th Edition, 2015.
3. Michael Armstrong, "Human Resource Management", Kogan Page, 2015.
4. David Lepak, Mary Gower, "Human Resource Management", Pearson, 2015.

Suggested Readings:

1 John P. Kotter, "Leading Change", Harvard Business School Press, 2015.
2 Raymond Andrew Noe, John R. Hollenbeck, Barry Gerhart, Patrick M. Wright, "Fundamentals of Human Resource Management", 7th Edition, Mc Graw-Hill, 2017.
3 Arun Monappa, Ranjeet Nambudiri, Patturaja Selvaraj, "Industrial Relations and Labour Laws", McGraw-Hill, 2015.
4 V.S.P. Rao, "Human Resource Management", Cengage Learning, 2019.
5 K.Aswathappa, "Human Resource Management", 8th Edition, Mc Graw-Hill, 2017.
6 Raman Preet, "Future of Human Resource Management: Case Studies with Strategic Approach ", Wiley Publishers, 2019.

20MBC202

FINANCIAL MANAGEMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To develop a broad understanding of the Concept of Finance functions and Time value of money, significance of Capital Budgeting techniques for the feasibility of Projects.
2. To gain knowledge about Theories of Capital Structure, Concept of Cost of Capital, and Dividend decisions.
3. To give insights about the importance of Working Capital Management and the tools to manage it.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand the Concept of Finance function and judge the Time Value of money in terms Annuity and Present Values.
2. Assess the feasibility of Projects using Capital Budgeting Techniques.
3. Apply the Capital Structure Theories to construct the best Capital mix for better Market Value of the Firm.
4. Implement the Dividend decisions in the interest of the Stakeholders.
5. Assess Working Capital requirements and apply the Tools to manage it.

Unit-I Finance Function

Nature and Scope of Financial Management: Finance function, Goals of Finance- Profit Maximizing vs Wealth Maximization. Risk- Return trade off. Time Value of Money - Future value, Present Value: Single Cash flows, Annuity, Multi period Compounding (simple problems).

Unit-II Investment Decision

Capital Budgeting: Nature, Significance, Investment Decision process. Evaluation Techniques: Traditional - Payback method, Improvement in Traditional Payback, ARR and DCF Techniques - NPV, IRR, Profitability Index. Capital budgeting under Risk and Uncertainty: Risk adjusted Discount Rate, Certainty Equivalents, Probability Tree Approach. (Problems and cases), Projection Selection under Capital Rationing (theory).

Unit-III Financing Decision

Sources of Finance: Concept of Leverage - Operating Leverage, Financial Leverage, Combined Leverage. EBIT - EPS Analysis. Capital Structure Theories: Net Income approach, Net Operating Income approach, Traditional view and MM hypothesis.

Cost of Capital: Concept and Importance, Measurement of important Costs: Cost of Debt, Cost of Preference Capital, Cost of Equity Capital, Cost of External Equity, Cost of Retained Earnings, Weighted Average Cost of Capital. (Problems and Cases).

Unit-IV Dividend Decisions

Forms of Dividend, Dividend Theories: Relevance theory of Dividend: Walter's Model- Gordon's Model, Irrelevance Theory of Dividend: MM Hypothesis. Dividend policies of Indian Companies (Problems and Cases).

Unit-V Working Capital Management

Concept of Working Capital, Determinants of Working Capital, Estimation of Working Capital requirements, Working Capital Policy. Management of Current Assets: Cash Management, Receivables Management and Inventory Management (Problems and Cases).

Text Books:

1. I. M. Pandey, "Financial Management", 11th Ed. Vikas Publishing House, New Delhi 2015.
2. Khan, M. Y. and Jain P. K "Financial Management: Text, Problems and Cases", 6th Edition, Tata McGraw Hill Pub. Co. Ltd New Delhi, 2011.
3. Brigham, E. F. and Ehrhardt. M. C., "Financial Management Theory and Practice", 15th Ed., Cengage Learning, USA, 2015.
4. Jonathan Berk, Peter DeMarzo, Ashok Thampy, "Financial Management", 3rd Ed. Pearson Education Limited, UK, 2010.

Suggested Readings:

1. Vishwanath S.R., "Corporate Finance: Theory and Practice", 2nd Ed. Response books, Sage Publications Ltd, New Delhi, 2007.
2. Prasanna Chandra, "Financial Management Theory and Practice" 9th Edition, McGraw Hill, New Delhi, 2015.
3. S R Vishwanath, "Corporate Finance: Theory and Practice", Sage publishing India, 2nd Edition, 2007.
4. Clive Wilson, Bruce Keers, Ronwyn Johnston, Andrew Medlen, Brian Walters, "Financial Management", 6th Edition, Cengage, 2018.
5. BhallaV.K., "International Financial Management (Text and Cases)", S.Chand Publications, 1st Edition, 2014.
6. RuzbehBodhanwala, "Financial Management Using Excel Spreadsheet", Taxmann Publications Private Limited, 3rd Edition, 2009.

20MBC203

BUSINESS RESEARCH METHODS

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of this Course are:

1. To provide understanding of the Concepts of Business Research Process, Ethics in Business Research and relevance of Research Designs used in Business Research.
2. To create an awareness on various Sources of Data, Sampling Methods and Methods of Qualitative and Quantitative Data Analysis and also to introduce Non-Parametric Tests.
3. To provide Students with an understanding of the basic Concepts of the Multivariate Techniques-its usefulness and provide guidance on how to prepare a Research Proposal and write a Quality Research Report.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand Business Research problems and will critically evaluate research papers considering Ethics in Research.
2. Compare and Contrast various Research Designs.
3. Analyze the similarities and differences between various Sampling Designs and Measurement Scales and make a Decision about how best to employ them in research studies.
4. Apply and interpret the Quantitative and Qualitative data and different types of Non-Parametric Statistical Tests.
5. Classify and select Multivariate Techniques so as to render appropriate solutions to the Business problems for attaining the Organizational Goals and effectively formulate a Research Proposal and communicate Research findings by preparing a Quality Research Report.

UNIT-I Introduction

Business Research - Meaning and Importance. Research Process - Overview. Review of Literature - Identifying, Accessing and Managing sources of Information and scholarly Literature. Research Gaps. Research Design - Introduction and Types - Exploratory, Descriptive and Causal Designs. Ethics in Business Research.

UNIT-II Data Collection and Sampling

Data Collection Methods - Primary and Secondary Sources. Design of Questionnaire. Sampling Procedure - Characteristics of a Good sample - Types of Sampling Designs and Sample size determination. Concept of Measurement and Scaling – Nominal, Ordinal, Interval and Ratio Scales, Rating scales -Thurston's, Likert's, Guttmann's, Semantic differential. The characteristics of Good Measures - Validity, Reliability and Practicality. Selecting a Measurement Scale

UNIT-III Data Processing and Analysis

Introduction to the analysis of Quantitative and Qualitative Data - Nature and Types of Data Analysis Methods. Non-parametric Statistics in Research - McNemar, Sign Test - One and Two samples, Run test, Wilcoxon Matched pairs test, Mann-Whitney test, Kolmogorov - Simronov D test, Kruskal –Wallis tests. Data Representation: Tabulation and Graphical presentation of Data.

UNIT-IV Multi-Variate Analysis

Structural and Functional Methods- Factor Analysis, Cluster Analysis, Discriminate Analysis, Conjoint Analysis, Multi-Dimensional Scaling. Structural Equation Modelling (SEM) - Overview. Multiple Regression (Numerical with two Independent Variables).

UNIT-V Research Proposal and Report Writing

Research Proposal - Purpose, Nature and Evaluation - Content and Format. Report Writing and Presentation - Introduction - Types of Research Report. Format and Evaluation of the Research Report. Academic Writing and Referencing - Plagiarism.

Text Books:

1. Donald R Cooper and Pamela S Schindler, Business Research Methods, 12th Ed, TMH, 2018.
2. J.K.Sharma, "Business Statistics-Problems and Solutions", 1st Ed., Pearson, 2010.
3. Deepak Chawla and Neena Sondhi "Research Methodology - Concepts and Cases", Vikas Publications, 2018.
4. William G. Zikmund Et al., "Business Research Methods", Cengage Learning, 2016.

Suggested Readings:

1. Bajpai Naval, "Business Research Methods", Pearson , 2017
2. Alan Bryman and Emma Bell, "Business Research Methods", OUP Oxford, 2015.
3. ken and Black, " Applied Business Statitics", Wiley-India, 2012.
4. Saunders mark, Philip Lewis and Adrian Thornhill, "Research Methods for Business Students, Pearson, 2015.
5. Gabe T. Wang & Keumjae Park, "Student Research and Report Writing: From Topic Selection to the Complete Paper", Wiley-Blackwell, 2016
6. Umeshkumar Dubey , D P Kothari & G K Awari, "Quantitative Techniques in Business, Management and Finance: A Case-Study Approach", Chapman and Hall/CRC,2016.

SCHOOL OF MANAGEMENT STUDIES CBIT Hyderabad

20MBC204

OPERATIONS RESEARCH

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of this Course are:

1. To familiarize the Students with the basic Concepts and tools of Operations Research.
2. To make the Students understand the mathematical models used in Operations Research.
3. To provide the Students to learn the techniques constructively to make effective Business decisions.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Develop mathematical model and solve the real life system with limited constraints by applying LPP.
2. Formulate and solve transportation and assignment concepts to implement Supply chain management.
3. Evaluate alternatives using decision making under risk and uncertainty and game theory.
4. Apply PERT and CPM techniques to plan, schedule and control project.
5. Apply simulation process in queuing theory to evaluate the system.

Unit-I Introduction

Operation Research, Definitions, Evolution, Scope and Applications in Business. Linear Programming: Models, Assumptions of LPP, Formulation, Graphical Method, Simplex Method, Big-M Method. Formulation of Dual to Primal.

Unit-II Transportation and Assignment

Transportation Problem, Initial Solution Methods, North -West Corner Method, Least Cost Method (LSM) and Vogel's Approximation Method, Degeneracy, Unbalanced TP. Optimality Test - Stepping Stone Method and MODI Method. Assignment Problem, Hungarian Method, Unbalanced problems, Restricted AP. The Travelling - Salesman problem.

Unit-III Statistical Decision Theory and Game Theory

Decision Theory, Criteria for Decision Making under Risk and Uncertain Environments, Concept of Utility, Expected Monetary Value, EVPI Utility as a Concept of Decision Making. Game theory, Zero Sum Game, Saddle point, Pure strategies, Mixed strategies, Dominance, Graphical Method for (mx2) and (2xn) games.

Unit-IV Project Management by Network Analysis

Network fundamentals - Scheduling the Activities - PERT Vs CPM - Three Time estimates - beta Distribution - Identifying Critical Path - Probability of completing the Project within Scheduled time, Critical Path Method - Optimization of Project parameters - Crashing.

Unit-V Queuing Theory and Simulation

Queuing Theory - Concepts of Queue/Waiting Line - General structure of a Queuing system - Operating characteristics of Queues, Probabilistic Queuing model - Single Channel Queuing model - Poisson arrival and Exponential service times with infinite Population. Simulation: Process of Simulation, Applications of Simulation to different Management Problems.

Text Books:

1. Richard .I. Levin, David. S. Rubin "Quantitative Approaches to Management", Mc Graw Hill International Book Co., 1992.
2. Barry Render, Ralph M. Stair, Jr., Michael E. Hanna "Quantitative Analysis for Management", Pearson Education, 2017.
3. J. K.Sharma, "Business Statistics - Problems and Solutions" Pearson, 2011.
4. S. D. Sharma, "Operations Research", Kedar Nath Ram Nath and Co., 2010

Suggested Readings:

1. H. A. Eiselt, Carl-Louis Sandblom, "Operations Research: A Model-Based Approach", Springer, 2010.
2. Edwin K. P. Chong, Stanislaw H. Zak, "An Introduction to Optimization", 4th Edition, A John Wiley & Sons Publications, 2013.
3. A. Ravi Ravindran, "Operations Research Applications", CRC Press, Taylor & Francis Group, 2009.
4. R. Panneerselvam, "Operations Research", 2nd Edition, PHI Learning, 2009.
5. Kanthi Swarup, Gupta Pk, Man Mohan, Sultan Chand and Sons, 2014.
6. Gupta Prem Kumar, Operations Research, S Chand, 7th ed., 2014.

20MBC205

OPERATIONS MANAGEMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of this Course are:

1. To provide an understanding on the Process Planning, Design, Process Layout, Types of Production systems and to comprehend the different ways of measuring Productivity.
2. To develop Skills necessary to understand Work study and know the Techniques to Manage Inventory.
3. To provide knowledge on managing Quality and ways Total Quality Management facilitates Organizational effectiveness.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Apply knowledge of basic Concepts of Operations Management for developing processes and improving Operational Performance.
2. To develop aggregate capacity plans and Mater Production Schedule in operation environments and enabling the importance of facility location, layout and line balancing.
3. To identify and eliminate nonessential operations and develop feasible method of performing a job by applying work study techniques.
4. To calculate inventory levels and order quantities to make use of various inventory classification models.
5. To advance cognizance on Total Quality Management and to efficaciously implement the contemporary Quality techniques in an Organisation.

Unit–I Introduction

Introduction to Operations Management - The Historical evolution of Operations Management - Scope of Operations Management - Interface between the Operation Systems and Systems of other Functional areas. Process Planning and Process Design, Ergonomic Considerations, Production Planning and Control: Basic functions of Production Planning and Control, Production Cycle. Types of Production Systems - Project, Job Shop, Assembly, Batch and Continuous flow. Productivity- Measuring Productivity - Ways of improving Productivity. Recent Trends in Operations.

Unit-II Scheduling and Control of Production Operations

Aggregate Planning, Master Production Schedule (MPS), Operations Scheduling, Product Sequencing: Sequencing of Products in Multi- Product Multi - Stage

situations by using Johnson Rule and CDS method. Capacity Planning - Determinants of Plant Capacity, Capacity Planning Strategies and Line Balancing. Plant Location and Layout: Factors influencing Location, Different types of Layouts. Maintenance Management: Objectives, Preventive and Breakdown Maintenance, Failure Concept, Reliability, Replacement Policies. Information System for Maintenance Management.

Unit-III Work Study

Work Study - Method Study and Work Measurement - Objectives of Work Study - Relationship of Time and Motion Study to Work Study - Basic Work Study procedure - Various techniques in Method Study for identifying the most appropriate method. Work measurement - its uses and different methods, computation of allowance and Standard Time.

Unit-IV Materials and Inventory Management

Objectives of Materials Management - Materials Requirement Planning [MRP-I], Manufacturing Resource Planning [MRP-II] - Sources of Supply of Materials- Selection, Evaluation and Performance of Suppliers. Vendor Rating.

Make or Buy decisions. Value Analysis: Aims, Procedure, Advantages and Application areas. Inventory Control - Need for Inventory, EOQ Model, and Economic Production Quantity Model.

Unit-V Quality Management

Quality - Need for Quality, Quality Gurus, Quality Awards, Bureau of Indian Standards, International Organization for Standardization. Quality Dimensions - Product and Service. Concept of TQM, Evolution of TQM - TQM Framework - Conventional vs. Total Quality Management. Quality Costs.

Text Books:

1. Stevenson J. William, "Operations Management", 13th edition, Tata McGraw-Hill, 2017.
2. Panneerselvam R. "Production and Operations Management", Prentice Hall India Learning Private Limited, 3rd edition, 2012.
3. Robert S. Russel, Bernard W III Taylor, "Operations Management", 7th edition, Hoboken, Wiley, 2011.
4. B Mahadevan, "Operations Management: Theory and Practice", Pearson Education India, 3rd edition, 2015.

Suggested Readings:

1. Jay Heizer, Barry Render, Chuck Munson, "Operations Management", 12th edition, Pearson, 2020.
2. Lee J., Krajewski,"Operations Management", 9th edition, PHI, 2009.
3. Everett. Adam, Jr. and Ronald J. Elbert, "Production and Operations Management Concepts", 5th edition, Prentice-Hall, 2006.
4. Richard Chase, Ravi Shanker, F. Robert Jacobs, "Operations and Supply Management", McGraw Hill Education, 12th edition, 2010.
5. K Aswathappa, K ShridharaBhat, "Production and Operations Management", Himalaya Publishing House Pvt. Ltd, 2nd edition 2015.
6. KanishkaBedi, "Production and Operations Management", OUP Australia and New Zealand, 2nd edition, 2007.

20MBC206

BUSINESS ANALYTICS

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	3

Course Objectives: The Objectives of this Course are:

1. To provide in-depth knowledge of handling Data and Business Analytics tools that can be used for Decision-making in an Organization.
2. To familiarize Students on Data Warehousing Concepts, Data Mining Techniques and understand relationships between the underlying Business Processes of an Organization.
3. To provide knowledge on Prescriptive Analytics and its types, and the various applications of Business Analytics on different Domains.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand the basic Concepts of Business Analytics in an Organization.
2. Establish the Data Warehousing Mechanism.
3. Experiment various methods of Visualization and Data mining methods.
4. Compare and contrast among Descriptive, Predictive and Prescriptive Analytics.
5. Practice the application of Business Analytics in different domains.

Unit-I Introduction

Introduction to Analytics, Data Science, Big Data. Applications of Analytics in different Domains. Business Analytics - Challenges from Outside and Within, BASP (Business Analytics Success Pillars) framework, Analyst's Role in the BA Model - Three Requirements the Analyst Must Meet.

Unit-II Descriptive Analytics

Data Warehousing - Introduction, Characteristics, Data Marts, Meta Data, Data Warehouse Architecture, Data Extraction, Transformation and Load Processes in a Data Warehouse Business Reporting and Business Performance Measurement and Visual Analytics.

Unit-III Predictive Analytics

Data Mining - Introduction, Characteristics, and Data Mining Process. Text Mining - Introduction, Text Analytics, Applications and Sentiment Analytics and Applications. Web Mining - Introduction, Web Analytics.

Unit-IV Prescriptive Analytics

Prescriptive Analytics - Introduction, Prescriptive Models - Simulation, Heuristic, Automated Decision Systems and Expert Systems, Knowledge Management.

Unit-V Future of Big Data

Big Data: Definition. Big Data Technologies - Hadoop, R, Python, Machine Learning and Artificial Intelligence. Data Scientist, Applications of Analytics in different Domains. Fundamentals of Marketing Analytics, Finance Analytics, HR - Analytics and Supply Chain Analytics.

Text Books:

1. U.Dinesh Kumar, "Business Analytics", Wiley, 2017.
2. Ramesh Sharada, Dursun Delen, Efraim Turban, "Business Intelligence and Analytics", 10th Ed., Pearson, 2014.
3. Jean Paul Isson, Jesse S.Harriot, "Win with Advanced Business Analytics" 1st Ed., Wiley, 2012.
4. Gert H.N. Laursen, Jesper Thorlund, "Business Analytics for Managers", John Wiley and Sons, Inc.2010.

Suggested Readings:

1. Laursen, Thorlund, "Business Analytics for Managers", 2nd Ed., Wiley, 2017.
2. Sahil Raj, "Business Analytics", 3rd Ed., Cengage Learning, 2015.
3. Albright, Winston, "Business Analytics - Data Analysis and Decision Making", 5th Ed., Cengage Learning, 2015.
4. Jac Fitz, Mattox II, "Predictive Analytics for Human Resources", 3rd Ed., Wiley, 2015.
5. Artun, Levin, "Predictive Marketing", 2nd Ed., Wiley, 2015.
6. R N Prasad, Seema Acharya, "Fundamentals of Business Analytics", Wiley, 2011.

20MBC207

LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	3

Course Objectives: The Objectives of the Course are:

1. To facilitate the Students to plan a Career in Business and to get a clear understanding of the Logistics and Supply Chain Management.
2. To provide insights in to the role of Logistics and Supply Chain Management in an Organization.
3. To make them focus on Warehousing and Transportation techniques, also to expound the role of other Functional areas for an effective Supply Chain.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand the History, Evaluation and various Concepts of Logistics and Supply Chain Management.
2. Classify and compare Various Processes and Technology used in Logistics and Supply Chain Management.
3. Analyse and differentiate various strategies in Transportation and Warehousing in Logistics and Supply Chain Management.
4. Analyse Various Strategic issues and Manufacturing Techniques in relation to Logistics and supply chain management.
5. Develop best Network Design, Planning and Operations in Logistics and Supply Chain management.

Unit-I Introduction

Introduction to Supply Chain Management (SCM) - Concept, Evolution, Objectives, Importance and Function of SCM, Conceptual Framework of SCM, Process view of Supply Chain , Supply Chain Strategies, Drivers and Metrics of Supply Chain. Strategic Fit, Achieving Strategic Fit and Obstacles.

Unit-II Logistics Management

Logistics Management, Inbound, Internal and Outbound Logistics in SCM, Logistics Organization Development of Integrated Logistics Strategy, 3PL, 4PL, Reverse Logistics. Role and Importance of Inventory in SC, JIT, VMI, Outsourcing. SEZ in India, Dry Ports in India, Custom House Agent (CHA) ICDS.

Unit-III Transportation and Warehousing

Transportation in Supply Chain, Transportation Formats, Modes of Transportation, Transportation Performance factors, Modes of Transport, Fleet Management, Multi model transport, Containerization, Vehicle Scheduling and Routing, Milk run and Cross docking. Warehousing- Types of Warehouses, Warehousing Operations, Warehouse Management systems, RFID/CRM.

Unit-IV Strategic Issues in Supply Chain

Strategic Partnerships, Alliances and Collaborative advantage, Strategic relationships in-logistics, Bullwhip effect, Benchmarking - Issues and Problems, Types, Methods, Process, Lean Manufacturing, Agile Manufacturing. Laws related to Transport in India.

Unit-V Supply Chain Interface

SC Network Design, Distribution Network in Supply Chain, Factors influencing Design, Models in Distribution Network, Supply Chain Integration - Internal and External, Role of IT and HR in SCM, Retailing and SCM Green Supply Chain Management

MANAGEMENT STUDIES CBIT Hyderabad

Text Books:

1. Chandrasekaran. N, "Supply Chain Management Process, Systemand Practice", 2nd edition, Oxford University Press, 2012.
2. K. Shridhara Bhat, "Logistics and Supply Chain Management", 1st Ed. Himalaya Publishing House, 2016.
3. Sunil Chopra, Peter Meindl and D.V.Karla, "Supply ChainManagement, Strategy, Planning and Operations", 6th edition, Pearson education, 2016.
4. B. Rajashekar and G.V.R.K. Acharyulu, "Logistics and Supply chain Management", Excel Books, 2009.

Suggested Readings:

1. Shah, J, "Supply Chain Management, Text and Cases", 2nd Ed., Pearson Education, 2016.
2. Crandall, Richard E and others, "Principles of Supply Chain Management", 2nd Edition, CRC Press, 2014
3. Judy Dickens, "Supply Chain Planning and Execution", 1st edition, Willford Press, 2019.
4. Richard B Chase, Ravi Shankar and F Robort Jacobs, "Operations and Supply Chain Management", 15th edition, Mc Graw Hill Education, 2018.
5. James Stevens, "Supply Chain Management: Strategy, Operation & Planning for Logistics Management", 1st edition, Create Space Publications, 2016.
6. Sudalaimutu, S and Anthony Raj, "Logistics Management for International Business" 1st edition, PHI learning, 2009.

20MBC301

STRATEGIC MANAGEMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To understand the role of Strategy and Environmental analysis in Business Decision Making
2. To provide insights on various Strategies, Practices, Competitiveness and Sustainability.
3. To help the Students develop their Skills for applying the Concepts in solving real time problems in Domestic and Global scenarios.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Investigate and understand the Business scenarios nationally and internationally.
2. Appraise and analyze the contemporary issues and challenges faced in Business
3. Craft and formulate the Strategies for real-time Business problems.
4. Integrate and apply the learned skills to implement Strategies from holistic and multi-functional perspectives.
5. Analyze and Evaluate real life situations for Self, Organizational and Societal sustainability.

Unit-I Introduction

Introduction to Strategic Management, Purpose of Business, Crafting and Executing Strategies, Strategic Intent, Developing Strategic Model, Choices of Strategy, Strategic Capability and Core competencies of Business, Phases of Strategic management, Strategic Decision Making.

Unit-II Strategic Analysis and Formulation

Environmental Scanning, SWOT & PESTEL Framework, Different Tools and Techniques for analyzing Strategies, Porters Five Force Framework, Organic Model of Strategic Planning, Real-time Strategy Planning, Strategic Formulation, Competitive Analysis, Strategy Development Processes.

Unit-III Strategies for Business

Types of Strategies- Offensive, Defensive, Exit and Entry barriers, Industry Life Cycle States and Strategies, Tailoring Strategy for Leaders, Challengers, Followers, weak and crisis Businesses, The Five Generic Competitive Strategies, Red and Blue Ocean Strategies, Grand Strategies.

Unit-IV Strategic Implementation

Impact and Issues of Culture, leadership, Resource Allocation, Staffing, Directing and Organizational Values on Strategic Implementation, Operationalizing and Institutionalizing strategy, Strategies for competing in International Markets, Managing Conflicts, Managing Strategic Change.

Unit-V Strategic Evaluation and Control

Strategic Evaluation, The Balanced Scorecard, Measuring Performance, Strategic control-Types, Strategic Information System, Issues in Managing Technology, Strategic issues in Entrepreneurial Ventures, small Businesses, Not-for-Profit Organizations, Sustainability and Sustainable Development.

Text Books:

1. Exploring Corporate Strategy, Gerry Johnson, Kevan Scholes, Richard Whittington, Prentice Hall, 8th edition.
2. Strategic Management and Business Policy-Towards Global Sustainability, Thomas L. Wheelen, J. David Hunger, Pearson Education, 13th edition
3. Strategic Management: A South Asian Perspective, Hitt & Ireland el al., Cengage Learning, 9th edition, 2013
4. Strategic Management: Concepts and Cases, Fred R. David, Prentice Hall, 13th Edition.

Suggested Readings:

1. Essentials of Strategic Management – The Quest for Competitive Advantage, John E. Gamble, Margaret A. Peteraf, Arthur A. Thompson, Jr., Mc. Graw Hill Education, 4th Edition.
2. Strategic Management: Creating Competitive Advantage, Gregory Dess and G. T. Lumpkin, TMH 2009.
3. Strategic management: Concepts and Cases, Thompson & Strickland, TMH, 2009.
4. The Blue Ocean Strategy Reader, w. Cham Kim, Renee Mauborgne, Harvard Business Review Press, 2017.
5. Strategic Planning: Formulation of Corporate Strategy, V.S. Ramaswamy, S. Namakumary, Macmillan Publishing House.
6. Strategic Management: Theory and Applications, Adrian & Alison, Oxford University Press, 2010.

20MBC401

ENTREPRENEURIAL DEVELOPMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course objectives: The Objectives of the Course are:

1. To sensitize the students about the concept and functions of entrepreneur with particular reference to Self-Employment and its process.
2. To educate on how to identify the Business Opportunities and to equip the Students with process of Project Formulation and Appraisal
3. To create awareness on how to raise funds from the appropriate institutional sources under suitable schemes and enable the Students to understand the role of Venture capitalists in Entrepreneurship Development.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand the concept of entrepreneurship and its close relationship with Economic Development of a Country.
2. Identify the business opportunities and procedures to comply with.
3. Formulate, Execute and Evaluate Feasible project design.
4. Make use of the support rendered by Institutional Finance.
5. Identify the appropriate agencies for Venture Capital funding.

Unit-I Entrepreneurial Development Perspective

Concepts of Entrepreneurship Development, Evolution of the concept of Entrepreneur, Functions of an Entrepreneur, Theories of Entrepreneurship, Entrepreneur Vs. Intrapreneur, Entrepreneur Vs. Entrepreneurship, Entrepreneur Vs. Manager, Attributes and Characteristics of a successful Entrepreneur, Role of Entrepreneur in Indian economy and developing economies with reference to Self-Employment Development, Entrepreneurial Culture.

Unit-II Creating Entrepreneurial Venture

Business Planning Process, Environmental Analysis - Search and Scanning- Identification of Problems and Opportunities- Various Sources of Business opportunities. Entrepreneurship Development Programmes (EDPs) - Meaning and Types. Basic Government Procedures to be complied with. Role of Central Government and State Government in promoting Entrepreneurship.

Unit-III Project Management

Project: Concept and Classification- Project Identification, Project Formulation, Common errors in Project Formulation- Project Report, Project Appraisal- Technical, Financial, Marketing, Personnel and Management Feasibility.

Unit-IV Institutional Finance

Estimating and Financing the Funds requirements- Institutional Finance to Entrepreneurs- Need and Importance, Institutional finance from IDBI, IFCI, LIC, UTI, NABARD, SFCs, SIDCs EXIM Bank. Role of NSIC, SSIB, SSICs for Entrepreneurship development. Schemes offered by various Commercial Banks.

Unit-V Start-up and Venture Capital

Start-up Basics - Opportunity, Ideation, Customer Discovery, Market Analysis. Business Incubation centres. Venture Capital Financing Concept and features. Structure and regulatory framework of venture capital financing in India. Investment process and evaluation- Structuring venture capital financing. Exit Strategies of Venture capitalist.

Text Books:

1. E.Gordon & K. Natarajan, "Entrepreneurship Development", HPH, 2017
2. Vasanth Desai, "Dynamics of Entrepreneurial Development and Management", S. Chand & Co. Ltd, 2013.
3. S.S. Khanka, "Entrepreneurship Development", S. Chand & Co. Ltd, 2007
4. Coulter, "Entrepreneurship in Action", PHI, 2005

Suggested Readings:

1. Ogbe Alloysius Augustine, "Fundamentals of Entrepreneurship Development", Panamaline Books Distributors Limited, August, 2018.
2. Brito Silvio Manuel, "Entrepreneurship: Trends and Challenges", InTech, April, 2018.
3. David H. Hott, " Entrepreneurship New Venture Creation, PHI, 2016
4. Charantimath Poornima M , "Entrepreneurship Development and Small Business Enterprises", Pearson Education, 2018
5. Amit Kumar Dwivedi, "Cases In Entrepreneurship " Bookwell Publications, 2014
6. B. Janakiram & M. Rizwana "Entrepreneurship Development: Text & Cases", Excel Books, 2011.

SCHOOL OF MANAGEMENT STUDIES
CBIT
Hyderabad

20MBE301

INVESTMENT MANAGEMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The objectives of the course are:

1. To provide in-depth analysis of various investment opportunities including fixed income securities.
2. To demonstrate fundamental and technical analysis along with common stock valuation.
3. To provide an insight into portfolio theories and evaluation.

Course Outcomes: After completion of the course, students will be able to:

1. Classify various investment options with risk and return calculations.
2. Evaluate the bonds and strategies to manage them.
3. Choose the investment option with the help of fundamental and technical analysis.
4. Measure the value of common stocks by applying various approaches.
5. Construct the portfolio using various models.

Unit-I Introduction

Concept, Investment Decision Process; Real vs. Financial assets; Sources of investment- information; Investment vs. Speculation; Factors to be considered in investment decision. The concept and Measurement of Risk and Return (Individual and Portfolio) - Range, Standard Deviation and Co-Efficient of Variation, Ex-ante and ex-post returns. Risk return trade-off. (Simple Problems).

Unit-II Fixed Income Securities

Fixed Income Securities Features and types of debt instruments, Types of bonds- Euro bonds, Foreign bonds and Global bonds, Gold Bonds, Bond indenture, factors affecting bond yield. Bond yield measurement - Current yield, holding period return, YTM, AYTM and YTC. Bond duration- Macaulay's duration and modified Macaulay's duration. Bond convexity. Bond portfolio management strategies - active and passive. (Problems and Cases).

Unit-III Fundamental and Technical Analysis

Approaches to Investment analysis- Fundamental Analysis- Economy, Industry and Company analysis - Factors, Technical Analysis. - Dow theory, charts, moving averages, Relative strength index, Efficient Market Hypothesis, Japanese candle stick method. (Problems and Cases).

Unit- IV Common Stocks- Analysis and Valuation

Common Stocks - Analysis and Valuation Basic Features of Common Stock, Approaches to valuation- Balance sheet model, dividend capitalization models; earnings capitalization models; Security Market Indexes, their uses; computational procedure of Sensex and Nifty. (Problems and Cases).

Unit- V Portfolio Theory and Evaluation

Portfolio Theory and Evaluation Concept of portfolio. Portfolio return and risk. Harry Markowitz's Portfolio theory, construction of optimal portfolio, Single-index model. Capital market theory: Introduction of risk-free asset, Capital Market Line (CML). Capital asset pricing model (CAPM): Security Market Line (SML). Arbitrage Pricing Theory (APT): The Law of one price, two factor arbitrage pricing. Introduction to Mutual Funds. Performance measures - Sharpe's reward to variability index, Treynor's reward to volatility index, Jensen's differential index, Fama's decomposition of returns. (Problems and Cases).

Text Books:

1. Charles P.Jones, "Investments Principles and Concepts", 12th edition, Wiley India edition. 2016.
2. Prasanna Chandra, "Investment Analysis and Portfolio Management", 5th edition, McGraw Hill India, 2017.
3. V.K.Bhalla , "Investment Management", 17th edition, S.Chand Publications, 2016.
4. Donald E. Fischer, Ronald .J.Jordan & A K Pradhan , "Security Analysis and Portfolio Management", 7th edition, Pearson Education, 2018

Suggested Readings:

1. Punithavathy Panidan, "Securities Analysis and Portfolio Management", 2nd Edition, Vikas Publications, 2012.
2. V A Avadani, "Securities Analysis and Portfolio Management", 12th revised edition, Himalaya Publishing House, 2019.
3. Reilly & Brown, "Investment Analysis and Portfolio Management", 10th edition, Cengage, 2016.
4. Kevin S, "Securities Analysis and Portfolio Management", 2nd revised edition, PHI learning, 2015.
5. Mab Faber, "Global Value- How to spot Bubbles, Avoid Market Crashes, and Earn Big Returns in the Stock Market", 1st edition, Mebane Faber publishers, 2014.
6. Alexander. G.J, Sharpe.W.F and Bailey, J.V, "Fundamentals of Investments", 3rd edition, PHI, 2001.

20MBE302

FINANCIAL MARKETS AND SERVICES

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To make the Students understand the structure and functions of the Financial Markets, Financial Instruments and Financial Market Intermediaries.
2. To equip the Students with various patterns of Trading and Settlement and Financial Services.
3. To provide insights into Insurance Services and Claims Management.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Have a comprehensive overview on Financial Markets and Instruments.
2. Understand the Trading and Settlement activities.
3. Acquire Knowledge on various Financial Services and the Regulatory Framework.
4. Enhance knowledge on various types of Insurance Services.
5. Gain insights on Claims Management Procedures.

Unit-I Introduction

Structure of Indian Financial System, Role of Financial System in Economic Development, Financial Markets: Money Market, Capital Markets, Commodities Market and FOREX Market- an Overview. Stock Exchanges: Functions, Listing and Formalities. Role of SEBI in India. Financial Instruments: Commercial Paper, Certificate of Deposit, Treasury Bills, Commercial Bills, Gilt-edged Securities, Equity Shares, Preference Shares, Debentures, Warrants and Convertibles, ADRs and GDRs, Mutual Funds.

Unit-II Trading and Settlement

Demat account, Patterns of Trading and Settlement, Speculations- Types of Speculations, Activities of Brokers, Broker Charges, Settlement Procedure. Financial Intermediaries: Merchant Bankers, Underwriters, Bankers to an Issue, Registrars and Share Transfer Agents, Debenture Trustees, Portfolio Managers. Role of NSDL and CDSL. Credit Rating Agency: Functions, the ABCs of rating scales, Global Credit Rating Agencies.

Unit-III Financial Services

Concept, Nature, Scope and Functions of Financial Services. Types of Financial Services: Hire Purchase, Consumer Credit, Factoring and Forfeiting, Housing Finance, Venture Capital and Lease Financing. Growth of financial services in India. Regulatory Framework of Financial Services. Contemporary issues in Financial Markets and Services.

Unit-IV Insurance Services

Introduction to Insurance: Terminology, Procedure, Various methods of calculating Premium, factors affecting Premium calculations. Principles of Insurance, Concept of Corporate Insurance: Fire, Marine, Machine and Electronic Equipment, Motor Vehicle, Money in transit and Burglary, Fidelity, Directors and Officers Insurance Policy. Basic concepts of Life and General insurance. Types of Insurers, Functions of Insurers: Production, Underwriting, Rate Making. Reinsurance.

Unit-V Claims Management

Managing Claims and Losses: Understanding procedures and calculating Receivables amount, Causes for short settlement and procedures to reduce, Grievance redressal and legal aspects. Organizing and controls for Risk Management, Purchase of Insurance Policies and Services, Cost Optimization, Insurance as a tool for Risk Management. Banc-Assurance. Role of Insurance Regulatory Development Authority.

Text Books:

1. Sandeep Goel, "Financial Markets, Institutions and Services", PHI Learning, 2018.
2. Emmett J. Vaughan; Therese M. Vaughan, "Fundamentals of Risk & Insurance", Wiley,India Edition, 11th Edition 2013.
3. Pathak Bharati V., "The Indian Financial System- Markets, Institutions and Services", 3rd Edition, Pearson Education.
4. Mishra M.N., "Life Insurance, Administration and Management", Sultan Chand & Co., New Delhi, 22nd Edition, 2016.

Suggested Readings:

1. Kumar Vinod, Gupta Atul, Kaur Manmeet, "Financial Markets Institutions & Financial Services", Taxmann's, 2017 Edition, July, 2017.
2. Blokdyk Gerardus, "Claims Management A Complete Guide", The Art of Science, 2019 Edition.
3. Rejda George E., "Principles of Risk Management and Insurance", Pearson Education, Tenth Edition, 2011.
4. Dobbyn John, French Christopher, "Insurance Law in a Nutshell", West Academic Publishing, 5th Edition, 2016.
5. Bhole, L.M., "Financial Institutions and Markets: Structure, Growth and Innovations", McGraw-Hill, New Delhi, Fourth Edition, 2008.
6. M Y Khan, "Financial Services", McGraw Hill Education (India), 8th Edition, 2015.

20MBE304

TRAINING AND DEVELOPMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To develop an understanding of the Concept and Importance of Training and Development.
2. To discuss the practice of Training and Development in the modern Organizational setting.
3. To familiarize Students with the tools and techniques involved in the implementation and evaluation of Training, besides giving an overview of emerging training trends.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Get familiarized with how to do Training and Development Programmes and recall its importance.
2. Efficiently conduct Needs Assessment and design the Training Programme as per the demands of the Industry requirements
3. Make use of an appropriate Training and Developments method so as to contribute to the Organizational Success.
4. Identify the suitable mechanism for the implementation of the Training and Development Programmes.
5. Choose right mechanism to evaluate the Training and Development methods initiated and understand the emerging Training and Development trends in the Organizations.

Unit- I Introduction

Training and Development- Concepts, The role of Training in the Organizations, Essentials of Management Development Programmes, Field areas of Employee Training, Importance and Benefits of Training and Development, Structure of Training Organizations, A Training Process Model, Training Practices in Modern Organizations.

Unit- II Needs Assessment and Designing the Programme

Understanding the Why, When and Where aspects of Training Need Analysis (TNA), The Framework for Conducting a TNA- Organizational, Operational and Person Analysis, Outcomes of TNA- Training and Non Training Needs, Approaches to TNA- Proactive and Reactive Approaches.

Organizational constraints, developing Objectives - Identifying and writing a Good Learning Objectives. Facilitation of Learning and Training Transfer, Design theory- Elaboration and Gagne- Briggs Theories, Outcomes of the Design.

Unit-III Methods of Training and development

Overview of On-the Job and off-the Jobs methods, Matching methods with Outcomes, Important Training Methods- Lectures and Demonstration, Computer-Based Training, Games and Simulations, Sensitivity Training method, Teaching Aids for Training- selecting appropriate Training Aid, Principles of using Audio-visual Aids- Static and Dynamic media, Management Development Implications, Training for Executive-Level Management.

Unit-IV Implementation and Evaluation

Integrated Instructional Strategy- Content, Method of instruction, Facilities- Training room and the off-site Training facilities, Material and Equipment and Trainers, The Strategy. Implementation- Dry Run, Pilot Program, Tips for Trainers for Effective Implementation.

Rational for evaluation, Resistance to Training Evaluation, Types of Evaluation, Evaluation Design Issues.

Unit-V Emerging Training and Development Trends

Future Global Trends and Perspectives in Training and Development, Trend setting elements for Training and Development- Globalization, Priority differences of Countries and Companies, In-house v/s Training Outsourcing, Consultation Movement, Advancements in Appraisal Technique, E-learning, Cyber Training Programmes, Harnessing the Advancement in Training Technology.

Text Books:

1. P.Nick Blanchard, James W. Thacker, A.Anand Ram, Effective Training, Systems, Strategies and Practices, Pearson, 2013.
2. Raymond A Noe, Amitabh Deo Kodwani, Employee Training and Development" McGraw Hill, 2018
3. Rolf Lynton, Uday Pareek, Training for Development, Sage India, 2011.
4. Dipak Kumar Bhattacharyya, Training and Development: Theories and Applications, Sage Publications, 2015.

Suggested Readings:

1. Rishipal, "Training and Development Methods", S. Chand & Company Ltd, 2011
2. Jean Barbazette,"Managing the Training Function For Bottom Line Results: Tools, Models and Best Practices", Pfeiffer, 2008.
3. Pandu G. Naik,Training and Development: Text, Research and Cases, Excel Books 2008.
4. B. Janakiram, Training and Development: Indian Text edition, Dream tech Press; Indian Text edition, 2007.
5. R.K. Sahu, Training and Development, Excel Books India, 2009.
6. Steve W. J. Koziowski, Learning & Development in Organizations, Rouledge, 2010.

20MBE305

PRODUCT AND BRAND MANAGEMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To provide an understanding of New Products, explore New Product ideas, new Product Development and the Strategies for Product Portfolio planning of a conglomerate.
2. To familiarize the Students understand the Brand Image, Brand Identity, Brand Equity, Branding Decisions and Brand Audit.
3. To develop the understanding of Brands with Consumer Behaviour, Brand Architecture and its Strategies.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Easily comprehend New Product Development Process and its Models, and learn to create actionable focus to successfully manage the Product.
2. Design the Product Portfolio Strategies for a conglomerate, manage and amplify existing products.
3. Analyze the Branding Strategies, Brand Purpose- Managing Brand Reputations.
4. Understand and conduct the measurement of Brand Equity and Brand Performance, design Brand Architecture Strategies in real life situation.
5. Learn the Contemporary Issues and analyze Future Trends.

Unit-I Introduction

Product, Policy, objectives, Product Mix concepts - Product Line, Product Length, Product Depth, Product Breadth, Product Mix decisions, Packaging, Product Modification and Deletion. New Product Development: Innovation and Diffusion of product. New Product Development (NPD) - Process, Models.

Unit-II New Product Development Process

New Product Introduction, Growth Strategies Intensive, Interactive, Diversification strategies. Product Portfolio analysis BCG, GE, Ad little. Shell International. Idea generating device. Role of R & D. Product Maps, Market Maps and Joint Space Maps-Perceptual and Preference mapping. Idea- Screening. Product Concept generation, concept selection, and Concept Testing, Design for manufacturing, Product Prototype and Product Recalls.

Unit-III Brand Management- Knowledge, Identity and Positioning

Brand vs commodity, understanding Brands, benefits of Branding, Brand Attributes, Branding Decisions, Brand Awareness and Consumer Brand knowledge, Brand Image, Brand Identity, Brand associations, Establishing P.O.P and P.O.D, Brand Personality, Brand Extension, Line extensions Brand Licensing, Franchising and Global Branding, Brand Positioning- Strategies and Repositioning Straddle Positioning and Brand Mantra.

Unit-IV Crafting, Measuring and Managing Brand Equity

Creating Brand Equity, models of Brand equity – Brand Asset Valuator, Aaker model, Brandz and Brand Resonance, measuring Brand Equity, Building Brand Equity, Tracking Valuation Managing Brand Equity-Brand worth, Reinforcement, Revitalization and Brand Crisis.

Unit-V Brand Architecture Strategies

Introduction to Brand Architecture Strategies and its designing, Brand - Product Matrix, Breadth and depth of Branding Strategy, Brand Architecture systems, Brand Hierarchy, Branding policies.

Text Books:

1. Moore William L., Pessemier Edgar, Product Planning and Management: Designing and Delivering value, McGraw-Hill, Inc., 1993.
2. Ulrich K T, Eppinger D Steven, Goyal Anitha, Product Design and Development, 6th edition, Tata McGraw Hill, 2010.
3. Tapan K. Panda, Product and Brand Management, 1st edition, 2016, Oxford University Press.
4. Aaker D, Building Strong Brands, The Free Press, Simon and Schuster, New York, 2012.

Suggested Readings:

1. Dr. Anandan, Product Management, 2nd edition, Tata McGraw Hill, 2010.
2. Majumdar, R, Product Management in India, 3rd Edition, PHI Learning Pvt. Ltd, 2009.
3. Kapferer, J N, The New Strategic Brand Management: Creating and Sustaining Brand Equity Long Term, 4th edition, Kogan Page, 2008.
4. Kavin Keller, 4th edition, Strategic Brand Management. Pearson Education, 2008.
5. U C Mathur, Product and Brand Management, 2nd edition Excel Books, New Delhi, , 2009.
6. Tapan K Panda, 1st edition, Building Brands in the Indian Market. Excel Books, New Delhi, 2008.

20MBE306

INTEGRATED MARKETING COMMUNICATION AND DIGITAL MARKETING

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To make the Students understand the basic Concepts of Integrated Marketing Communication, Planning and Evaluating Marketing Communications Strategies and Executions.
2. To provide a comprehensive understanding of Brand Promotion, Audience engagement, Public Relations and Strategic Communications.
3. Understand the importance of Digital and Social Media Marketing and its applications.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand the process of creating valuable Brand and how to engage Consumers via Integrated Marketing Communications.
2. Analyze the important issues when planning and evaluating Marketing Communications Strategies and Executions.
3. Develop an effective Integrated Marketing Communication Process.
4. Evaluate the knowledge in Marketing Communication which ensures that they make the correct decision in Communications, Advertising and Digital Marketing in real scenario.
5. Examine the applications of Digital and Social Media Marketing in the Globalized market.

Unit-I Introduction

Integrated Marketing Communications, Recent Trends in the Market, Understanding the Marketing Process, Decisions for Effective Communications Campaign, Building Customer Based Brand Equity, Brand Loyalty, Successful Marketing Communications Campaign, Choosing Marketing Communications Agency, Structure of an Advertising Agency.

Unit-II IMC Planning Process

Consumer Information Processing, Steps of Effective Communications, Communications Objectives, How Advertising works – AIDA and Hierarchy of Effects Models, Consumer Approach to Buying Process: FCB Grid, Determining Marketing Communications Budget, Relationship between Communications Budget and Sales.

Unit-III Marketing Communications Mix

Theoretical Approaches to Advertising Design, Message Strategies - Cognitive, Affective and Conative, Advertising Appeals- Emotional, Fear, Humor, Rationality, Sex, Scarcity, Executional Frameworks- Animation, Slice of Life, Dramatization, Informative, Testimonial, Authoritative, Demonstration, Fantasy. Sales Promotions, Public Relations, Direct Marketing, Event Management, Sponsorship and Cause Related Marketing, Alternative Marketing, Crisis Management, Trade Fair and Exhibitions.

Unit-IV Digital Marketing

Digital Marketing - Components, Benefits, Plan, Skills required for Digital Marketing, Digital Marketing Platforms and Strategies, Trends, Search Engine Optimization and Content Marketing.

Unit-V Social Media

Social Media Marketing – Social Networking with Facebook, LinkedIn, Blogging as a social medium, Microblogging with Twitter, Social Sharing with YouTube, Social media for Customer Reach, Acquisition and Retention. Evaluation of an Integrated Marketing Communications Campaign.

Text Books:

1. Terence A. Shimp, J. Craig Andrews, Advertising, Promotion, and other aspects of Integrated Marketing Communications, 9th edition, Cengage, 2016
2. Kruti Shah and Alan D'Souza, Advertising and Promotions – An IMC Perspective, Tata Mcgraw Hill, 2013.
3. Michael Miller, B2B Digital Marketing, 1st edition, Pearson, 2014.
4. Seema Gupta, Digital Marketing, 1st edition, Mc Graw Hill, 2018.

Suggested Readings:

1. Belch George E; Belch Michael; Purani Keyoor, Advertising and Promotion- An Integrated Marketing Communications Perspective, 9th edition, Mc Graw Hill, 2013.
2. Jerome M.Juska, Integrated Marketing Communications- Advertising and Promotion in a Digital World, Routledge, 2017.
3. Dutta, Kirti, Integrated Marketing Communication, 1st edition, Oxford University Press, 2016.
4. Dave Evans and Jake Mckee, Social Media Marketing. Wiley India Pvt. Ltd., 2011.
5. Dodson, I, The art of digital marketing: the definitive guide to creating strategic, targeted, and measurable online campaigns, 1st edition, John Wiley & Sons, 2016.
6. Moutusy Maity, Internet Marketing: A Practical Approach in the Indian Context, 1st edition, Oxford University Press, 2017.

SCHOOL OF MANAGEMENT STUDIES CBIT Hyderabad

20MBE307

BUSINESS DATA MINING

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To familiarize the students to understand the concepts of Data Mining and Preprocessing of Data.
2. To provide insights on Association Rule Mining and Clustering.
3. To demonstrate the application of Logistic Regression and Sentiment Analytics to solve Business Problems.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand the concepts of Data Mining and Data Preprocessing.
2. Extract and represent the knowledge from data by Preprocessing and Visualization
3. Establish the Association among frequently purchased items and categorize the dataset into different clusters.
4. Understand the concept of classification problems and their applications across different sectors.
5. Apply sentiment analytics to various real time business applications.

Unit-I Introduction
Data Mining; Kinds of data that can be mined- Database Data, Data Warehouses, Transactional Data, Other Kinds of Data; Major Issues in Data Mining- Mining Methodology, User Interaction, Efficiency and Scalability, Diversity of Database Types, Data Mining and Society

Unit-II Data Preprocessing
Data Preprocessing: An Overview- Reasons to process the data, Major Tasks in Data Preprocessing; Data Cleaning- Missing Values, Noisy Data, Data Cleaning as a Process; Data Reduction- Principal Component Analysis, Histograms, Clustering, Sampling, Data Cube Aggregation; Data Transformation and Data Discretization- Data Transformation by Normalization, Discretization by Binning, Discretization by Histogram Analysis.
Case Study: Handling Missing Values in Melbourne Housing Price Data.

Unit-III Association Rule Mining and Clustering
Mining Association Rules- Item sets, Association Rules, Generating Rules Efficiently; Metrics for Association Rule Mining- Support, Confidence and Lift; Pros and Cons of Association Rule Mining.
Clustering- Finding Similarities Using Distances- Euclidean Distance and Other Distance Metrics; K- Means Clustering and Hierarchical Clustering; Comparing Clusters Created by K-Means and Hierarchical Clustering
Case Study III.1: Market Basket Analysis of Groceries Dataset
Case Study III.2: Mall Customer Clustering

Unit-IV Classification Problems- I- Logistic Regression
Overview of Classification; Binary Logistic Regression; Classification- Encoding Categorical Features, Building Logistic Regression Model, Printing Model Summary, Predicting on Test Data; Measuring Accuracies- Creating Confusion Matrix, Receiver Operating Characteristic (ROC) and Area Under the Curve; Finding Optimal Classification Cut-off -Youden's Index and Cost- Based Approach.
Case Study: Predicting Employee Attrition on HR Attrition Dataset.

Unit-V Sentiment Analytics Using Naïve Bayes Algorithm

Exploring the Dataset; Text Preprocessing- Bag-of-Words Model, Creating Count Vectors, Displaying Document Vectors, Removing Low Frequency Words, Removing Stop Words, Creating Count Vectors, Distribution of Words across Different Sentiment.

Using Naïve Bayes Model for Sentiment Classification

Using n-Grams for Sentiment Classification

Case Study: Sentiment Analytics on Sentiments Expressed by Users of Zomato

Text Books:

1. Szabo, Gungar Polatkan, Oscar Boykin, Chalkiopoulos, "Social Media Data Mining and Analytics", 3rd Ed., Wiley, 2019.
2. Ian H. Witten, Eibe Frank, Mark A. Hall, Christopher J. Pal, "Data Mining: Practical Machine Learning Tools and Techniques", 4th Ed., Elsevier, 2017.
3. Megan Squire, "Mastering Data Mining with Python – Find patterns hidden in your data", 1st Ed., PACKT Publishing, 2016.
4. Florin Gorunescu, "Data Mining: Concepts, Models and Techniques", Vol 12, Springer, 2011.

Suggested Readings:

1. Luis Torgo, "Data Mining with R: Learning with Case Studies", 2nd Ed., CRC Press, 2011.
2. Jiawei Han, Jian Pei, Micheline Kamber, "Data Mining: Concepts and Techniques", 3rd Ed., Elsevier, 2010.
3. Joseph B. Pigus, "Data Mining With Neural Networks", 2nd Ed., TMH, 2017.
4. Robert Layton, "Learning Data Mining With Python", 2nd Ed., PACKT Publishing, 2015.
5. Xin-She Yang, "Introduction to Algorithms for Data Mining and ML", 1st Ed., Academic Press, 2019.
6. Boris Kovalerchuk, Evgeni Vityaev, "Data Mining in Finance", 3rd Ed., Kluwer Academic Publishers, 2010.

20MBE308

Python Programming

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To Understand Python programming and related eco-system of libraries and packages.
2. To demonstrate usage of Python as standard Programming Language.
3. To analyze the data and represent the data with various visualization techniques.

Course Outcomes: On successful completion of this Course, Students will be able to:

1. Understand the basics of Python and extend the functionality using add-on packages.
2. Identify and apply different ways of storing information.
3. Extract data from dataset and apply loop and control statements.
4. Analyze data using various data manipulation tasks on the dataset.
5. Compare and contrast the data and its variations with visualization techniques.

UNIT- I: Introduction

Introduction on Essential Python Libraries- NumPy, Pandas, Matplotlib, IPython and Jupyter, SciKit-Learn, StatsModels; Declaring Variables in Python-Integer, Float, Boolean and String.
Activity I.1: Installation and Setup;
Activity I.2: Basic Exercises Using Python- Input and Output Exercise.

UNIT- II: Built-In Data Structures-I

Introduction to Loops- If, If-else, else, for and while; Introduction to Functions; Strings; Random Number Generation; Performing Basic Statistics on the Generated Random Numbers; Introduction to Built-in Data Structures- List, Dictionary, Set and Tuple;
Activity II.1: Exercise on Loops, Functions and Strings
Activity II.2: Exercises on List- List Operations and Manipulations, List Functions, List Slicing, List Comprehension.

UNIT- III: Built-In Data Structures-II

Introduction to Dictionary- Operations and Manipulations, Dictionary Functions and Comprehension; Introduction to Sets- Operations and Manipulations and Comprehension; Introduction on Tuples- Creation of a Tuple, Operations and Manipulations, Unpacking a Tuple
Activity III.1: Exercise on Dictionary and Sets
Activity III.2: Exercise on Tuples

UNIT- IV: Working With Pandas Dataframe

Loading the dataset into Pandas Data Frame; Type of the Dataset; List of Columns in the Dataset; Printing first 5 and last 5 records; Transpose Operation; Shape and Information of Dataset; Slicing and Indexing; Value Counts and Cross Tabulations; Sorting Data Frame by Column Values; Creating New Columns; Grouping and Aggregating; Joining Data Frames; Applying Different Operations; Conditional Filtering; Dropping a Column or a Row.
Case Study: World Happiness Score Data

UNIT- V: Data Visualization Using Matplotlib And Seaborn
Importance of Data Visualization in presenting a Business Problem; Types of Charts- Bar Chart, Pie Chart, Histogram, Distribution Plot, Box Plot, Comparing Distributions, Scatter Plot, Pair Plot and Heat Map, Subplots, Colors, Markers, Line Styles, Ticks, Labels and Legends, Annotations and Drawing on a Subplot
Case Study: Data Visualization of Retail Mart Data.

Text Books:

1. Gowrishankar, Veena, "Introduction to Python Programming", 1st Ed., CRC Press, 2019.
2. Fabio Nelli, "Python Data Analytics", 2nd Ed., Apress, 2018.
3. Wes McKinney, "Python for Data Analysis", 2nd Ed., OREILLY, 2017.
4. Samir Madhavan, "Mastering Python for Data Science", 1st Ed., Packt Publishing, 2015.

Suggested Readings:

1. Bhasin, "Python Basics", 1st Ed., Mercury Learning and Information, 2019.
2. Nichola Lacey, "Python by Example", 1st Ed., Cambridge University Press, 2019.
3. Robert Johansson, "Numerical Python", 2nd Ed., Apress, 2019.
4. Pratap, "Statistics for Machine Learning", 1st Ed., Packt Publishing, 2017.
5. Zed A Shaw, "Learn Python 3 the Hard Way", 1st Ed., Addison-Wesley, 2017.
6. Unpingco, "Python for Probability, Statistics and Machine Learning', 2nd Ed., Springer, 2016.

20MBE309

TRANSPORT MANAGEMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To familiarize various concepts of Transport management
2. To provide in depth knowledge related to various aspects of Transportation.
3. To empower with necessary skills in different modes of Transportations.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand various concepts of Transport management.
2. Classify different modes in Transport management.
3. Apply their knowledge in various processes of Transport management.
4. Analyze different types of fright preparations in Transport management.
5. Plan and organize various systems and procedures in Fleet management.

Unit-I Introduction to Transportation

History of Transportation- Global and India, Role of Transportation in Logistics, Commerce and Industry. Principles and Practices, Scope and relationship with other logistics providers-E-commerce, 2PL, 3PL, 4PL and 5PL. Modes of Transportation – Road, Rail, Air, Ocean, Inland transportation, Multi Modal Transportation, RoRo. Process of Transportation.

Unit II Modes of Transportation

Road transport- registration of vehicle, insurance, fitness, owners of vehicle, vendorship, functions of transport organization/ truck broking agency, Different types of permits.
Air transportation- domestic/international cargo, air cargo agents/consolidators, CHAs.
Ocean transport- sea fright, liners, containers, LCL/FCL, Discounted rates.
Rail Transportation- Train racks, SLR, VPU, Express cargo trains, Private goods trains, CFS.
Refrigerated transportation, Pipe line transportation.

Unit-III Operations in Transportation

Transportation Network- Domestic and International. Process of Booking- Documents verification, Way bill (RR/LR), Acceptance of material, Preparation of consignment note, marking and labeling. Stocking, Dispatch procedure. Hub operations- Inbound, sorting/stocking, Outbound procedures. Delivery procedure- receiving, stocking, last leg/mile delivery.

Unit- IV Fright Management

Factors affecting transportation rates, fright structure, various types of rates- FTL, LTL, Sundry, express cargo transportation, liner fright rates, air cargo rates, rail cargo rates. Contractual rates, effect of fuel rates volatility on contractual rates, seasonal effects on fright rates. Effects of rates during calamities. Freight Rates- Time for Payment- Lien for freight.

Unit V Fleet Management

Planning and Resourcing: Need for Planning, Fleet management , Main types of road freight transport, Route survey and route planning, Vehicle routing and scheduling issues, Data requirements, Manual methods of vehicle routing and scheduling, Computer routing and scheduling, Periodical maintenance of fleet, SOP for vehicle maintenance, Information system applications, Integration of GPS. Long Haul, Coordination with terminals.

Text Books:

1. David Lowe, "Lowe's Transport Manager's and Operator's Handbook", 49th Edition, Kogan Page limited, 2019.
2. MB. Stroh, "A Practical Guide to Transportation and Logistics", 3rd edition, Logistics Network Inc, 2006.
3. Krishnaveni Muthiah, "Logistics Management & World Sea borne Trade", 1st Edition, Himalaya Publishing House, 2018.
4. S Jaya Krishana, Transportation Management – Imperatives and Best Practices, ICFAI University Press, 2007.

Suggested Readings:

1. B Rajashekar and G.V. R. K. Acharyulu, "Logistics and Supply Chain Management", Excel Books, 2009.
2. Alan Rushton, Phil Croucher and Peter Baker, "Logistics and Distribution Management: Understanding the Supply Chain", 5th edition, 2014.
3. Mohammad Achahchah, "Lean Transportation Management" 1st edition, Productivity Press, 2019.
4. Sudalaimutu, S and Anthony Raj, "Logistics Management for International Business" 1st edition, PHI learning, 2009.
5. S K Sarangi, "Transportation Management" 1st edition, Himalaya Publications, 2010.
6. Lora M Cecere, "Supply Chain Metrics that Matter", 1st edition, Wiley Publications, 2015.

20MBE310

DISTRIBUTION AND WAREHOUSE MANAGEMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To provide indepth knowledge in various functions of Warehouse management and Inventory Management.
2. To deliver knowledge on various Distribution methods.
3. To educate on minimizing total physical effort and distribution Cost of Goods.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Apply their knowledge on Warehousing location, design, and operations.
2. Understand of various Inventory management systems and control.
3. Analyze different techniques to manage warehouse efficiency.
4. Make use of various techniques for optimum capacity utilization of shipping and packing.
5. Plan and select appropriate warehouse facilities management

Unit-I Introduction to Warehousing

Introduction - Warehousing, Distribution-Distribution methods-Warehouse Design- factors of warehouse design; Warehouse Location, Warehouse Operations - Warehouse Layout - Functions - Centralized and Decentralized -Warehouse operations and Storage Systems - Warehousing Cost Analysis .

Unit-II Inventory Management

Concepts - Role in Supply Chain -Role in Competitive Strategy - Functions - Types - Cost -Inventory control Models – Economic Lot size, EOQ, Economic Batch Quantity [EBQ], ROL -Reorder Level, P model, Q model, MRP, ABC analysis, Just in Time (JIT). Modern methods Kanban, DRP and ERP. FIFO, LIFO, Weighted average method. Interface between Sales and Production with SCM- Make to Stock (MTS), Make to Order (MTO), Assembly to Order (ATO), Configured to Order (CTO), Engineer to Order (ETO)

Unit-III Managing Warehouse Efficiency

Order picking - Picking methods-pick path - Measuring Warehouse Efficiency - Warehouse Workforce design and development - cross docking. Warehousing Operations: warehousing operations- inbound process, outbound processes, Functions of Warehouse- break-bulk, cross docking, order mixing, Risk management

Unit-IV Shipping and Packing

Optimum capacity utilization- Container optimization-Container loading and void fill-Weigh checking-Automated loading-Dock management-packaging-types-cost- and labelling functions and design- ASRS and their Operations – Bar Coding-Technology & Applications in Logistics Industry - RFID Technology & Applications

Unit-V Warehouse Facilities Management

Material Handling Systems - Types of Material Handling Equipment -Modern Warehousing - Types of Conveyors - Refrigerated Warehouses; Centralized and Decentralized Storage Systems: MHEs Safety & Security: types of warehousing hazards, protections taken against warehousing hazards, manual and automated MHEs in warehouse, legal requirements for ensuring a safe workplace; IT interface and Warehousing Management Systems (WMS).

Text Books:

1. Frazelle, "World Class Warehousing & Material Handling", 2ndedition, Tata McGraw-Hill, 2016.
2. Gwynne Richards, "Warehouse Management" 3rd edition, Kogan Page, 2017.
3. P Gopal Krishnan and Abid Haleem, "Hand book of Materials Management", 2nd edition, PHI learning, 2019.
4. Gopalakrishna, P. and Shandilya M.S., "Stores Management and Logistics", 1st edition, S.Chand & Co, 2013

Suggested Readings:

1. Arnold, "Introduction Materials Management", 7thedition , Pearson Education, 2011.
2. Satish K. Kapoor and PurvaKansal, Basics of Distribution Management - A Logistical Approach, 1st Edition, Prentice Hall, 2004.
3. Vinod.V.Sople, "Logistics Management", 3rdedition, Pearson Education, 2012.
4. J.P Saxena, "Warehouse Management", 1st edition, Vikas Publications, 2003.
5. Sudalaimutu, S and Anthony Raj, "Logistics Management for International Business" 1st edition, PHI learning, 2009.
6. Max Muller, "Essentials of Inventory Management" 2nd edition, Amacom, 2011.

20MBE310

DISTRIBUTION AND WAREHOUSE MANAGEMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To provide indepth knowledge in various functions of Warehouse management and Inventory Management.
2. To deliver knowledge on various Distribution methods.
3. To educate on minimizing total physical effort and distribution Cost of Goods.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Apply their knowledge on Warehousing location, design, and operations.
2. Understand of various Inventory management systems and control.
3. Analyze different techniques to manage warehouse efficiency.
4. Make use of various techniques for optimum capacity utilization of shipping and packing.
5. Plan and select appropriate warehouse facilities management

Unit-I Introduction to Warehousing

Introduction - Warehousing, Distribution-Distribution methods-Warehouse Design- factors of warehouse design; Warehouse Location, Warehouse Operations - Warehouse Layout - Functions - Centralized and Decentralized -Warehouse operations and Storage Systems - Warehousing Cost Analysis .

Unit-II Inventory Management

Concepts - Role in Supply Chain -Role in Competitive Strategy - Functions - Types - Cost -Inventory control Models – Economic Lot size, EOQ, Economic Batch Quantity [EBQ], ROL -Reorder Level, P model, Q model, MRP, ABC analysis, Just in Time (JIT). Modern methods Kanban, DRP and ERP. FIFO, LIFO, Weighted average method. Interface between Sales and Production with SCM- Make to Stock (MTS), Make to Order (MTO), Assembly to Order (ATO), Configured to Order (CTO), Engineer to Order (ETO)

Unit-III Managing Warehouse Efficiency

Order picking - Picking methods-pick path - Measuring Warehouse Efficiency - Warehouse Workforce design and development - cross docking. Warehousing Operations: warehousing operations- inbound process, outbound processes, Functions of Warehouse- break-bulk, cross docking, order mixing, Risk management

Unit-IV Shipping and Packing

Optimum capacity utilization- Container optimization-Container loading and void fill-Weigh checking- Automated loading-Dock management-packaging-types-cost- and labelling functions and design- ASRS and their Operations – Bar Coding-Technology & Applications in Logistics Industry - RFID Technology & Applications

Unit-V Warehouse Facilities Management

Material Handling Systems - Types of Material Handling Equipment -Modern Warehousing - Types of Conveyors - Refrigerated Warehouses; Centralized and Decentralized Storage Systems; MHEs Safety & Security: types of warehousing hazards, protections taken against warehousing hazards, manual and automated MHEs in warehouse, legal requirements for ensuring a safe workplace; IT interface and Warehousing Management Systems (WMS).

Text Books:

1. Frazelle, "World Class Warehousing & Material Handling", 2nd edition, Tata McGraw-Hill, 2016.
2. Gwynne Richards, "Warehouse Management" 3rd edition, Kogan Page, 2017.
3. P Gopal Krishnan and Abid Haleem, "Hand book of Materials Management", 2nd edition, PHI learning, 2019.
4. Gopalakrishna, P. and Shandilya M.S., "Stores Management and Logistics", 1st edition, S.Chand & Co, 2013

Suggested Readings:

1. Arnold, "Introduction Materials Management", 7th edition , Pearson Education, 2011.
2. Satish K. Kapoor and PurvaKansal, Basics of Distribution Management - A Logistical Approach, 1st Edition, Prentice Hall, 2004.
3. Vinod.V.Sople, "Logistics Management", 3rd edition, Pearson Education, 2012.
4. J.P Saxena, "Warehouse Management", 1st edition, Vikas Publications, 2003.
5. Sudalaimutu, S and Anthony Raj, "Logistics Management for International Business" 1st edition, PHI learning, 2009.
6. Max Muller, "Essentials of Inventory Management" 2nd edition, Amacom, 2011.

20MBE401

FINANCIAL RISK MANAGEMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To make the Students understand the various facets of Risk Management.
2. To provide indepth the concept of Derivatives and its various types.
3. To familiarize the Students about Forwards, Futures, Swaps and Options.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand the measures and differentiate between different types of Risks that an Organization faces.
2. Have a comprehensive view about types of Derivatives and their Trading and Settlement.
3. Evaluate Forwards and Futures Contracts and Hedging Strategies.
4. Comprehend the computational aspects of Swaps and the associated Risk.
5. Evaluate various Option Trading Strategies and select the suitable one for the given situation.

Unit-I Introduction

Concept, Nature, Source, Measurement, Identification and Evaluation of Risk. Types of Risk. Possible Risk Events, Risk Indicators, Risk Management Process- Pre-requisites and fundamentals. Misconceptions of Risk. An Integrated Approach to Corporate Risk Management. Management of Interest Rate Risk, Credit Risk and Exchange Rate Risk. Non-Insurance methods of Risk Management- Risk Avoidance, Loss Control, Risk Retention and Risk Transfer.

Unit-II Derivatives

Development and Growth of Derivative Markets, Types of Derivatives, Uses of Derivatives, Types of Traders- OTC and Exchange Traded Securities- Types of Settlement- Fundamental linkages between Spot and Derivative Markets, The Role of Derivatives Market, Uses and Misuses of Derivatives.

Unit–III Forward and Futures

Forwards: Definition- Features and pay-off profile of Forward Contracts. Valuation of Forward contracts. Forward contracts to manage Commodity Price Risk, Interest Rate Risk and Exchange Rate Risk.

Features: Definition- Specifications of Futures Contract - Margin Requirements- Marking to Market- Basis and Convergence of Future price and Spot price. Valuation of Future Contracts- Types of Futures Contracts- Securities, Stock Index Futures, Currencies and Commodities- Hedging Strategies- Hedge ratio. Difference between Forwards and Futures Contracts.

Unit-IV Swaps

Concept and Nature- Evolution of Swap Market- Features of Swaps- Major Types of Swaps: Interest Rate Swaps- Currency Swaps- Commodity Swaps- Equity Index Swaps. Credit Risk in Swaps- Credit Swaps- using Swaps to Manage Risk- Pricing and Valuing Swaps.

Unit-V Options

Definition- Exchange Traded Options, OTC Options – Specifications of Options – Call and Put Options- American and European Options – Intrinsic Value and Time Value of Options – Option payoff, Options on Stock Indices and currency. Option Pricing Models: The Binominal Option Pricing Model (BOPM): Assumptions and problems - single and two period models. The Black and Scholes Option Pricing Model (BSOPM): Assumptions and problems.

Text Books:

1. John C. Hull & Sankarshan Basu, "Options, Futures and Other Derivatives", 10th Ed, Pearson Education, 2017.
2. S.K.Mishra, "Derivatives and Risk Management", 2nd Ed., Everest Publishing House, 2010.
3. Sundaram Janakiramanan, "Derivatives and Risk Management", Pearson Education, 2011.
4. Rajiv Srivastava, "Derivatives and Risk Management", 2nd Edition, OUP India, 2013.

Suggested Readings:

1. Paul Hopkins, Kogan Page, "Fundamentals of Risk Management", 4th Ed., Institute of Risk Management, 2017.
2. Jean-Philippe Bouchaud and Mark Potters, "Theory of Financial Risk and Derivative Pricing", 2nd Ed. Cambridge press, 2009.
3. David. A. Dubofsky& Thomas. W. Miller, Jr., "Derivatives Valuation and Risk Management", Oxford University Press, 2003.
4. R. Madhumathi, M. Ranganatham, "Derivatives and Risk Management", Pearson Education, 2012.
5. Prakash B Yaragol, "Financial Derivatives Text & Cases" First Edition, Vikas Publishing House, 2018.
6. S.L. Gupta, "Financial Derivative Theory, Concepts and Problems", 9th printing, PHI Learning private limited, 2010.

20MBE402

PROJECT APPRAISAL AND FINANCING

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To provide basic knowledge of Project Planning in addition to the ideas for Generation and Screening of the projects.
2. To deliver varied aspects of Projects in terms of Market, Demand, Technical and Financial.
3. To illustrate the Structure of Financial Institutions in India and Human Aspects of Project Management.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Have a comprehensive view on project Planning and analysis along with ideas for generation and screening of the projects.
2. Understand the important facets of Market, Demand and Financial Analysis of the projects.
3. Understand the Feasibility Analysis and Find out the cash flows of the project.
4. Incorporate Risk Sensitivity, Scenario Analysis and Simulation Analysis for Managing Risk in the project appraisal decision.
5. Analyze projects in the Public Domain with special reference to Social Cost Benefit Analysis and understanding Corporate Governance in India.

Unit-1 Introduction to Project Planning

Levels of Decision Making- Key Issues in major Investment Decisions- Interface between Strategic Planning and Capital Budgeting. Generation of Ideas – Monitoring the environment - Corporate Appraisal - Preliminary Screening - Project rating index - Sources of positive NPV -Qualities of a Successful Entrepreneur.

Unit-2 Market Analysis and Demand Analysis

Market and demand analysis: Process. Technical Analysis: Manufacturing Process and technology -Study of Material Inputs and Utilities – Product Mixes - Plant Capacity - Location and Site - Machinery and Equipment - Structures and Civil Works - Project Charts and Layouts- Schedule of the project Implementation.

Unit-3 Financial Analysis

Financial Analysis: Estimation of cost of project and means of financing - Estimates of Sales and Production - Cost of production - Working Capital requirement and its financing - estimates of working results –Projected cash flow statement - Projected balance sheet. Project cash flows: Basic principles of measurement of cash flows - Components of the cash flow streams - Viewing a project from different points of view - Definition of cash flows by Financial Institutions and Planning Commission - Biases in Cash Flow estimation.

Unit-4 Project Risk Analysis

Source and Measure of Risk - Sensitivity Analysis - Scenario Analysis, Simulation analysis–Managing risk - Selection of Project - Risk Analysis in practice. Special Decision Situations: Choice between Mutually Exclusive Projects of unequal life - Optimal Timing Decision - Determination of Economic Life - inter-relationships between Investment and Financing aspects.

Unit-5 Project Management and Corporate Governance

Project Management: Structure of Financial Institutions in India. Rationale for Social Cost Benefit Analysis (SCBA) – UNIDO Approach - Little and Mirle Approach. Forms of Project Organization - Project Planning, Project Control, Human aspects of Project Management - Prerequisites for successful Project Implementation. Corporate Governance: Introduction - Major Corporate Governance Failures- Need for Corporate Governance in India, Theories of Corporate Governance - Agency Theory, Stewardship Theory, and Stakeholder Theory – Convergence- Problems of Governance in Companies.

Text Books:

1. Prasanna Chandra, "Projects: Planning, Analysis, Selection, Financing, Implementation and Review", McGraw-Hill Education, 8th edition, 2015.
2. Bob Tricker, "Corporate Governance Principles, Policies, and Practices", Oxford University Press, 2015.
3. Ambrish Gupta, "Project Appraisal and Financing", PHI Learning, 2017.
4. John Bartlett, "Project Risk Analysis and Management Guide", APM Publishing Ltd, second edition, 2004.

Suggested Readings:

1. Choudhary S., "Project Management", Mc-Graw Hill, 2006.
2. Desai, Vasant, "Project Management", Himalaya Publishing House, 2006.
3. Machiraju, H.R.: "Introduction to Project Finance", Vikas Publishing House.
4. N. Balasubramanian, "Corporate Governance and Stewardship", TMH, 2012.
5. Rashmi Agrawal, Yogieta S Mehra "Project Appraisal & Management", Taxmann's,2017.
6. David Hillson, "Managing Risk in Projects", Gower Publishing Company, 2009.

20MBE403

INDUSTRIAL RELATIONS AND LABOUR LAWS

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the course are:

1. To develop an understanding of the basics of industrial relations Concepts.
2. To introduce them the concepts of Trade Unions and Labour Administration Machinery.
3. To discuss the importance and various provisions of labour laws in the Digital Era.

Course Outcomes: After completion of the course, student will be able to:

1. Apply the knowledge of basics and approaches of industrial relations in real time situations.
2. Understand the dynamics of trade unions and their recognition for successful negotiations.
3. Appraise the process of labor administration and labour policy in the Digital Era.
4. Develop Strategies to deal with various parties involved in Industrial Relations.
5. Interpret and Implement various updated provisions related to Labour Laws.

Unit-I Industrial Relations Perspectives

Conceptual framework and approaches to Industrial Relations–Influence of Emerging socioEconomic scenario on growth of Industrial relations in India-Factors influencing Industrial Relations in India-Differences in perspectives –Industrial relations and Employee relations. Industrial Relations for Startup's,and Small Firms, Future of Employee relations. Industrial conflict-Types and causes of Industrial disputes - Machinery for prevention and settlement of Industrial disputes. Recent Amendments.

Unit-II Trade Unions

Structure, characteristics and Functions of Trade Union; Trade union act-1926-problems of Trade union recognition and government policy- Recognition of Trade unions as collective bargaining agents-Problems and issues involved in collective bargaining process-Role of collective bargaining in promoting Industrial amity and peace-Industrial Employment(standing orders) Act-1946. Recent Amendments.

Unit-III Labour legislation Administration

Importance of Labour laws, The classification of labour laws-Labour administration-Evolution of labour administration in India-Labour policy in India-Judiciary and the child labour-Right to education and child labour-Public interest litigation and child labour-Labour administrative machinery of the government-Role of ILO in Labour administration. Changing Business Environment and labour laws- Digital Transformations in the Industrial Relations Context ,WTO and social clause. Recommendations of II National commissioner on Labour. Recent Amendments.

Unit-IV Employee Benefits

Defining and Exploring employee benefits-Employee benefits practice-Legal and discretionary benefits practice-The economics of employee benefits-Regulating employee benefits-social security legislations-The ESI Act-1948-The Maternity benefit act-1961-The workmen's compensation act-1923-The payment of gratuity act-1972-Employee provident fund and miscellaneous provisions act1952. -Recent Amendments.

Unit-V Wage legislation and administration

The need and importance of Wage legislation - Payment of Wages Act 1936 -The minimum wages Act 1948 - The payment of Bonus Act 1965- Equal remuneration Act 1976 - The context and concept of wage - Wage administration in India - Components and the determinants of wage - Wage structure towards a wage policy-Recent Amendments.

Text Books:

1. C.B. Mamoria, Satish Mamoria, P. Subba Rao, "Dynamics of Industrial Relations", Himalaya Publishing House, 16th Edition, 2020.
2. C.S. Venkat Rathnam, Manoranjan Dhal, "Industrial Relations", Oxford University Press - New Delhi, 2nd Edition, 2017.
3. S.C. Srivastava, "Industrial Relations and Labour Laws", Vikas Publishing House, New Delhi, 7th Edition, 2019.
4. P.N. Singh and Neerajkumar, "Employee relations Management", Pearson Education, New Delhi, 1st Edition, 2011.

Suggested Readings:

1. Joseph J. Mortocchio, "Employee Benefits", Tata McGraw Hill, New Delhi, 6th Edition, 2017.
2. Monappa, Ranjeet Nambudiri, Patturaja Selvaraj, "Industrial Relations and Labour Laws", Mc Grawhill Education, 2nd Edition, 2012.
3. P.K. Padhi, "Labour and Industrial Laws", PHI Learning Pvt. Ltd., 3rd Edition, 2017.
4. Al Rainnie, "Industrial Relations in Small Firms: Small Isn't Beautiful", Routledge Library Editions, 1st Edition, 2016.
5. Susan Hayter, Chang-Hee Lee, Elgar, "Industrial Relations in the Emerging Economies-The Quest for Inclusive Development", Edward Elgar Publications, 1st Edition, 2018.
6. Venkat Venkat Raman, "The Digital Matrix: New Rules for Business Transformation through Technology", Lifetree Media, Penguin Random House India, 1st Edition, 2017.

SCHOOL OF MANAGEMENT STUDIES CBIT Hyderabad

20MBE404

STRATEGIC HUMAN RESOURCES MANAGEMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the course are:

1. To give an understanding of the concept and importance of strategic Human Resources management in an Organization.
2. To discuss the importance of Strategic Human Resources Planning with a focus on forecasting the demand and supply of Human Resources in an organization.
3. To showcase how the SHRM can be implemented with an emphasis on HR functions and to make the students aware about the need for Strategy Evaluation in an Organization.

Course Outcomes: After completion of the course, student will be able to:

1. Analyse strategic role of Human Resources management in an Organization.
2. Assess various environmental factors that affect SHRM Practices.
3. Appreciate and manage the managerial issues in SHRM.
4. Draft an efficient Human Resources Plan that contributes to effective management of resources.
5. Design required HR functional strategies to support SHRM practices in the organization and effectively evaluate SHRM practices by adopting an appropriate approach depending on the nature of strategy adopted.

Unit- I Introduction

Introduction to business and corporate strategies; HR Strategies to increase firm performance-Integrating HR strategies with business strategies, HR as a Strategic Partner: The Measurement Challenge-Implementation of SHRM: Process based approach. Strategic role of HRM, over view of Planning and Implementing HR Strategy, Emerging issues in SHRM.

Unit- II Strategic Human Resource Environment

Technology, structure-Workforce diversity; Demographic trends, Temporary & contract Labour - Management Trends: Introduction, Changing Environment, Business Complexities, Portfolio, Process and Structure related Strategic responses, Multinational, Global and Transnational strategies in HRM, Global environment-International Developments.

Unit- III SHRM Planning

The strategic role of HR Planning- Overview of HR planning - Managerial Issues in Planning: Personal Implications, Changing Receptivity-Selecting Forecasting Techniques: Purpose of planning, Organizational and Industry Characteristics, Environmental Turbulence and Other Considerations-Forecasting the Supply of Human Resources: Replacements Charts, Succession Planning, Markov Analysis, Renewal Models, computer simulation and Utilization of Supply Forecasting Techniques-Forecasting the Demand for Human Resources, Expatriation and repatriation management in global HRM.

Unit-IV Strategy Implementation

Efficient Utilization of Human Resources-Dealing with employee shortages and Surpluses: Recruitment & Retention strategies, training & development strategies: An overview of performance management strategies and reward &compensation strategies-Retrenchment strategies - Special Implementation Challenges: Career paths for Technical Professionals, Dual- Career Couples, Strategies for future corporate- Virtual Corporation,

Unit- V Human Resource Evaluation

Overview of Evaluation: scope, Strategic Impact, Levels of Analysis-Criteria, Levels of Constituents and Ethical Dimensions-Approaches to Evaluation: Audit, Analytical, Quantitative and Qualitative Approaches-Outcome and process criteria-Balance Scorecard Perspective-Bench marking-Industry Influences. Prevalence of Evaluation. Evaluating Strategic Contributions in Emerging Areas

Text Books:

1. Charles R. Greer, Strategic Human Resource Management, Pearson Education, 2004.
2. Jeffrey A Mello, Strategic Human Resource Management, South-western Publications, 2012.
3. Srinivasan Kandula, Human Resource Management in Practice, Prentice Hall of India, 2005
4. Michael Armstrong, Angela Baron, Handbook of Strategic HRM, Jaico Publishing House, 2006.

Suggested Readings:

1. Gary Dessler, Biju Varrkey, Human Resource Management, Pearson Education, 2017.
2. Rosemary Harrison, Employee Development', University Press, India Ltd., 2013.
3. Luis R. Gomez-Mejia, David B. Balkin, Robert L. Cardy, Managing Human Resources, PHI, 2001.
4. Peter J. Dowling, Denice E. Welch, Randall S. Schuler, International Human Resource Management, Thomson South-Western, 2002.
5. Anuradha Sharma, Aradhana Khandekar, Strategic Human Resource Management- An Indian Perspective, First Edition, Sage Publications, 2006.
6. Graeme Salaman, John Storey, Jon Billsberry, Strategic Human Resource Management, Sage Publications, 2005.

20MBE405

CONSUMER BEHAVIOUR

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To give the perspective of Consumers, their Buying Behaviour patterns and address the importance of environmental influences on volatile Consumer Behaviour.
2. To get the students acquainted with the concepts of Consumer Motivation, Personality, Perception and its implication that help them in obtaining knowledge on individual determinants of Consumer Behaviour.
3. To enable students to understand the consumer decision making process and gain insights about the models of Consumer Behaviour comprehensively.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand the concepts to be applied to Marketing strategy.
2. Analyze the environmental factors affecting Consumer Buying Behaviour and learn the impact of socio-cultural settings on the consumption behaviour.
3. Develop the Marketing Strategies by applying the dynamics that influence consumers in taking decisions.
4. Analyze the challenges that might influence the formulation of effective Marketing Strategies from a Consumer Behaviour perspective.
5. Evaluate the dynamics of Human behaviour and the basic factors that influence the Consumer Decision Process.

Unit-I Introduction

Introduction, Definition, Customers and Consumers, Consumer Behavior and its Applications, Evolution of Consumer Behaviour, Market Research and Consumer Behaviour, Market Segmentation and Positioning, Consumer Behaviour Model.

Unit-II Environmental Influences on Consumer Behaviour

Culture - Definition, Characteristics, Cross-Cultural understanding of Consumer Behaviour; Subcultures - Nature. Social Class - Process of Social Stratification, Nature, Measurement and Categorization, Social Class and Consumer Behaviour. Social Groups - Group, Classification of Groups, Group Properties, Reference Groups- Nature. Family - Significance, Family Life Cycle, Family Purchasing Decisions. Personal Influence and Diffusion of Innovations - Nature and Significance, Communication and Influence Flow, Opinion Leadership, Adoption and Diffusion of Innovations.

Unit-III Individual Determinants of Consumer Behaviour

Personality and Self-Concept- Personality Theories and Applications, Personality and Marketing, Self-Concept and Consumer Behaviour; Motivation and Involvement - Nature and Role of Motives, Dimensions of Involvement. Information Processing - Information Acquisition, Perceptual Encoding, Marketing Implications. Learning and Memory - Characterizing Learning, Classifying Learning, Characteristics of Memory Systems, Retrieval of Information. Attitudes - Characteristics, Functions, Sources of Attitude Development, Attitude Theories and Models.

Unit-IV Consumer Decision Processes

Problem Recognition- Types, Situations, Results, Marketing Implications. Search and Evaluation – Information Search Process, Information Evaluation Process, Marketing Implications. Purchasing Processes – Choosing a Store, In-Store Purchasing Behaviour, Nonstore Purchasing Processes, Purchasing Patterns. Post Purchase Behaviour – Postpurchase behavior, Product Disposition.

Unit-V Models of Consumer Behaviour

Traditional Models of Consumers-Microeconomic Model, Macroeconomic Model. Contemporary Models – Nicosia Model, Howard-Sheth Model, Engel-Kollat-Blackwell- Model, Sheth Family Decision Making Model, Bettman's Information Processing Model, Sheth-Newman-Gross Model of Consumption Values

Text Books:

1. Loudon, L. D., & Albert, J. Della Bitta, "Consumer Behaviour", 4th edition, Tata Mcgraw Hill, Reprint 2017.
2. Schiffman and Kannik, Consumer Behaviour, 11th edition, Pearson Edition, 2015.
3. Black-well, R.Miniard PW and Engel, Consumer Behaviour, Thompson learning, 2010.
4. Kumar Dinesh, Consumer Behaviour, 1st edition, Oxford publication, 2015.

Suggested Readings

1. Solomon, M. R., Consumer behaviour: buying, having, and being, 11th edition, Pearson Education India, 2015.
2. Leon G. Schiffman, J. Wisenblit and S. Ramesh Kumar, Consumer Behavior, 12th edition, Pearson Education, 2018.
3. Kardes, Frank R, Consumer Behavior and Managerial Decision Making, 2nd Edition, Pearson, 2001.
4. Suja R .Nair, Consumer Behaviour in Indian Perspective, HPH, 2013.
5. Sheth and Mittal, Consumer Behaviour Thompson learning, 2015.
6. Gupta, S. L., & Pal, S., Consumer Behaviour- An Indian perspective, Text and cases, 2nd edition, Sultan Chand & Sons, 2013.

20MBE406

SERVICES AND RETAIL MARKETING

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To familiarize with characteristics of services, retail marketing concepts and make them understand the concepts of services and retail industry and provide insight into the marketing mix for services and service quality.
2. To educate on strategies to deal with characteristics of services and concept of services marketing triangle.
3. To create awareness on retail formats, theories and discuss the issues relating to merchandise management, emerging concepts.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand overview of services and retail and its significance.
2. Understand concepts of service, challenges in delivering quality services and retail industry trends.
3. Apply suitable marketing mix for various services and develop strategies to deal with characteristics of services.
4. Design unique retail formats considering the need of the customers.
5. Analyze consumer evaluations of retail offerings and apply retail concepts to real situations and formulate retail marketing strategies for the success of retail industry.

Unit-I Introduction

Service Sector - Indian Scenario and Global Issues, Services Concepts- Scope of Goods and Services, Goods-Services continuum, 4Is of Services, Goods and Services Categorization, Industrial Services.
Retailing - Meaning, Evolution, Functions, Types, significance of retail industry, Organized vs Unorganized retailing, Retailing in India- Scenario, Factors affecting Retailing in India, Retailing Opportunities in India.

Unit- II Service marketing Mix and Service Quality

Services Marketing Mix: Product, Pricing, Place, Promotion, People, Physical evidence and Process.
Service Quality- Dimensions of Quality, Understanding Quality Management. Measuring Service Quality.

Unit- III Strategies for Service Marketing

Overview, Strategies for dealing with Intangibility, Inventory, Inconsistency and Inseparability. Loyalty, Switching, Intention to Stay, TAM (Technology Adoption Model). Service Marketing Triangle- External Marketing, Internal Marketing, Interactive Marketing.

Unit-IV Retail Marketing

Retail formats, Retail Pricing Strategies, role of franchising in retail, Technology in retail, Factors affecting retail. Retail Pricing - The concept of retail pricing and the factors affecting price, elements of retail price, developing a pricing strategy, adjustment to retail price. CRM in retailing. E-tailing- Issues and Challenges.

Unit-V Merchandise Management

Sources of Merchandise, Merchandise Presentation Techniques, Category Management, Store Layout and Visual Merchandising – Fundamental of Store Design, Types of Display Areas, Space Planning, Point of Purchase, Retail Operations – Controlling Store Operations, Customer Service – Gathering Customer Information, Understanding Customer, Service offered, Customer Evaluation, Building a Sustainable Advantage, Customer Complaints, Retail Selling – Qualities required for Retail Selling, The Selling Process.

Text Books:

1. Rampal M. K and Gupta S. L, Services Marketing Concepts, Applications and Cases. Galgotia Publishing Company - New Delhi, 2008.
2. S.M.JHA, Services Marketing HPH, Mumbai, 2009.
3. A J Lamba, The Art of Retailing. TMH, 2009.
4. Levy and Weitz, Retailing. TMH, 2009.

Suggested Readings:

1. Zeithaml, V. A., Bitner, M. J., Gremler, D. D. & Pandit, A, Services marketing, 6th edition, Indian Edition, Tata McGraw-Hill, 2013.
2. Christopher Lovelock, Jochen Wirtz, Jayanta Chatterjee, Services Marketing: People, Technology, Strategy, 7th edition, Pearson Ed., 2011.
3. David Gilbert, Retail Marketing Management, 2nd Edition, Pearson Education, 2006.
4. Barry, B. and Evans, J, Retail management: A Strategic Approach, 12th edition, Pearson Education India, 2012.
5. Michael Levy, Barton A. Weitz, Ajay Pandit, Retailing Management, Special Indian edition, 8th edition, Tata McGraw-Hill Education, 2017.
6. Piyush Kumar Sinha and Dwarika Prasad Uniyal, Managing Retail, 2nd edition, Oxford University Press, 2012.

20MBE407

MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To understand the various Machine Learning Algorithms.
2. To familiarize various Classification Techniques and Recommender Systems.
3. To get the students acquainted with the concepts of different searching techniques of AI systems.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand complexity of Machine Learning algorithms.
2. Apply common Machine Learning algorithms in solving the business problems.
3. Differentiate various Machine Learning solutions
4. Understand the fundamental principles of intelligent systems.
5. Evaluate the various search mechanisms and design a Chatbot.

Unit–I Machine Learning

What is Machine Learning; Types of Machine Learning Algorithms- Supervised, Unsupervised and Reinforcement Learning.

Supervised Learning- K Nearest Neighbors, Random Forest and Boosting

Case Study: Predicting Employee Churn Using KNN, RF and Boosting.

Unit-II Recommender Systems Using Machine Learning

User Based Similarity- Calculating Cosine Similarity Between Users, Filtering Similar Users, Challenges with User Based Similarity. Item Based Similarity- Calculating Cosine Similarity between Movies, Finding Most Similar Movies. Matrix Factorization

Case Study: Application of Recommender System using Netflix Movie Recommender Data.

Unit-III Decision Tree Classification

Introduction to Decision Tree; Building Decision Tree Classifier using Gini Criteria; Measuring Test Accuracy; Displaying the Tree; Building Decision Tree Classifier using Entropy Criteria; Finding Optimal Criteria; Maximum Depth of the Tree and Benefits and Disadvantages of Decision Tree

Case Study: Applying Decision Tree Classification on German Credit Data.

Unit- IV Artificial Intelligence

Introduction- Meaning and Foundations of AI, History of AI. Intelligent Agents- Agents and Environments, Concept of Rationality, Nature of Environments, The Structure of Agents, AI: The present and Future. Problem Solving-I: Solving Problems by Searching- Problem Solving Agents, Searching for Solutions, Uninformed Search Strategies, Informed Search Strategies, Heuristic Functions.

Unit-V Problem Solving

Beyond Classical Search- Local Search Algorithms and Optimization Problems, Beyond Classical Search, Adversarial Search, Constraint Satisfaction Problems, Chatbot –Introduction, Characteristics and its importance.

Text Books:

1. Wei- Meng Lee, "Python Machine Learning", Weily, 3rd Ed., 2019.
2. Rich, Knight, Nair, "Artificial Intelligence", Tata McGraw Hill, 3rd Ed., 2017.
3. Tom M. Mitchell, "Machine Learning", McGraw Hill, 4th Ed., 2017.
4. Russell, Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 2nd Ed., 2015.

Suggested Readings:

5. Paul Deitel, Harvy Deitel, "Python for Programmers- with introductory AI Case Studies", 1st Ed. Pearson Education, 2019.
6. Puneet Mathur, "Machine Learning Applications Using Python: Cases Studies from Healthcare, Retail, and Finance", 1st Ed., Apress, 2019.
7. Joshua Eckroth, "Python AI Projects for Beginners", 1st Ed., Packt Publishers, 2018.
8. Shalev-Shwartz, Ben-David, "Understanding ML from Theory to Algorithms", 1st Ed., Cambridge University Press, 2014.
9. Stephen Marsland, Machine Learning - An Algorithmic Perspective, 2nd Ed., CRC Press, 2014.
10. Saroj Kaushik, "Artificial Intelligence", 1st Ed., Cengage Learning India, 2011.

20MBE408

CLOUD COMPUTING

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To impart the basics of cloud computing for business management.
2. To illustrate and explore the benefits of cloud storage and its applications, usage by managers.
3. To enable students explore cloud computing driven real time systems.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand the characteristics and models in Cloud computing.
2. Asses Cloud services applications and the challenges associated with Cloud Computing.
3. Apply various cloud services and deployment models and virtualization techniques for business.
4. Analyze the concepts of cloud storage and demonstrate their use.
5. Evaluate various cloud programming models and apply them in virtual office management.

Unit–I Introduction to Cloud Computing

Evolution - Cloud Computing, Hardware, Internet and Software, Virtualization. Cloud service Attributes: Access to the cloud, Cloud Hosting, Information technology support. Characteristics of Cloud Computing: Rapid Elasticity, Pay per use, Independent Resource Pooling, Network Access, Web Services on Cloud

Unit-II Cloud Services Applications

Cloud Delivery Models- Infrastructure-as-a-Service, Platform-as-a-Service, Software-as-a-Service. Cloud Categories: Public Cloud, Private Cloud, Hybrid Cloud, Community Cloud. Applications – Online Planning and Task Management –Event Management – CRM. Cloud Service Development tools - Word Processing, Databases, Storing and File Sharing on Cloud

Unit-III Cloud Computing For Managers

Centralizing Email Communications – Collaborating on Schedules - To-Do Lists, Contact Lists. Online Community development, Online collaboration tools for Projects, Cloud Computing for Business

Unit-IV Cloud Management

Privacy and its relation to Cloud-based Information Systems. Security in the Cloud: Data Security and Control, Provider Loss, Subpoenaed Data, Lack of Provider Security, Encryption. Common Standards in the Cloud, End-User Access to the Cloud Computing, Legal and Ethical dimensions, Cloud Pricing Models.

Unit–V Virtual Office Management

Web-based communication tools, Web Mail Services, Web Conference Tools, Social Networks and Groupware, collaborating via blogs and Wikis, IBM, Amazon Ec2, Google Apps for Business

Text Books:

1. John W. Rittinghouse and James F. Ransome, "Cloud Computing Implementation, Management and Security", CRC Press, Taylor & Francis Group, Boca Raton London, 2010.
2. Kumar Saurahb, "Cloud Computing – Insights into new era infrastructure", Wiley India, 2nd Edition.
3. Michael Miller, "Cloud Computing: Web-Based applications That Change the Way You Work and Collaborate Online", Que Publishing, 2009
4. Haley Beard, "Cloud Computing Best Practices for Managing and Measuring Processes for Ondemand Computing, Applications and Data Centers in the Cloud with SLAs", Emereo Pty Limited, July 2008.

Suggested Readings:

1. Alfredo Mendoza, "Utility Computing Technologies, Standards, and Strategies", Artech House INC, 2007.
2. Bunker and Darren Thomson, "Delivering Utility Computing", John Wiley & Sons Ltd, 2006.
3. Igor Fyanberg, Hui-LanLu, Dorskuler, "Cloud Computing business Trends and Technologies", Wiley Publishers,2016.
4. Michael Hugos , "Business in the Cloud", John Wiley & Sons Ltd., 2011.
5. Joe Wienman, "Cloudonomics: The Business value of cloud computing", John Wiley & sons Ltd, 2012.
6. Anthony T.Velte, Toby J. Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", MCgraw Hill Publishers, 2010.

20MBE409

E-COMMERCE LOGISTICS

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To explain the various concepts of E-commerce logistics.
2. To familiarize with various operations and warehousing technologies in E-Commerce Logistics.
3. To provide application knowledge on network design and automation in E-Commerce Logistics.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand E-commerce and E-commerce logistics and its terminologies.
2. Understand and choose appropriate fulfillment centre for e-commerce logistics.
3. Applying various techniques in e-commerce logistics warehousing and consignment movement process.
4. Build suitable warehouse network design and application of automated technologies in handling of consignment.
5. Utilizing various technologies associated with E-commerce logistics.

Unit I History of E- commerce Logistics

The Evolution of Logistics and supply chain from Direct to Store models to E-Commerce, Meaning – functions and special characteristics of E-commerce, E-commerce in India, E-commerce and its technological aspects, overview of developments in information technology and e-commerce: Scope of E commerce, benefits and limitations of E-commerce. Role of Logistics in E- commerce, emergence of E-commerce logistics specialists.

Unit II E-Commerce and Fulfilment centres

Understanding E-Commerce fulfilment centres, definition and process, Faster order fulfil filament process, Real time decision support, Difference between distribution centre and fulfilment centre, Mega e-fulfilment centres, Strategies in E-commerce fulfilment, In-house order fulfilment, Managing inventory with outsourced fulfilment centre, end to end E-commerce logistics, E-commerce retail logistics

Unit-III Operations in E- Commerce Logistics

Inventory management, Parcel hubs/sortation centres warehousing, packaging, labelling, private labelling and manufacturing, white libelling, billing, shipping, payment collection, return, and exchange. Operating models: The marketplace model, Inventory-led model, Fulfilled by e-retailer drop ship model; Capacity and load matching, Track and tracing of consignments, managing on time deliveries. Dynamic Logistics alliance/integration in e-commerce.

Unit-IV Network and warehouse design

Distribution global network, retail distribution network, direct store delivery, automation in distribution, automated picking technology, distribution centre design, implementation of warehouse management systems, science of warehouse slotting optimization, grocery/industrial distribution. Robot in fulfilment operations, ASRS, yard management, network locations, E-commerce retail logistics activities, First mile logistics Fulfilment, Line haul management.

Unit-V Logistics solutions for E-commerce

Logistics solutions for e- commerce, demand planning, tracking, pre-shipping, last mile delivery-COD-managing returns, dedicated customer support,3rd party shipping carrier, subscription model Order, Invoice management system, Omni channel e-commerce, POS (Point of Sales) e commerce integration system, Emerging trends in Voice commerce, E-commerce SEO, Seamless interface with existing SCM or ERP system logistics, E- commerce and consumer buying habits.

Text Books:

1. Paul T Sudhakar, "Logistics in E-Commerce Business", 1st edition, Create space Independent Publication, 2017.
2. Deborah L. Bayles, "E-commerce logistics and fulfilment: Delivering the goods", 1st edition, Prentice Hall, 2000.
3. P. T. Joseph, "E-Commerce: An Indian Perspective", 5th edition, PHI Learning, 2015
4. Deryn Graham, "E-logistics and E-supply Chain Management: Applications for Evolving Business", Business Science Reference, 2013.

Suggested Readings

1. Geunes, J., Akçali, E., Pardalos, P., Romeijn, H.E., and Shen, Z.-J.M. (Eds.), "Applications of Supply Chain Management and E-Commerce Research" Springer, 2005.
2. Janice Reynolds, "Logistics and Fulfilment for e-business", 1st edition, CRC Press, 2001.
3. Frazelle, "World Class Warehousing & Material Handling", 2nd edition, Tata McGraw-Hill, 2016.
4. Gwynne Richards, "Warehouse Management" 3rd edition, Kogan Page, 2017.
5. P Gopal Krishnan and Abid Haleem, "Hand book of Materials Management", 2nd edition, PHI learning, 2019.
6. Gopalakrishna, P. and Shandilya M.S., "Stores Management and Logistics", 1st edition, S.Chand & Co, 2013.

20MBE410

INTERNATIONAL LOGISTICS

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

4. To provide insights of International logistics operations.
5. To impart knowledge of International fright structure.
6. To focus on different types of containers and its transportation.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand various terminologies of global logistics.
2. Analyze various shipping methods in Air and Ocean transport.
3. Apply knowledge in various systems and procedures of international trade.
4. Choose appropriate international insurance and packing methods.
5. Categorize fright structure in international logistics.

Unit I Introduction

Global supply chain – Its importance in a Global economy – Stages in International Development - Export/ Import, Terms and conditions of purchase of sales, method of payment, etc.), Quality considerations (e.g. ISO9000, industry quality specifications, etc, Security issues.). Role of Clearing Agent, Role of IATA and TIACA in Air Cargo Industry, International Air Transport; Exim policies.

Unit II Modes of International Transportation

Types and Terminology- Features, Advantages and Disadvantages of using sea mode, Classification of ships, Shipping Methods, S wage in Ship, Major Sea-routes around the world, Parties and Perils Associated with Sea Mode; Maritime Risks, Marine Insurance. Air cargo industry, International Air Transportation, Models in Air cargo planes.

Unit III Containerization in International Trade

Containerization and Chartering Containerization: Genesis, Concept, Classification, Benefits and Constraints; Inland Container Depot (ICD): Roles and Functions, CFS, Export Clearance at ICD; CONCOR; ICDs under CONCOR; Chartering: Kinds of Charter, Charter Party, and Arbitration. Export and Import procedure in India, Transport Documents, Mate Receipt, Bill of Lading - features and types, Air-way Bill.

Unit-IV Insurance Regulation and Packing

International insurance- risk management, Insurance and transportation liability regimes- marine insurance policies-coverage under a marine cargo insurance policy – airfreight policy- Lloyd's principles, Baltic exchange, UN convention on liner code of conduct. INCOTERMS 2013; Packing requirements (i.e. regulatory, preservation of cargo types of containers, packing materials, etc.

Unit V Fright Structure in International Trade

Freight Structure and Role of intermediaries: Principles of Freight Rates, Linear Freight Structure, Tramp Freight Structure, Ocean Freight- Types of Sea Freight, Calculation. Air Cargo Tariff Structure- Air Freight Classification, Air Freight Calculation, Factors Affecting Air Freight Rates, Air Freight Consolidation of Cargo Tariff Structure; Shipping Agents, Freight Brokers, Freight Forwarders Stevedores.

Text Books:

1. Krishnaveni Muthaiah, "Logistics Management and World Sea borne trade", 1st edition, Himalaya Publishing House, 2018.
2. Kent N. Gourdin, "Global Logistics Management, a competitive Advantage for the 21st Century", 2nd edition, Blackwell Publishing, 2006.
3. Khurana P.K., Export management, 12th edition, Cyber Tech Publication, 2019.
4. Cherunilam F., International Trade and Export Management, 21st edition, Himalaya Publication, 2019.

Suggested Readings:

1. Donald J. Bowerson, "Logistic and Supply Chain Management" 5th edition, Prentice Hall of India, 2009.
2. Paul Murphy, Donald Wood, "Contemporary Logistics", 12th edition, Prentice Hall, 2017.
3. Sudalaimutu, S and Anthony Raj, "Logistics Management for International Business" 1st edition, PHI learning, 2009.
4. Rama Gopal C, "Export Import Procedures-Documentation and Logistics" 1st edition, NewAge Publications, 2019.
5. Pierre David, "International Logistics", 5th edition, Cicero Press, 2017.
6. Jhon Mangan and Chandra C.Lalwani, "Global Logistics and Supply Chain Management", 3rd edition, 2016.

OPEN ELECTIVE

20MBO101

BUSINESS ENVIRONMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To familiarize the Students with various aspects of Business Environment factors along with detailed discussion on Planning and Industrial policies, mechanism of Fiscal Policy and Monetary Policy.
2. To provide in depth knowledge on changes in the growth of National Income, Inflation, Poverty and other economic policies.
3. To understand the Concept of WTO Agreements and its Implications, EXIM Policies, FEMA on various MNCs activities.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand the various environmental factors that influence the domestic and international business activities.
2. Evaluate and Implement appropriate decisions with the help of industrial policy and regulation.
3. Analyze the Fiscal policy and Monetary Policy and its impact on business operations.
4. Analyze the changes in various economic growth factors that have impact on business activities.
5. Adapt trade, EXIM policies and FEMA Act for organization stability and sustainability.

Unit-I Introduction

Colonialism and development of the Indian Economy - Digital Economy : Business Environment - Meaning, Importance, Environmental Factors, Planning in India-Planning Commission- NITI Aayog - Liberalization and Planning, Industrial Policy and Regulatory Structure - Industrial Policy - Industrial Licensing Policy, Made in India.

Unit-II Economic Development

Five Year Planning- Industrial Policy 1991, New Industrial Policy, Startups, MSME, Small Scale Industries (SSI) - Industrial Finance - Foreign Direct Investment (FDI) - Modes - India's Inflow and Outflow.

Unit-III Economic Policies

Fiscal Policy- Latest Union Budget - Reforms Undertaken - Role of Government. Monetary Policy - Basic Concepts, Monetary Policy in the 21st Century - Banking Sector Reforms. Role of Regulatory Institutions in Indian Financial system - RBI and SEBI, Capital Market Institutions - Stock Indices- Derivatives Market - Global and Indian Scenario.

Unit-IV Economic Growth

National Income - Concepts, Foreign Trade and Balance of Payment, Poverty in India, Unemployment in India, Inflation, Human Development Index, Rural Development - Schemes, Problems of Economic Growth.

Unit-V Domestic and International Trade Policy

Evolution of International Financial System, Global Recession and Developing Economies: Policy Changes and Issues - Sector wise Trade Policies: Recent Developments GATT - WTO - Agreements and Implications. EXIM Policies and FEMA: India's New EXIM Policy - Legal Framework - Initiatives, FEMA - Indian Multinational Companies - Role in World Economy.

SCHOOL OF MANAGEMENT STUDIES CBIT Hyderabad

Text Books:

1. Justin Paul "Business Environment: Text & Cases" , 4th edition, Tata Mcgraw Hill, 2018.
2. V.K Puri and S.K Misra " Indian Economy", 37th edition, Himalaya Publishing house, 2019.
3. Francis Cherunilam "Business Environment: Text & Cases", 25th edition, Himalaya Publication, 2017.
4. Ramesh Singh, "Indian Economy" 11th edition, McGraw Hill Education, 2019.

Suggested Readings:

1. Gaurav Datt and Ashwani Mahajan, "Indian Economy", 72nd ed, S.Chand, 2016.
2. K.Ashwathappa "Essentials of Business Environment: Text, Cases& Exercises" 12th edition, Himalaya Publications, 2014.
3. B N Ghosh, "Business Environment", 1st edition, Oxford University Press, 2014.
4. Pailwar V.K, "Business Environment", 1st edition, PHI learning, 2014.
5. Saleem SK, "Business Environment", 3rd edition, Pearson Education, 2015.
6. Amory Lovins, L. Hunter Lovins, Paul Hawken, Forest Reinhardt, Robert Shapiro, Joan Magretta Harward business review on Business Environment, Harvard business school press, 2000.

20MBO102

CORPORATE SOCIAL RESPONSIBILITY

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of this Course are to:

1. Understand the prominence of Historical evidence in exploring the Concept of CSR and Corporate Governance.
2. Understand the various Forms, Models and Theories of CSR and the role of the major Institutions in promoting CSR.
3. Provide insights into the various indices of CSR and the growth of CSR in various countries.

Course Outcomes: After Completion of the Course, Students will be able to:

1. To describe the basic terms and concepts related to CSR and Corporate Governance.
2. To apply the models and theories to suggest the organizations the essential CSR initiatives.
3. To examine the potential public responsibilities of corporations within the global community.
4. To observe the extent to which Business can meet the Challenges of Sustainable Development.
5. To evaluate how CSR is being practiced in various Organisations.

UNIT-I Introduction

Concept of CSR, Corporate Philanthropy, Corporate Citizenship, Evolution and Development of CSR, CSR Strategy, Arguments in Favour and Against CSR, Drivers of CSR, Dimensions and Importance of CSR, Corporate Governance and Corporate Social Responsibility.

UNIT-II CSR Models and Theories

Forms of CSR - Economic Responsibility, Legal Responsibility, Ethical Responsibility, Philanthropic Responsibility. Models of CSR - Philanthropic model, Ethical model, Statist model, Liberal model, Stakeholder model. Theories of CSR - Fiduciary Capitalism Theory, Stakeholder Theory, Social Contract Theory, Feminist Theory.

UNIT-III CSR Framework

Role of various Institutions in CSR – Role of Government, Educational Institutions, Media. Creating CSR Framework, Framework for rating CSR, International framework for Corporate Social Responsibility. CSR Legislation in India and the World.

UNIT-IV CSR and Development

Business and Inclusive growth, Standards and Indices for CSR, Sustainability and its Challenges, Strategies Business tool for Sustainable Development, Global CSR- CSR and development in Developing countries, CSR practice in India: A study with a Global contrast. Ethical Management and CSR.

UNIT-V CSR Trends and Opportunities

Current trends and opportunities in CSR, Environment Protection and CSR, CSR Case Studies with reference to India - Failures and Success, Future for CSR, Contemporary Issues in CSR.

Text Books:

1. Madhumita Chatterji, "Corporate Social Responsibility", Oxford University Press, 2015.
2. S.S.Khanka, "Business Ethics and Corporate Social Responsibility", S.Chand, 2014.
3. William B, Werther, "Strategic Corporate Social Responsibility: Stakeholders in a Global Environment", Sage publications, 2008.
4. Andrew Crane, Dirk Matten, Laura Spence, "Corporate Social Responsibility: Readings and Cases in a Global Context", 2007.

Suggested Readings:

1. Subhasis Ray, S. Siva Raju, "Implementing Corporate Social Responsibility: Indian Perspectives", 2014.
2. K.S. Ravichandran, Corporate Social Responsibility – Emerging Opportunities and Challenges in India", 2013.
3. Robert A.G. Monks, Nell Minow, "Corporate Governance", 5th edition, Wiley, 2013.
4. Bob Tricker, "Corporate Governance- Principles, Policies, and Practices", Oxford University Press, 3rd edition, 2018.
5. C. V.Baxi, Ajit Prasad, "Corporate Social Responsibility: Concepts and Cases: the Indian Experience", Excel Books India.
6. Subash Chandra Das, "Corporate Governance in India", 4thedition, PHI Learning

20MBO103

BUSINESS LAW AND ETHICS

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of this Course are:

1. To give an Overview of Legal issues that they deal within their Professional and Personal life and to provide knowledge on General Contracts, Special Contracts and Negotiable Instruments.
2. To discuss the formation of Company, Process, and Dissolution and to educate on the rights of consumers and Redressal mechanism.
3. To provide understanding the significance of Ethical conduct for Business and Community.

Course Outcomes: After Completion of the Course, the Students will be able to:

1. Apply Legal aspects of Business law to the problems associated with business and its transactions
2. Critically review the special contracts and reflect them on the current Legal issues
3. Understand various provisions of Companies Act.
4. Claim the rights as a consumer by recalling the Redressal Mechanism available
5. Exhibit the skills required to identify and resolve the ethical issues in the Business environment.

Unit- I Introduction

Definition, Contract and Agreement, Essential Elements of a Valid Contract, Classification of Contracts. Offer and Acceptance - Legal Rules, Communication of Offer, Acceptance and Revocation. Consideration - Need, Legal Rules, Stranger to a Contract, Contract without Consideration. Capacity to Contract. Free consent - Coercion, Undue Influence, Misrepresentation, Fraud, Mistake. Performance of Contract. Remedies for Breach of Contract - Quasi Contracts - Kinds, Quantum Meruit.

Unit – II Special Contracts

Special Contracts: Indemnity and Guarantee - Contract of Indemnity, Contract of Guarantee, Distinction between Contract of Indemnity and Guarantee, Bailment and Pledge - Classification of Bailment, Duties and Rights of Bailor and Bailee, Termination of Bailment, Pledge, Bailment vs. Pledge, Rights and Duties of Pawnee and Pawnor, Pledge by Non-Owners. Contract of Agency - Creation of Agency, Classification of Agents, Relations of Principal and Agent, Principal with Third Party, Delegation of Authority, Termination of Agency. Sale of Goods Act - Distinction between Sale and Agreement to Sell. Conditions and Warranties- Express and Implied, Caveat Emptor. Negotiable Instruments Act: Characteristics, Types, Essential elements and distinctions between Promissory Note, Bill of Exchange, and Cheques - Types of Crossing.

Unit-III Companies Act

Definition of Company - Characteristics - Classification of Companies - Formation of Company - Memorandum and Articles of Association - Prospectus - Shareholders Meetings - Board Meetings - Law relating to Meetings and Proceedings - Company Management - Qualifications, Appointment, Powers, and Legal position of Directors - Board - M.D and Chairman - their powers, Prevention of Oppression and Mismanagement, Winding-up of a Company.

Unit-IV Consumer Protection Act

Consumer Protection Law: Introduction to Consumer Protection Law in India, Rights of Consumers, Consumer Councils - Central and State Councils, Redressal Machinery - National Commission, State Commission, District Forum.

Unit-V Business Ethics

Ethical and Value Based Considerations – Need and Justification – Business Ethics and Efficiency – Social Responsibility of Business – Fair and Just cooperation among Owners, Managers, Workers and Customers –

Fair Market Wages – Integrity and Ethical consideration in Business Operations – Indian Value system and its relevance in Management.

Text Books:

1. N.D. Kapoor, "Elements of Mercantile Law", Sultan Chand & Co., 2018.
2. K.R. Bulchandani, "Business Law for Management", 6th ed, HPH, 2014.
3. Satish B. Mathur, "Business Law", Tata Mc Graw Hill, 2010.
4. O. C. Ferrell et.al., "Business Ethics: Ethical Decision Making and Cases", Cengage Learning, 2014

Suggested Readings:

1. PPS Gogna, "A Text Book of Company Law", 6th ed., S. Chand, 2014.
2. Akhileshwar Pathak, "Legal Aspects of Business", 6th ed., Tata McGraw Hill. 2014.
3. Kenneth W. Clarkson, Roger LeRoy Miller & Frank B. Cross , "Business Law: Text and Cases", Cengage Learning, 2017.
4. Henry R. Cheeseman, "Business Law", Pearson, 2018
5. Christine Ladwig & George Siedel, "Strategy, Law and Ethics for Business Decision, West Academic Publishing, 2020
6. Richard T De George, Business ethics, 7th ed., Pearson, 2014.

SCHOOL OF MANAGEMENT STUDIES CBIT Hyderabad

20MBO202

BANKING MANAGEMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To provide Conceptual and Practical understanding of Banking Industry and Monetary Policy implications.
2. To make Students proficient in Management of various Lending functions and educate them in Credit Delivery and Monitoring and Managing.
3. To equip the Students with latest trends, Regulations and Innovations in Banking arena.

Course Outcomes: After Completion of the Course, Student will be able to:

1. Understand Banking system and get insight on overview of Banking.
2. Acquire Knowledge on Banks monetary Policy –Implication and Analyze Financial Statements.
3. Develop a clear understanding and knowledge about the Lending functioning of bank.
4. Analyse the importance of Credit Delivery and monitoring as well as how a bank manages Credit Risk.
5. Explain on banking Regulatory system and Evaluate new innovations in banking products and services.

Unit -I Introduction

Banking: Evolution of Banking in India - Origin, Nationalization, Reforms of Banking sector. Types of Banking: Universal Banking, Wholesale Banking, Private Banking, Retail Banking; Role of Banks in the development of Economy, RBI: Origin and Growth - Functions. Monetary Policy: Central Bank tools to regulate Money Supply- Policy rates, Monetary Ratios, Application of Monetary policy tools in India. Banks Financial statements: Basic Concepts - Bank Liabilities, Assets and Income statement. Analysing Banks Financial Statements, CAMELS, Ratings, Key Performance indicators.

Unit -II Sources and Uses of Bank Funds

Sources of Bank Funds, Deposits, Deposit Insurance in India, Pricing, Deposit Services, Need, Approaches to Deposit Pricing, Bank Liabilities - Non Deposit sources. Features of Bank Credit, Types of lending, Steps in assessment of Credit Worthiness of a Prospective borrower, Credit process and Financial appraisal for Credit Decisions, Different types of Loans and their features, Loan Pricing- The Basic Model, Pricing Fixed and Floating Rate Loans, Hedging, Matched funding, and Price leadership model, Cost-Benefit Loan Pricing Customer Profitability Analysis.

Unit - III Credit Delivery and Monitoring

Modes of Credit Delivery - Cash Credit, Working Capital Demand Loan, Overdrafts, Bills finance and Pricing of Loans. Legal aspects of Lending - Secured and Unsecured Loans and Types of Securities. Credit Monitoring. Need for Credit Review, Triggers of Financial Distress - Models of Financial Distress - The Altman's Z score and other Models. Rehabilitation Process.

Unit - IV Managing Credit Risk

Basic Concepts - Expected and Unexpected Loss, Elements of Credit Risk, Credit Risk of Portfolio. Credit Risk Models - Basic Model and Modelling Credit Risk. Managing Credit Risk-Estimating PD, EAD and LGD, Need for the Credit Risk Models - Best Practice Industry Model Credit Migration Approaches- Credit Migration Approach used by Credit Metrics, Calculation of Portfolio Risk and Credit Migration Approach Used by Credit Portfolio View. Option pricing Approach - KMV Model.

Unit -V Regulation and Innovations in Banking System

Regulation of Bank Capital: Need to regulate, Concept of Economic Capital, Regulatory Capital, Basel Accords I, II and III - Implementation, Criticism. NPA's - Gross and Net concept of NPA's, Causes, Implications and Recovery of NPA's. Banking Innovations: Need, Core Banking solutions, Retail Banking - Products and Services - Nature, Scope, Future and Strategies, Plastic Money and E-Money, National Electronic Funds Transfer, RTGS, ATM, Mobile Phone Banking, Net Banking and Security Issues in E-Banking. Cyber Security and Frauds. Mergers and Acquisitions in Banks.

Text Books:

1. Padmalatha Suresh & Justin Paul, "Management of Banking & Financial Services", 3rd Edition., Pearson Education, 2016
2. Peter.S.Rose & Sylvia. C. Hudgins, "Bank Management & Financial Services', 8th Edition, Tata McGraw Hill, 2014.
3. K. Sriharsha Reddy & R.Nageswar Rao, "Banking & Insurance, First Edition, Paramount Publishing House, 2013.
4. Vasant Desai, "Banks & Institutional Management", 2nd Edition, Himalaya Publishing House, 2010.

Suggested Readings:

1. Bank Financial Management, IIBF, Macmillan 2010.
2. Vijayaragavan Iyengar, Introduction to Banking, Excel Books, 2009.
3. Reddy.P.N., Appannaiah.H.R.; Theory & Practice of Banking;8th Edition Himalaya Publishing House. 2004.
4. V.Rajaraman , Credit Appraisal Risk Analysis & Decision Making, 10th Edition, snow White (2019).
5. S.K. Maheshwari S.N. Maheshwari, "Banking Law and Practice", 11th Edition, Kalyani Publishers 2014.
6. Mittal R.K., Saini A.K. & Dhingra Sanjay, "Emerging Trends in the Banking Sector", Macmillan 2008.

20MBO203

CUSTOMER RELATIONSHIP MANAGEMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of this Course are:

1. To make students understand the Concepts and Principles of CRM and its dynamism.
2. To educate Students on the Strategic, Operational and Analytical Customer Relationship Management.
3. To enable Students to understand how to manage Customer Relationship.

Course Outcomes: After Completion of the Course, the Students will be able to:

1. Understand and Analyze the Relationship theory from the perspective of the Customer and the Organization.
2. Develop and evaluate Strategic CRM decisions.
3. Analyze and Devise Operational CRM Decisions.
4. Appraise Analytical CRM Decisions.
5. Evaluate CRM Implementation Strategies.

Unit-I Introduction

Definition, CRM Constituencies, Commercial and not-for-profit contexts of CRM, Models of CRM, Understanding Relationships – Relationship, Relationship quality, Relationships with Customers and Suppliers, Customer Lifetime value, Customers Satisfaction, Loyalty and Business Performance, Relationship Management Theories, Managing the Customer Lifecycle - Customer Acquisition, Managing the Customer Lifecycle- Customer Retention and Development.

Unit-II Strategic CRM

Customer Portfolio Management (CPM) - Portfolio, Customer, Basic Disciplines of CPM, CRM in the Business-to-Business context, Customer Portfolio Models, Additional Customer Portfolio Management Tools, Strategically significant Customers, Seven Core Customer Management Strategies. Delivering Customer Experienced Value - Understanding Value, Customers Experience Value, Modelling Customer - Perceived Value, Sources of Customer Value, Customization, Value through Marketing Mix. Managing Customer Experience - Concepts, Customer Experience Management vs. Customer Relationship Management.

Unit-III Operational CRM

Sales Force Automation (SFA) - Meaning, SFA eco-system, SFA adoption, SFA and Sales Performance. Marketing Automation - Benefits. Service Automation - Customer Service, Modelling Service Quality, Customer Service Excellence certification, Service Automation, benefits from Service Automation.

Unit-IV Analytical CRM

Developing and Managing Customer related databases - Corporate Customer - Related data, Structured and Unstructured Data, Customer - Related Database, Data Integration, Data Warehousing, Data Marts, Knowledge Management. Using Customer - Related Data - Analytics for CRM Strategy and Tactics, Analytics throughout the Customer Lifecycle, Analytics for Structured and Unstructured data, Big Data Analytics, Analytics for Structured Data.

Unit-V CRM Implementation

Develop the CRM Strategy, Build CRM Project foundations, Needs Specification and Partner selection, Project Implementation, Performance Evaluation.

Text Books:

1. Francis Buttle and StanMaklan,"CRM:Concepts and Technologies", 3rd Ed., Routledge, 2015.
2. Alok Kumar Rai, "Customer Relationship Management: Concepts and Cases", 2nd Ed., PHI, 2013.
3. Jagdish N. Sheth, Atul Parvatiyar and G.Shainesh, "Customer Relationship Management", "Emerging Concepts, Tools and Application",1st Ed.,Tata McGraw Hill, 2001.
4. Dilip Soman and Sara N-Marandi, "Managing Customer Value: One StageataTime"1stEdition, World Scientific Publishing, 2009.

Suggested Readings:

1. Ken Burnett, "The Handbook of Key Customer Relationship Management", Pearson Education, 2005.
2. Jill Dyche, "The CRM Handbook: A Business Guide to Customer Relationship Management", Addison Wesley, 2001.
3. Zikmund, William G., Mcleod, Raymond, Jr., Gilbert, Faye. W., "Customer Relationship Management: Integrating Marketing Strategy and Information Technology", John Wiley & Sons, 2003.
4. Greenbag, Paul., "CRM at the Speed of Light, Fourth Edition: Social CRM 2.0 Strategies, Tools, and Techniques for Engaging Your Customers", 4th Edition, McGraw-Hill Education, 2008.
5. Baran, R and Galka, R., CRM: The Foundation of Contemporary Marketing Strategy", 1st Edition, Routledge, 2013.
6. Mukesh Chaturvedi, AbinavChaturvedi, "Customer Relationship Management - An Indian Perspective", 2nd Edition, Excel Books, 2008

20MBE303

PERFORMANCE AND COMPENSATION MANAGEMENT

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits	4

Course Objectives: The Objectives of the Course are:

1. To develop an understanding of the concept of Performance Management and the importance of the various Performance Assessment techniques.
2. To discuss the importance of Performance Metrics and benchmarking in improving Individual and Organizational Performance.
3. To understand the Concept of Compensation Management and its importance in Employee Retention.
4. To introduce various methods of designing Compensation System and make Students aware about the Management of Employee Benefits.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Effectively design the process of Performance Management system.
2. Efficiently identify an appropriate Performance Appraisal method at their workplace as an HR Professional.
3. Decide the standard performance benchmarks to influence the Performance of Organizational members.
4. Influence the Stakeholders of Compensation and also integrate compensation with other HR initiatives in line with Organizational realities.
5. Formulate new set of Compensation system and manage the various Employee Benefits in the Organisations.

Unit-I Introduction

Definition, Performance Appraisal to Performance management. Objectives of Performance Management. Process of Performance Management. Performance planning and Role clarity. KPAs - Performance Targets. Trait, Behaviour and Results approaches to measuring Performance. The impact of HRM practices on Performance.

Unit-II Performance Management Systems

Assessment Centre - Psychometric tests: Aptitude or Ability tests and Personality Tests. Role Play- Self-appraisal - 360 Degree appraisals- Rating-less appraisals for the future of Performance Management System (PMS). Critical incidents methods. Attribution theory- Causal matrix. Alternative models for Assessing Performance.

Unit-III Performance Bench marking

Diagnosis and Performance improvement - Performance Measures Pyramid - Direction of trouble shooting with Behavior model- Mager and Pipes trouble shooting model- European Foundation for Quality Management (EFQM) Excellence model- Diagnostic and Process bench marking. Outcome Metrics- Economic Value Added (EVA). Building a High Performance culture-Ethics in Performance Management.

Unit-IV Strategic Compensation Management Concepts

Concept of Compensation- Exploring and defining the Compensation- Job Evaluation approach to Compensation- Compensation dimensions- Role of Compensation in Organization- factors influencing Compensation- Aligning Compensation Strategy with HR Strategy and Business Strategy- New trends in Compensation Management.

Unit-V Designing Compensation System - Employee Benefits Management

Traditional Pay System and Modern Pay Systems- Pay for Performance, Competency Based Pay, Equity Based Rewards, Team Rewards- Reward Strategy and Psychological Contract- Law relating to Compensation- International Compensation- Executive Compensation, Benefits Administration, Employee Welfare and Working conditions- Statutory and Voluntary measures.

Text Books:

1. Michael Armstrong, Armstrong's Handbook of Performance Management: An Evidence-Based Guide to Delivering High Performance, kogan Page, 2012
2. Bhattacharyya, Performance Management Systems and Strategies, Pearson, 2011
3. Joseph J. Martocchio, Strategic Compensation: A Human Resource Management Approach, Pearson Ed, 2018
4. Henderson, Compensation Management in a Knowledge Based World, Pearson Ed, 2007

Suggested Readings:

1. A S Kohli, T Deb, Performance Management, Oxford Higher Education, 2008
2. A.M. Sharma, Performance Management systems, HPH, 2010
3. Clive Fletcher & Richard Williams, Appraisal: Improving Performance and Developing the Individual, Routledge, 2016.
4. T V Rao, Performance Management: Toward Organizational Excellence, Sage Publications Pvt. Ltd, 2016.
5. George Milkovich, Compensation, McGraw-Hill Higher Education, 2019.
6. Tapomoy Deb, Compensation Management: Text & Cases, Excel Books, 2012.

20MBSD201

PERSONALITY DEVELOPMENT AND CAREER GUIDANCE

Instruction	4 hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Course Objectives: The Objectives of the course are:

1. To educate the students on the concepts and aspects of Personality Development.
2. To help them understand the important elements in Soft Skills.
3. To prepare them for facing job Interviews and Career Planning.

Course outcomes: After completion of the course, students will be able to:

1. Identify their personality style, while recalling the importance of Personality Development for better employment and entrepreneurship
2. Develop right attitude and exhibit appropriate leadership style to achieve self and Organizational goals.
3. Demonstrate the soft skills that are required for effective functioning of an Organization
4. Exhibit good employability skills that are expected from the Industry.
5. Devise and Implement a Proper Career Planning and development Strategy.

Unit-I Introduction

The Concept of Personality- Dimensions and Theories of Freud and Erickson- Personality Analysis- Significance of Personality Development- Personality Tests.

Unit-II Aspects of Personality Development

Attitude- Concept- Significance- Ways to Develop the Attitude. Self-awareness- Meaning, Components, benefits, improving Self-awareness. Goal Setting- Meaning, Importance, Types, Steps for Goal Setting, SMART Goals. Leadership Development- Importance, Styles, Theories of Leadership.

Unit-III Soft Skills

Interpersonal Skills- Time Management- Networking- Creative Thinking- Problem Solving-Negotiation and Conflict Resolution- Stress Management- Work Ethics

Unit-IV Job Preparation and Career Skills

Sources of Occupation Information- Resume Building- Writing Resumes and Cover Letters - The Art of Participation in Group Discussions- Psychometric Analysis- Strategies to be Successful in an Interview- Mock Sessions.

Unit-V Career Planning and Development

Career Opportunities - Career Goals and Plans- Benefits of Career Planning- Guidelines for Choosing a Career- Tips for Successful Career Planning- Developing Career Goals- Career Growth Benefits from E-Learning- Career Planning within a Corporate Setting and while Switching a Company (Things to know while starting a Career)

Text Books:

1. BarunK.Mitra, " Personality Development and Soft Skills", 2nd Edition, Oxford University Press, , 2016.
2. Swamy Vivekananda, "Personality Development", Adhakshya Advaita Ashrama, 1st Edition, 2015.
3. M.S. Rao, "Soft Skills: Enhancing Employability, Connecting campus With Corporate", Wiley (Dreamtech Press), 1st Edition, 2019.
4. Mellisa Hume, "Career Guidance for Now and for the Future", Balboa Press, 1st Edition, 2014.

Suggested Readings:

1. Niles, S. & Harris-Bowlsbey, J. Career development interventions in the 21st century. (4th ed.), Upper Saddle River, NJ: Pearson, 2013.
2. Bill Gothard, Phil Mignot, Melvyn Ruff, Career Guidance in context, Sage Publications, 2012.
3. Richard N. Bolles, What Color Is Your Parachute? 2020 APractical Manual for Job-Hunters and Career Changers, Ten Speed Press, 2019
4. Gibson, R. & Mitchell, M. "Introduction to Career Counselling for the 21st Century", Pearson Education, 2005.
5. Joseph Murphy, "The Power of Your Subconscious Mind", Jaico Publishing House, 1st Edition, 2018.
6. Stephen R. Covey "The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change", 25th Edition, Turtleback books, 2013.

20MT C05

CALCULUS

(Common to ECE, EEE, MECH, CHEM, CIVIL)

Instruction	3 L+1T/2P Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives:

1. To explain the solutions of system of linear equations by Matrix Methods.
2. To discuss mean value theorems.
3. To explain the Partial Derivatives and the extreme values of functions of two variables.
4. To discuss the convergence and divergence of the series.
5. To explain the expansion of functions in sine and cosine series.

Course Outcomes:

Upon completing this course, students will be able to:

1. Apply the Matrix Methods to solve system of linear equations.
2. Analyse the geometrical interpretation of Mean value theorems.
3. Determine the extreme values of functions of two variables.
4. Examine the convergence and divergence of infinite Series.
5. Calculate the Euler's coefficients for Fourier series of a function.

UNIT-I

Matrices: Rank of a matrix, Echelon form, consistency of linear system of equations, Linear dependence and independence of vectors. Eigen values, Eigenvectors, Properties of Eigen values& Eigen vectors, Cayley-Hamilton theorem, Quadratic form, Reduction of quadratic form to canonical form by linear transformation, Nature of quadratic form.

UNIT-II

Calculus: Rolle's Theorem, Lagrange's Mean value theorem, Cauchy's mean value theorem (without proofs). Curvature, Radius of curvature, Centre of curvature, Evolute and Involute.

UNIT-III

Multivariable Calculus (Differentiation): Functions of two variables, Partial derivatives, Higher order partial derivatives, Total derivative, Differentiation of implicit functions , Change of variables, Jacobians, Taylor's theorem for functions of two variables, Maxima and minima of functions of two variables.

UNIT-IV

Sequences and Series: Convergence of sequence and series. Tests for convergence of series: Comparison test, limit comparison test, D'Alembert's ratio test, Raabe's test, Cauchy's root test, alternating series, Leibnitz's series, absolute and conditional convergence.

UNIT-V

Fourier series: Periodic functions, Euler' formulae**,** Conditions for a Fourier expansion, functions having points of discontinuity, change of interval, even and odd functions, half range sine series, half range cosine series, and its applications in practical Harmonic analysis.

HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Text Books:

1. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. B.V.Ramana., Higher Engineering Mathematics, Tata McGraw-Hill, New Delhi, 11th Reprint,

Suggested Reading:

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw- Hill, New Delhi, 2008.
2. R.K.Jain, S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th edition, 2016.
3. David.Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/ Cole, 2005.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20CY C01 **CHEMISTRY**

(Common to all branches)

Instruction:	3Hours per Week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE:	40 Marks
Credits:	3

Course Objectives

1. This syllabus helps at providing the concepts of chemical bonding and chemical kinetics to the students aspiring to become practicing engineers
2. Thermodynamic and Electrochemistry units give conceptual knowledge about processes and how they can be producing electrical energy and efficiency of systems.
3. To teach students the value of chemistry and to improve the research opportunities knowledge of stereochemistry and organic reactions is essential.
4. Water chemistry unit impart the knowledge and understand the role of chemistry in the daily life.
5. New materials lead to discovering of technologies in strategic areas for which an insight into Polymers, nanomaterials and basic drugs of modern chemistry is essential.

Course Outcomes

At the end of the course student will be able to:

1. Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions.
2. Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells.
3. Illustrate the major chemical reactions that are used in the synthesis of organic molecules.
4. Classify the various methods used in treatment of water for domestic and industrial use.
5. Outline the synthesis of various Engineering materials & Drugs.

UNIT-I Atomic and molecular structure and Chemical Kinetics:

Atomic and molecular structure: Molecular Orbital theory - atomic and molecular orbitals. Linear combination of atomic orbitals (LCAO) method. Molecular orbitals of diatomic molecules. Molecular Orbital Energy level diagrams (MOED) of diatomic molecules & molecular ions (H_2 , He_2^+ ,N_2 , O_2 , O_2^- , CO, NO). Pi- molecular orbitals of benzene and its aromaticity.

Chemical Kinetics: Introduction, Terms involved in kinetics: rate of reaction, order & molecularity; First order reaction-Characteristics: units of first order rate constant & its half-life period, second order reaction-Characteristics: units of second order rate constant & its half- life period. Numericals.

UNIT-II Use of free energy in chemical equilibria

Use of free energy in chemical equilibria: Thermodynamic functions: Internal energy, entropy and free energy. Significance of entropy and free energy (criteria of spontaneity).Free energy and emf (Gibbs Helmholtz equations and its applications). Cell potentials, electrode potentials, – Reference electrodes (NHE, SCE)- electrochemical series. Nernst equation and its applications. Determination of pH using combined Glass & Calomel electrode. Potentiometric Acid base & Redox Titrations.Numericals.

Battery technology: Rechargeable batteries & Fuel cells.

Lithium batteries: Introduction, construction, working and applications of Li-MnO_2 and Li-ion batteries.

Fuel Cells: Introduction, difference between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell.

HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad–75.

UNIT- III Stereochemistry and Organic reactions

Stereochemistry: Representations of 3 dimensional structures, Types of stereoisomerism- Conformational isomerism – confirmations of n-butane (Newman and sawhorse representations), Configurational isomerism -

Geometrical (cis-trans) isomerism & Optical isomerism- optical activity, Symmetry and chirality: Enantiomers (lactic acid) & Diastereomers (Tartaric acid), Absolute configurations, Sequence rules for R&S notation.

Types of Organic reactions: Substitution Reactions- Electrophilic substitution (Nitration of Benzene); Nucleophilic Substitution (S_N1& S_N2); Free Radical Substitution (Halogenation of Alkanes)

Addition Reactions: Electrophilic Addition – Markonikoff's rule, Free radical Addition - Anti Markonikoff's rule (Peroxide effect), Nucleophilic Addition – (Addition of HCN to carbonyl compounds)

Eliminations-E1 and E2 (dehydrohalogenation of alkyl halides)

Cyclization (Diels - Alder reaction)

UNIT–IV Water Chemistry:

Hardness of water – Types, units of hardness, Disadvantages of hard water, Alkalinity and Estimation of Alkalinity of water, Boiler troubles - scales & sludge formation, causes and effects, Softening of water by lime soda process (Cold lime soda process),ion exchange method and Reverse Osmosis.Specifications of potable water & industrial water.Disinfection of water by Chlorination; break point chlorination, BOD and COD definition, Estimation (only brief procedure) and significance, Numericals.

UNIT-V Engineering Materials and Drugs:

Introduction, Terms used in polymer science; Thermoplastic polymers (PVC) &Thermosetting polymers (Bakelite); Elastomers (Natural rubber).Conducting polymers- Definition, classification and applications.

Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography.

Nano materials-Introduction to nano materials and general applications, basic chemical methods of preparation- Sol-gel method.Carbon nanotubes and their applications.Characterisation of nanomaterials by SEM and TEM (only Principle).

Drugs-Introduction, Synthesis and uses of Aspirin (analgesic), Paracetamol (Antipyretic), Atenolol (antihypertensive).

Text Books:

1. P.C. Jain and M. Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company Ltd.,New Delhi,16th edition (2015).
2. W.U. Malik, G.D.Tuli and R.D.Madan, "Selected topics in Inorganic Chemistry", S Chand & Company Ltd, New Delhi, reprint (2009).
3. R.T. Morrison, R.N. Boyd and S.K. Bhattacharjee, "Organic Chemistry", Pearson, Delhi, 7th edition(2019).
4. A Textbook of Polymer Science and Technology , Shashi Chawla,Dhanpat Rai & Co. (2014)
5. T. Pradeep, Nano: The Essentials, Tata McGraw-Hill Education, Delhi, 2012
6. G.L. David Krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K.L.N. Reddy and C.Sudhakar, "Drugs", Universities Press (India) Limited, Hyderabad (2007).

Suggested Readings:

1. B. H. Mahan, "University Chemistry", Narosa Publishing house, New Delhi, 3rd edition (2013).
2. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", S. Nagin Chand & Company Ltd., 46th edition (2013).
3. T.W. Graham Solomons, C.B. Fryhle and S.A. Snyder, "Organic Chemistry", Wiley, 12th edition (2017).
4. P.W. Atkins, J.D. Paula, "Physical Chemistry", Oxford, 8th edition (2006).

20CE C01

ENGINEERING MECHANICS - I

Instruction:	3 L Hours per week
Duration of SEE:	3 Hours
SEE:	60 Marks
CIE:	40 Marks
Credits:	3

Course Outcomes: At the end of the course the student will be able to

1. Calculate the components and resultant of coplanar forces system.
2. Understand free body diagram and apply equilibrium equations to solve for unknown forces.
3. Apply concepts of friction for solving engineering problems.
4. Analyse simple trusses for forces in various members of a truss.
5. Determine centroid for elementary, composite figures and bodies.

UNIT- I:
Resolution and Resultant of Force System: Basic concepts of a force system. Components of forces in a plane. Resultant of coplanar concurrent force system. Moment of a force, couple and their applications. Resultant of coplanar non-concurrent force system.

UNIT - II:
Equilibrium of Force System: Free body diagram, equations of equilibrium. Lami's theorem, equilibrium of coplanar force systems.

UNIT - III:
Friction: Theory of static friction, Laws of friction, applications to single body, connected systems, wedge friction and belt friction.

UNIT - IV:
Analysis of Simple Trusses: Introduction to trusses, analysis of simple trusses using method of joints and method of sections.

UNIT - V:
Centroid and Centre of Gravity:
Centroid of lines and areas from first principles, centroid of composite figures, theorems of Pappus, centre of gravity of bodies and composite bodies.

Text Books:

1. K. Vijaya Kumar Reddy and J. Suresh Kumar, "*Singer's Engineering Mechanics: Statics and Dynamics*", B. S. Publications (SI Units), 3rd edn. Rpt., 2019.
2. A. Nelson., "*Engineering Mechanics*", Tata McGraw Hill, Delhi, 2010.

Suggested Reading:

1. Irving H. Shames, *"Engineering Mechanics",* 4th Edition, Prentice Hall, 2006.
2. R. C. Hibbeler, *"Engineering Mechanics: Principles of Statics and Dynamics",* Pearson Press, 2006.
3. Basudeb Bhattacharyya, "*Engineering Mechanics*", Oxford University Press, 2nd edn., 2016.

i/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20CS C01

PROGRAMMING FOR PROBLEM SOLVING
(Common to all Programs)

Instruction	3 Periods per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The objectives of this course are

1. Identification of computer components, Operating environments, IDEs.
2. Understanding the steps in problem solving and formulation of algorithms to problems.
3. Develop programming skills as a means of implementing an algorithmic solution with appropriate control and data structures.
4. Develop in tuition to enable students to come up with creative approaches to problems.
5. Manipulation of text data using files.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify and understand the computing environments for scientific and mathematical problems.
2. Formulate solutions to problems with alternate approaches and represent them using algorithms / Flowcharts.
3. Choose data types and control structures to solve mathematical and scientific problem.
4. Decompose a problem into modules and use functions to implement the modules.
5. Apply arrays, pointers, structures, and unions to solve mathematical and scientific problems.
6. Develop applications using file I/O.

UNIT -I

Introduction to computers and Problem Solving: Components of a computer, Operating system, compilers, Program Development Environments, steps to solve problems, Algorithm, Flowchart / Pseudocode with examples.

Introduction to programming: Programming languages and generations, categorization of high-level languages.

Introduction to C: Introduction, structure of C program, keywords, identifiers, Variables, constants, I/O statements, operators, precedence, and associativity.

UNIT – II

Introduction to decision control statements: Selective, looping, and nested statements.

Functions: Introduction, uses of functions, Function definition, declaration, passing parameters to functions, recursion, scope of variables and storage classes, Case study using functions and control statements.

UNIT – III

Arrays: Introduction, declaration of arrays, accessing and storage of array elements, 1-dimensional array, Searching (linear and binary search algorithms) and sorting (Selection and Bubble) algorithms, 2-D arrays, matrix operations.

Strings: Introduction, strings representation, string operations with examples. Case study using arrays.

UNIT – IV

Pointers: Understanding computer's memory, introduction to pointers, declaration pointer variables, pointer arithmetic, pointers and strings, array of pointers, dynamic memory allocation, advantages, and drawbacks of pointers.

Structures: Structure definition, initialization and accessing the members of a structure, nested structures, structures and functions, self- referential structures, unions, and enumerated data types.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

UNIT-V

Files: Introduction to files, file operations, reading data from files, writing data to files, error handling during file operations.

Preprocessor Directives: Types of preprocessor directives, examples.

Text Books:

1. M.T. Somashekar "Problem Solving with C", 2nd Edition, Prentice Hall India Learning Private Limited 2018
2. AK Sharma, "Computer Fundamentals and Programming", 2nd Edition, University Press, 2018
3. Pradeep Deyand Manas Ghosh, "Programming in C", Oxford Press, 2nd Edition, 2017

Suggested Reading:

1. Byron Gottfried, Schaum's Outline of Programming with C", Mc Graw-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
4. Reema Tharaja "Introduction to C Programming", Second Edition, OXFORD Press, 2015.

Online Resources:

1. https://www.tutorialspoint.com/cprogramming/index.htm.
2. https://onlinecourses.nptel.ac.in/noc18-cs10/preview

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad–75.

20CY C02

CHEMISTRY LAB

Instruction:	4 Hours per Week
Duration of SEE:	3 Hours
SEE:	50 Marks
CIE:	50 Marks
Credits:	2

Course Objectives

1. To impart fundamental knowledge in handling the equipment / glassware and chemicals in chemistry laboratory.
2. To provide the knowledge in both qualitative and quantitative chemical analysis
3. The student should be conversant with the principles of volumetric analysis
4. To apply various instrumental methods to analyse the chemical compounds and to improve understanding of theoretical concepts.
5. To interpret the theoretical concepts in the preparation of new materials like drugs and polymers.

Course Outcomes

At the end of the course student will be able to:

1. Identify the basic chemical methods to analyse the substances quantitatively & qualitatively.
2. Estimate the amount of chemical substances by volumetric analysis.
3. Determine the rate constants of reactions from concentration of reactants/ products as a function of time.
4. Calculate the concentration and amount of various substances using instrumental techniques.
5. Develop the basic drug molecules and polymeric compounds.

Chemistry Lab

1. Introduction: Preparation of standard solution of oxalic acid and standardisation of NaOH.
2. Estimation of metal ions (Co^{+2}& Ni^{+2}) by EDTA method.
3. Estimation of temporary and permanent hardness of water using EDTA solution
4. Determination of Alkalinity of water
5. Determination of rate constant for the reaction of hydrolysis of methyl acetate. (first order)
6. Determination of rate constant for the reaction between potassium per sulphate and potassium Iodide. (second order)
7. Estimation of amount of HCl Conductometrically using NaOH solution.
8. Estimation of amount of HCl and CH_3COOH present in the given mixture of acids Conductometrically using NaOH solution.
9. Estimation of amount of HCl Potentiometrically using NaOH solution.
10. Estimation of amount of Fe^{+2}Potentiometrically using $KMnO_4$ solution
11. Preparation of Nitrobenzene from Benzene.
12. Synthesis of Aspirin drug and Paracetamol drug.
13. Synthesis of phenol formaldehyde resin.

Text Books:

1. J. Mendham and Thomas , "Vogel's text book of quantitative chemical analysis", Pearson education Pvt.Ltd. New Delhi ,6th ed. 2002.
2. Senior practical physical chemistry by B.D.Khosla, V.C.Garg & A.Gulati,; R. Chand & Co. : New Delhi (2011).

Suggested Readings:

1. Dr.Subdharani , "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing, 2012.
2. S.S. Dara , "A Textbook on experiment and calculation in engineering chemistry", S.Chand and Company, 9th revised edition, 2015.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20CS C02

PROGRAMMING FOR PROBLEM SOLVING LAB
(Common to All Programs)

Instruction	4 Periods per week
Duration of SEE	3Hours
SEE	50Marks
CIE	50 Marks
Credits	2

Course Objectives: The objectives of this course are

1. Setting up programming environment.
2. Develop Programming skills to solve problems.
3. Use of appropriate C programming constructs to implement algorithms.
4. Identification and rectification of coding errors in program.
5. Develop applications in a modular fashion.
6. Manage data using files.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify and setup program development environment.
2. Design and test programs to solve mathematical and scientific problems.
3. Identify and rectify the syntax errors and debug program for semantic errors
4. Implement modular programs using functions.
5. Represent data in arrays, pointers, structures and manipulate them through a program.
6. Create, read, and write to and from simple text files.

Lab experiments

1. Familiarization with programming environment.
2. Simple computational problems using arithmetic expressions.
3. Problems involving if-then-else structures.
4. Iterative problems e.g., sum of series.
5. 1D Array manipulation.
6. 2D arrays and strings.
7. Matrix problems, String operations.
8. Simple functions.
9. Recursive functions.
10. Pointers and structures.
11. Dynamic memory allocation and error handling.
12. File handling:

Text Books:

1. Pradeep Dey and Manas Ghosh, “Programming in C”, Oxford Press, 2nd Edition, 2017.
2. Reema Tharaja “Introduction to C Programming”, Second Edition, OXFORD Press, 2015.

Online Resources:

1. https://www.tutorialspoint.com/cprogramming/index.htm
2. https://www.w3resource.com/c-programming/programming-in-c.php
3. https://www.w3schools.in/c-tutorial/

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20ME C02

WORKSHOP / MANUFACTURING PRACTICE

Instruction	5P Hours per week
Duration of SEE	3Hours
SEE	50Marks
CIE	50Marks
Credits	2.5

Course Objectives:

1. Give a feel of Engineering Practices & develop holistic understanding of various Engineering materials and Manufacturing processes.
2. Develop skills of manufacturing, safety, precision, quality, intelligent effort, optimization, positive &team work attitude to get things right the first time.
3. To provide basic knowledge of Steel, Plastic, Composite and other materials for suitable applications.
4. Study of Principle and hands on practice on techniques of fabrication, welding, casting, manufacturing, metrology, and allied skills.
5. To advance important hard & pertinent soft skills, productivity, create skilled manpower which is cognizant of industrial workshop components and processes and can communicate their work in a technical, clear and effective way.

Course Outcomes: At the end of the course, the students are able to

1. Understand safety measures to be followed in workshop to avoid accidents.
2. Identify various tools used in fitting, carpentry, tin smithy, house wiring, welding, casting and machining processes.
3. Make a given model by using workshop trades including fitting, carpentry, tinsmithy and House wiring.
4. Perform various operations in welding, machining and casting processes.
5. Conceptualize and produce simple device/mechanism of their choice.

List of Exercises

CYCLE 1

Exercises in Carpentry

1. To plane the given wooden piece to required size
2. To make a lap joint on the given wooden piece according to the given dimensions.
3. To make a dove tail-joint on the given wooden piece according to the given dimensions.

Exercises in Tin Smithy

1. To make a rectangular box from the given sheet metal with base and top open. Solder the corners.
2. To make a scoop.
3. To make a pamphlet box.

Exercises in Fitting

1. To make a perfect rectangular MS flat and to do parallel cuts using Hacksaw
2. To make male and female fitting using MSflats-Assembly1
3. To make male and female fitting using MSflats-Assembly2

HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Exercises in House Wiring

1. Wiring of one light point controlled by one single pole switch, a three pin socket controlled by a single pole switch, and wiring of one buzzer controlled by a bellpush
2. Wiring of two light points connected in series and controlled by single pole switch. Verify the above circuit with different bulbs. Wiring of two light points connected in parallel from two single pole switches and a three pin socket
3. Stair case wiring-wiring of one light point controlled from two different places independently using two 2- way switches.

CYCLE 2

Exercises in Casting

1. Study of Sand casting process and its applications.
2. Green sand moulding practice for a single piece pattern
3. Green sand moulding practice for a split pattern with a horizontal core

Exercises in Welding

1. Study of gas welding equipment and process. Identification of flames, making of Butt joint with gas welding.
2. Study of Arc welding process, making Butt joint with DCSP,DCRP
3. Study of Arc welding process, making Lap joint with A.C

Exercises in Machine shop

1. Study of Machine Tools like Lathe, Drilling, Milling and Shaper.
2. Facing, Plain turning and Step turning operations on Lathe machine.
3. Knurling and Taper turning on Lathe machine

Open ended Exercise:

1. Student should produce a component /mechanism by applying the knowledge of any one trade or combination of trades.

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I, 2008 and Vol. II, 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.

Suggested Reading:

1. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I", Pearson Education, 2008.
2. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.

20ME C03 **ENGINEERING EXPLORATION**

Instruction	4 Hours per week
Duration of SEE	Nil
SEE	Nil
CIE	50 Marks
Credits	1.5

Prerequisites: Nil

Course Outcomes: At the end of the course, the students are able to

1. Understand the role of an engineer as a problem solver.
2. Identify multi-disciplinary approaches in solving an engineering problem.
3. Build simple systems using engineering design process.
4. Analyze engineering solutions from ethical and sustainability perspectives.
5. Use basics of engineering project management skills in doing projects.

UNIT- I

Role of Engineers: Introduction, science, engineering, technology, engineer, scientist, role of engineer, various disciplines of engineering, misconception of engineering, expectations for the 21st century engineer and NBA graduate attributes.

Engineering problems and Design: Multidisciplinary facet of design, pair wise comparison chart, introduction to econometrics system, generation of multiple solution, Pugh chart, motor and battery sizing concepts, introduction to PCB design.

UNIT- II

Mechanisms: Basic components of a mechanism, degrees of freedom or mobility of a mechanism, 4-bar chain, crank rocker mechanism, slider crank mechanism, simple robotic arm building.

Platform-based development: Introduction to programming platforms (Arduino) and its essentials, sensors, transducers and actuators and their interfacing with Arduino.

UNIT- III

Data Acquisition and Analysis: Types of data, descriptive statistics techniques as applicable to different types of data, types of graphs and their applicability, usage of tools (MS-Office /Open Office/ Libre Office / Scilab) for descriptive statistics, data acquisition (temperature and humidity) using sensors interfaced with Arduino, exporting acquired data to spreadsheets, and analysis using representation.

UNIT- IV

Process Management: Introduction to Agile practice, significance of team work, importance of communication in engineering profession, project management tools, checklist, timeline, Gantt chart, significance of documentation.

UNIT -V

Engineering Ethics & Sustainability in Engineering: Identifying Engineering as a profession, significance of professional ethics, code of conduct for engineers, identifying ethical dimensions in different tasks of engineering, applying moral theories and codes of conduct for resolution of ethical dilemmas.

Sustainability in Engineering: Introduction, sustainability leadership, life cycle assessment, carbon foot print.

Text Books:

1. Clive L. Dym, Patric Little, Elizabeth J Orwin, “Engineering Design: A project-based introduction”, 4th edition, Willey.
2. Matthew Python, “Arduino programming for beginners”, Independently published,2020.
3. Patrick F. Dunn , “Measurement and data Analysis for engineering and science” , thirdedition,2014.
4. Andrew Stellman, Jennifer Greene, “Head First Agile: A brain-friendly guide to Agile principles, ideas, and real-world practices”, Kindle Edition.

Suggested Reading:

1. Charles B. Fleddermann, “Engineering ethics”, fourth edition, Prentice Hall,2012.
2. Rob Lawlor, “Engineering in society”, second edition, Royal academy of engineering.
3. Richard Dodds, Roger Venables, “Engineering for sustainable development: Guiding principles”, The Royal Academy of engineering, 2005.
4. Richard S. Paul, “Robot Manipulators: Mathematics, Programming, and Control”, MIT Press.

ENGINEERING EXPLORATION ASSESSMENT SCHEME

S. No	Name of the module	Work Hours	Marks	Evaluation
1	Role of Engineers	4	-	Evaluation - I
2	Engineering Design	16	5	
3	Mechanisms	6	3	
4	Engineering Ethics	2	2	
5	Platform-based Development	16	5	Evaluation - II
6	Data Acquisition and Analysis	6	4	Evaluation-III
7	Project Management	4	4	
8	Sustainability in Engineering	6	2	
9	Course Project Reviews	12	20	Final Evaluation
10	Code of conduct	-	5	
	Total	**72**	**50**	

i/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20MT C06

VECTOR CALCULUS AND DIFFERENTIAL EQUATIONS

(Common to ECE, EEE, MECH, CHEM, CIVIL)

Instruction	3 L+1T/2P Hours per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives:

1. To explain double and triple integrals of various functions and their significance.
2. To explain Scalar and vector functions with its Physical interpretations.
3. To discuss vector line, surface and volume integrals.
4. To explain relevant methods to solve first order differential equations.
5. To discuss the solution of higher order differential equations.

Course Outcomes:

Upon completing this course, students will be able to:

1. Calculate the areas and volumes.
2. Apply the vector differential operators to Scalars and Vector functions.
3. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.
4. Calculate the solutions of first order linear differential equations.
5. Solve higher order linear differential equations.

UNIT-I

Multivariable Calculus (Integration): Applications of definite integrals to evaluate surface areas and volumes of revolutions. Double integrals, Change of order of integration, Area enclosed by plane curves, Triple integrals, Volumes of solids.

UNIT-II

Vector Differential Calculus: Scalar and vector point functions, Gradient, Directional derivative, potential function. Divergence, Physical interpretation of Divergence, Curl, Physical interpretation of curl, vector identities.

UNIT-III

Vector Integral Calculus: Line integral, Surface integral and Volume integral, Green's theorem in a plane, Stoke's theorem and Gauss's divergence theorem (without proof**)**.Fluid flow, Physical interpretation of the divergence.

UNIT-IV

First Order Ordinary Differential Equations: Exact differential equations, Equations reducible to exact equations, Linear equations, Bernoulli's equation, Clairaut's equation, Riccati's equation, Orthogonal trajectories, Chemical reactions and solutions, Rate of decay of Radio-active materials.

UNIT-V

Higher Orders Linear Differential Equations: Higher order linear differential equations with constant coefficients, rules for finding Complementary function, Particular Integral and General solution. Method of variation of parameters, solution of Euler-Cauchy equation. Ordinary point, singular point, regular singular point and Power Series solution. Applications: LR and LCR circuits.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Text Books:

1. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition,2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.

Suggested Reading:

1. N.P.Bali and Dr.Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,9th edition, 2014.
2. R.K.Jain, S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Publications,5th edition, 2016.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic Geometry, 9th Edition, Pearson, Reprint, 2002

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20 EG C01

ENGLISH

(Common to all branches)

Instruction	2 Hours per week
Duration of SEE	3Hours
SEE	60Marks
CIE	40Marks
Credits	2

Course Objectives: This course will introduce the students:

1. To the role and importance of communication while developing their basic communication skills in English.
2. To basics of writing coherent paragraphs and formal emails.
3. To techniques of writing a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. To description, definition and classification of processes while enabling them to draft formal reports following a proper structure.
5. To gaining adequate reading comprehension techniques.

Course Outcomes: After successful completion of the course the students will be able to:

1. Illustrate the nature, process and types of communication and communicate effectively without barriers.
2. Construct and compose coherent paragraphs, emails and adhering to appropriate mobile etiquette.
3. Apply techniques of precision to write a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. Distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.
5. Critique passages by applying effective reading techniques

UNIT-I Understanding Communication in English:
Introduction, nature and importance of communication; Process of communication; Types of communication - verbal and non-verbal; Barriers to communication; Intrapersonal and interpersonal communication; Understanding Johari Window.
Vocabulary &Grammar: The concept of Word Formation; Use of appropriate prepositions and articles.

UNIT-II Developing Writing Skills I:
Paragraph writing. – Structure and features of a paragraph; Cohesion and coherence. Rearranging jumbled sentences. Email and Mobile etiquette.
Vocabulary & Grammar: Use of cohesive devices and correct punctuation.

UNIT-III Developing Writing Skills II:
Précis Writing; Techniques of writing precisely. Letter Writing – Structure, format of a formal letter; Letter of request and the response
Vocabulary and Grammar: Subject-verb agreement.
Use of prefixes and suffixes to form derivatives. Avoiding redundancies.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

UNIT-IV Developing Writing Skills III:
Report writing – Importance, structure, elements of style of formal reports ; Writing a formal report.
Vocabulary and Grammar: Avoiding ambiguity - Misplaced modifiers. Use of synonyms and antonyms.

UNIT-V Developing Reading Skills:
The reading process, purpose, different kinds of texts; Reading comprehension; Techniques of comprehension – skimming, scanning, drawing inferences and conclusions.
Vocabulary and Grammar: Words often confused; Use of standard abbreviations.

Text Books:

1. Language and Life: A Skills Approach, Board of Editors, Orient Black Swan,2017.
2. Swan Michael, Practical English Usage.OUP.1995.

Suggested Readings:

1. Wood F.T, Remedial English Grammar,Macmillan,2007
2. Zinsser William, On Writing Well, Harper Resource Book, 2001
3. Sanjay Kumar and PushpLata, Communication Skills. Oxford University Press,2011.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad–75.

20PY C07

PHYSICS
(CHEMICAL)

Instruction	3 L / week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:
The objectives of the course is to make the student

1. Learn the basic concepts of wave nature of light
2. Know about the properties of magnetic and dielectric materials
3. Understand the basics of nanomaterials
4. Familiarize with fundamental ideas of quantum mechanics

Course Outcomes: At the end of the course, the student will be able to

1. Demonstrate the physical properties of the light.
2. Find the applications of lasers and optical fibers in engineering and technology.
3. Identify different types of magnetic and dielectric materials.
4. Recall the fundamentals of nanomaterials.
5. Apply the ideas of quantum mechanics for related problems

UNIT-I

Wave Optics: Huygens' principle – Superposition of waves – Interference of light by splitting of wavefront and amplitude – Fresnel's biprism– Interference in thin films (reflected light) – Newton's rings – Fraunhofer diffraction from a single slit – Double slit diffraction–Concept of N-slits–Diffractiongrating and its resolving power. Polarization: Introduction–Malus's law–Double refraction –Nicol's prism–Quarter-wave plate and half-wave plate–Optical activity– Laurent's half shade polarimeter.

UNIT-II

Lasers: Characteristics of lasers – Einstein's coefficients – Amplification of light by population inversion–Rubylaser– He-Nelaser–Semiconductorlaser–Applicationsoflasersinengineeringand medicine. **Fiber Optics:** Introduction –Construction –Principle –Propagation of light through an optical fiber – Numerical aperture and acceptance angle – Step-index and graded-index fibers –Pulse dispersion – Fiber losses –Fiber optic communication system –Applications.

UNIT-III

Dielectric Materials: Introduction – Dielectric polarization – Types of dielectric polarization: electronic & ionic polarizations (quantitative); orientation & space-charge polarizations (qualitative) – Frequency and temperature dependence of dielectric polarization – Determination of dielectric constant (Schering bridge method) –Ferroelectricity– Barium titanate– Applications of ferroelectrics.
Magnetic Materials: Origin of magnetism – Magnetic moment - Bohr magneton – Classification of magnetic materials: dia, para, ferro, anti-ferro and ferrimagnetic materials – Weiss molecular field theory – Domain theory – Hysteresis curve – Soft and hard magnetic materials –Applications.

UNIT-IV

Nanomaterials: Properties of materials at reduced size – Surface to volume ratio – Quantum confinement – Preparation of nanomaterials: bottom-up approach (sol-gel method) and top-down approach (ball milling method) – Elementary ideas of carbon nanotubes – Applications of nanomaterials.

UNIT-V:

Quantum Mechanics: Introduction– Planck's' law of black body radiation – Wien's law and Rayleigh-

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Jean's law from Planck's law – Photoelectric effect – Compton effect – de-Broglie hypothesis – Wave-particle duality – Physical significance of ψ – Born's interpretation of the wave function – Verification of matter waves by Davisson-Germer's experiment – Uncertainty principle – Schrodinger wave equation (time-dependent and time-independent) – Particle in infinite square well potential.

Text Books:

1. B.K. Pandey and S. Chaturvedi, *Engineering Physics,* Cengage Publications, 2012.
2. M.N. Avadhanulu and P.G. Kshirsagar, *A Text Book of Engineering Physics*, S. Chand Publications, 2014.
3. M. Arumugam, *Materials Science*, Anuradha Publications, 2015.
4. S.L. Gupta and Sanjeev Gupta, *Modern Engineering Physics*, Dhanpat Rai Publications, 2011.

Suggested Reading:

1. R. Murugeshan and Kiruthiga Sivaprasath, *Modern Physics*, S. Chand Publications S. Chand Publications,2014.
2. V. Rajendran, *Engineering Physics*, McGraw-Hill Education Publications,2013.
3. P.K. Palanisamy, *Engineering Physics*, Scitech Publications, 2012.
4. V. Raghavan, *Materials Science and Engineering*, Prentice Hall India Learning Private Limited; 6th Revised edition, 2015.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad–75.

with effect from the Academic Year 2020-2021

20EEC01

BASIC ELECTRICALENGINEERING

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To understand the behaviour of different circuit elements R, L & C, and the basic concepts of electrical AC circuit analysis
2. To understand the basic principle of operation of AC and DC machines
3. To know about different types of electrical wires and cables, domestic and industrial wiring. safety rules and methods of earthing

Course Outcomes: After the completion of this course, the student will be able to

1. Understand the concepts of Kirchhoff's laws and to apply them in superposition, Thevenin's and Norton's theorems to get the solution of simple dc circuits
2. Obtain the steady state response of RLC circuits with AC input and to acquire the basics, relationship between voltage and current in three phase circuits.
3. Understand the principle of operation, the emf and torque equations and classification of AC and DC machines
4. Explain various tests and speed control methods to determine the characteristic of DC and AC machines.
5. Acquire the knowledge of electrical wiring, types of wires, cables used and Electrical safety precautions to be followed in electrical installations.
6. Recognize importance of earthing, methods of earthing and various low-tension switchgear used in electrical installations

UNIT-I

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation, Superposition, Thevenin and Norton Theorems, Time-domain analysis of first-order RL and RC circuits.

UNIT-II

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III

Transformers: Construction, Working principle, EMF Equation, Ideal and Practical transformer, Equivalent circuit of Transformer, OC and SC tests on a transformer, Efficiency and Regulation

UNIT-IV

DC and AC Machines: DC Generators: Construction, Principle of operation, EMF equation, Classification, Characteristics of shunt, series and compound generators.
DC Motors: Classification, Torque equation, Characteristics, Efficiency, Speed Control of Series and Shunt Motors.
Three - Phase Induction Motors: Principle of operation, Applications,

UNIT-V

Electrical Installations: Electrical Wiring: Types of wires and cables, Electrical Safety precautions in

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

handling electrical appliances, electric shock, first aid for electric shock, safety rules.
Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Earthing (Elementary Treatment only), Elementary calculations for energy consumption

Text Books:

1. L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011.
2. E. Hughes, Electrical and Electronics Technology, Pearson, 2010.

Suggested Reading:

1. D. P. Kothari & I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989
3. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
4. P.V. Prasad, S. Sivanagaraju, R. Prasad, "Basic Electrical and Electronics Engineering" Cengage Learning, 1st Edition, 2013

20EG C02

ENGLISH LAB

(Common to all branches)

Instruction	2 Hours per week
Duration of SEE	3Hours
SEE	50Marks
CIE	50Marks
Credits	1

Course Objectives: This course will introduce the students:

1. To nuances of Phonetics and give them sufficient practice in correct pronunciation.
2. To word stress and intonation.
3. To IELTS and TOEFL material for honing their listening skills.
4. To activities enabling them overcome their inhibitions while speaking in English with the focus being on fluency rather than accuracy.
5. To team work, role behavior while developing their ability to discuss in groups and making oral presentations.

Course Outcomes: After successful completion of the course the students will be able to:

1. Define the speech sounds in English and understand the nuances of pronunciation in English
2. Apply stress correctly and speak with the proper tone, intonation and rhythm.
3. Analyze IELTS and TOEFL listening comprehension texts to enhance their listening skills.
4. Determine the context and speak appropriately in various situations.
5. Design and present effective posters while working in teams, and discuss and participate in Group discussions.

Exercises

1. **Introduction to English Phonetics**: Introduction to auditory, acoustic and articulatory phonetics, organs of speech: the respiratory, articulatory and phonatory systems.
2. **Sound system of English**: Phonetic sounds and phonemic sounds, introduction to international phonetic alphabet, classification and description of English phonemic sounds, minimal pairs . The syllable: types of syllables, consonant clusters.
3. **Word stress**: Primary stress, secondary stress, functional stress, rules of word stress.
4. **Rhythm &Intonation** : Introduction to Rhythm and Intonation. Major patterns, intonation of English with the semantic implications.
5. **Listening skills** – Practice with IELTS and TOEFL material
6. **Public speaking –** Speaking with confidence and clarity in different contexts on various issues.
7. **Group Discussions -** Dynamics of a group discussion, group discussion techniques, body language.
8. **Pictionary –** weaving an imaginative story around a given picture.
9. **Information Gap Activity –** Writing a brief report on a newspaper headline by building on the hints given
10. **Poster presentation –** Theme, poster preparation, team work and presentation.

Suggested Reading

1. T Balasubramanian. A Textbook of English Phonetics for Indian Students, Macmillan, 2008.
2. J Sethi et al. A Practical Course in English Pronunciation (with CD), Prentice Hall India, 2005.
3. Priyadarshi Patnaik. Group Discussions and Interviews, Cambridge University Press Pvt Ltd., 2011
4. Aruna Koneru, Professional Speaking Skills, Oxford University Press, 2016

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20PY C10

PHYSICS LAB
(CHEMICAL)

Instruction	4Periods / Week
Duration of SEE	3Hours
SEE	50Marks
CIE	50Marks
Credits	2

Course Objectives:

The objectives of the course is to make the student

1. Apply theoretical physics knowledge in doing experiments
2. Understand the behaviour of the light experimentally
3. Analyze the physical properties of magnetic and dielectric materials
4. Familiarize with motion of electrons in electric and magnetic fields

Course Outcomes: At the end of the course, the student will be able to

1. Interpret the errors in the results of an experiment.
2. Demonstrate the wave nature of light experimentally
3. Utilize physical properties of magnetic and dielectric materials for various applications
4. Make use of lasers and optical fibers for engineering applications
5. Explain light induced phenomenon and motion of electrons in electric and magnetic fields

Experiments

1.	Error Analysis	:	Estimation of errors in the determination of time period of a torsional pendulum
2.	Fresnel's Biprism	:	Determination of wavelength of given monochromatic source
3.	Newton's Rings	:	Determination of wavelength of given monochromatic source
4.	Single Slit Diffraction	:	Determination of wavelength of given monochromatic source
5.	Diffraction Grating	:	Determination of wavelengths of two yellow lines of light of mercury lamp
6.	Malus's Law	:	Verification of Malus's law
7.	Double Refraction	:	Determination of refractive indices of O-ray and E-ray of given calcite crystal
8.	Polarimeter	:	Determination of specific rotation of glucose
9.	Laser	:	Determination of wavelength of given semiconductor laser
10.	Optical Fiber	:	Determination of numerical aperture and power losses of given optical fiber
11.	Dielectric constant	:	Determination of dielectric constant of given PZT sample
12.	M & H Values	:	Determination of magnetic moment M of a bar magnet and absolute value Hof horizontal component of earth's magnetic field
13.	B-H curve	:	Determination of hysteresis loss of given specimen
14.	Planck's constant	:	Determination of Planck's constant using photo cell
15.	e/m of an Electron	:	Determination of specific charge of an electron by J.J. Thomson method

NOTE: A minimum of TWELVE experiments should be conducted.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20EEC02

BASIC ELECTRICAL ENGINEERING LAB

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To acquire the knowledge of different types of electrical elements and to verify the basic electrical circuit laws and theorems.
2. To determine the parameters and power factor of a coil, calculate the time and frequency responses of RLC circuits and to familiarize with measurement of electric power & energy.
3. To determine the characteristics of Transformers, dc, ac machines and switchgear components

Course Outcomes: At the end of the course, the students are expected to

1. Get an exposure to common electrical components, their ratings and basic electrical measuring equipment.
2. Make electrical connections by wires of appropriate ratings and able to measure electric power and energy.
3. Comprehend the circuit analysis techniques using various circuital laws and theorems.
4. Determine the parameters of the given coil and calculate the time response of RL & RC series circuits.
5. Recognize the basic characteristics of transformer and components of switchgear.
6. Understand the basic characteristics of dc and ac machine by conducting different types of tests on them.

List of Laboratory Experiments/Demonstrations:

1. Demonstration of Measuring Instruments and Electrical Lab components.
2. Verification of KCL and KVL.
3. Time response of RL and RC series circuits.
4. Determination of parameters of a choke or coil by Wattmeter Method
5. Verification of Thevenin's and Norton's theorems
6. Turns ratio /voltage ratio verification of single phase Transformers
7. Open Circuit and Short Circuit tests on a given single phase Transformer
8. Observation of Excitation Phenomenon in Transformer
9. Measurement of three phase power in a balanced system using two Wattmeter method.
10. Measurement of 3-Ph Energy by an Energy Meter (Demonstration of Principle)
11. Load test on DC Shunt motor
12. Speed control of DC Shunt motor
13. Demonstration of Low Tension Switchgear Equipment/Components
14. Demonstration of cut - out section of Machines like DC Machine, Induction Machine etc.

Note: TEN experiments to be conducted from the above list.

i/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20ME C01

CAD AND DRAFTING

Instruction	1 T + 3 D Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2.5

Course Objectives:

1. To get exposure to a cad package and its utility.
2. Understanding orthographic projections.
3. To visualize different solids and their sections in orthographic projection
4. To prepare the student to communicate effectively by using isometric projection.
5. To prepare the student to use the techniques, skills, and modern tools necessary for practice.

Outcomes: At the end of the course, the Students are able to

1. Become conversant with appropriate use of CAD software for drafting.
2. Recognize BIS, ISO Standards and conventions in Engineering Drafting.
3. Construct the projections of points, lines, planes, solids
4. Analyse the internal details of solids through sectional views
5. Create an isometric projections and views

List of Exercises:

1. Introduction to CAD package: Settings, draw, modify tools, dimensioning and documentation
2. Construction of Conic Sections by General method
3. Orthographic projection: Principles, conventions, Projection of points
4. Projection of straight lines: Simple position, inclined to one plane
5. Projection of straight lines inclined to both the planes (without traces and mid-point)
6. Projection of planes: Perpendicular planes
7. Projection of planes: Oblique planes
8. Projection of solids: Simple position
9. Projection of solids: Inclined to one plane
10. Sections of solids: Prism, pyramid in simple position
11. Sections of solids: Cone and cylinder in simple position
12. Isometric projections and views
13. Conversion of isometric views to orthographic projections and vice versa.

Text Books:

1. N.D.Bhatt, “Elementary Engineering Drawing”, Charotar Publishers, 2012.
2. K.Venugopal, “Engineering Drawing and Graphics + AutoCAD”, New Age International Pvt.Ltd,2011.
3. Basanth Agrawal and C M Agrawal, “Engineering Drawing”, 2/e, McGraw-Hill Education (India) Pvt. Ltd.

Suggested Reading:

1. Shaw M.B and Rana B.C., “Engineering Drawing”, 2/e, Pearson, 2009.
2. K.L. Narayana and P.K. Kannaiah, “Text Book of Engineering Drawing”, Scitech Publications,2011.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20MBC02

COMMUNITY ENGAGEMENT

Instruction	3 Hours per week (30 hours field work & 2 hours per week)
SEE	Nil
CIE	50 Marks
Credits	1.5

Course Objectives: The main Objectives of this Course are to:

1. Develop an appreciation of Rural culture, life-style and wisdom among the Students.
2. Learn about the various livelihood activities that contribute to Rural economy.
3. Familiarize the Rural Institutions and the Rural Development Programmes in India.

Course Outcomes: After the completion of this Course, Student will be able to:

2. Gain an understanding of Rural life, Culture and Social realities.
3. Develop a sense of empathy and bonds of mutuality with Local Communities.
4. Appreciate significant contributions of Local communities to Indian Society and Economy.
5. Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economic improvements.
6. Utilise the opportunities provided by Rural Development Programmes.

Module I Appreciation of Rural Society

Rural life style, Rural society, Caste and Gender relations, Rural values with respect to Community, Nature and Resources, elaboration of 'soul of India lies in villages' (Gandhi), Rural Infrastructure.

Module II Understanding Rural Economy and Livelihood

Agriculture, Farming, Landownership, Water management, Animal Husbandry, Non-farm Livelihood and Artisans, Rural Entrepreneurs, Rural markets, Rural Credit Societies, Farmer Production Organization/Company.

Module III Rural Institutions

Traditional Rural organizations, Self-Help Groups, Panchayati Raj Institutions (Gram Sabha), Gram Panchayat, Standing Committees, Local Civil Society, Local Administration.

Module IV Rural Development Programmes

History of Rural Development in India, Current National Programmes: Sarva Shiksha Abhiyan, Beti Bhachao, Beti Padhao, Ayushman, Bharat, Swachh Bharat, PM Awas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA etc.

Text Books:

1. Singh, Katar, Rural Development: Principles, Policies and Management, Sage Publications, New Delhi, 2015.
2. A Hand book on Village Panchayat Administration, Rajiv Gandhi Chair for Panchayati Raj Studies, 2002.
3. United Nations, Sustainable Development Goals, 2015, un.org/sdgs
4. M.P Boraia, Best Practices in Rural Development, Shanlax Publishers, 2016.

Journals:

1. Journal of Rural development (published by NIRD & PR, Hyderabad).
2. Indian Journal of Social Work, (by TISS, Bombay).
3. Indian Journal of Extension Educations (by Indian Society of Extension Education).
4. Journal of Extension Education (by Extension Education Society).
5. Kurukshetra (Ministry of Rural Development, GOI).
6. Yojana (Ministry of Information & Broadcasting, GOI).

20MTC08

PARTIAL DIFFERENTIAL EQUATIONS AND STATISTICS

(For CIVIL/MECH/PROD/CHEM)

Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	4

Course Objectives:

1. To learn Numerical solution of ODE and Engineering problems.
2. To form PDE and to find its solution.
3. To know the model of wave and heat equations.
4. Able to fit the hypothetical data using probability distribution.
5. To learn fitting of distribution and predicting the future values.

Course Outcomes: On successful completion of this course the students shall be able to

1. Find solution of initial value problems of ODE by Numerical Method.
2. Solve Linear and Non-Linear PDE"s.
3. Solve One-Dimension Wave and Heat equations and Two Dimension Laplace equation.
4. Use the basic probability for fitting the Random phenomenon.
5. Analyze the random fluctuations of probability distribution and Principles of Least Squares approximations for the given data.

CO-PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	1		1	1	-	-	1	1	1
CO2	2	2	-	-	-	1		1	1	-	-	1	2	1
CO3	2	2	-	-	-	1		1	1	-	-	1	1	-
CO4	2	2	-	-	-	1		1	1	-	-	1	-	-
CO5	2	2	-	-	-	1		1	1	-	-	1	2	2

UNIT-I: Numerical Methods

Solution of Algebraic and transcendental equations by Bisection method, Regula-Falsi method Newton-Raphson method. Numerical Solutions of First Order Ordinary differential equations by Taylor"s series method, Euler"s method, Modified Euler"s method and Runge-Kutta method of fourth order.

UNIT-II: Partial Differential Equations

Formation of Partial Differential Equations, Linear Equations of First Order (Lagrange"s Linear Equations), Solution of First Order Non-linear Partial Differential Equation (Standard forms) and Charpits Method.

UNIT-III: Applications of Partial Differential Equations

Solution by Method of Separation of Variables, Solution of One dimensional Wave equation, Solution of One dimensional Heat equation, Solution of Two dimensional Laplace equation and its related problems.

UNIT-IV: Basic probability

Basic probability, Conditional probability, Baye"s theorem. Random variable, Discrete probability distribution

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

and Continuous probability distribution. Expectation, Addition and Multiplication theorem of expectation, properties of variance, Moments (Moments about the mean and moments about a point)

UNIT-V: Probability Distributions and Curve Fitting

Poisson distribution,MGF and Cumulants of the Poisson distribution, Normal distribution,characteristics of Normal distribution MGF and CGF of Normal distribution, Areas under normal curve. Correlation, Coefficient of Correlation and Lines of Regression. Curve fitting by the Method of Least Squares, Fitting of Straight lines, Second degree parabola, exponential and Growth curves.

Textbooks:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2017.
2. S.C.Gupta, V.K.Kappoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.

Suggested Reading:

1. Erwin kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.
2. S. J. Farlow, "Partial Differential Equations for Scientists and Engineers", Dover Publications, 1993.
3. Sheldon Ross, "A First Course in Probability", 9th Edition, Pearson publications, 201

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20CSC06

BASICS OF DATA STRUCTURES

(Common for all Programmes except CSE & IT)

Instruction	2 L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	2

Prerequisites:
Basic knowledge of programming language such as C or C++ is preferred (but not mandatory) and some mathematical maturity also will be expected.

Course Objectives: To introduce
1. Basic linear and non-linear data structures.
2. Analyzing the performance of operations on data structures.
3. Different sorting and searching techniques and their complexities.

Course Outcomes: The students will be able to
1. Identify various data structures, searching & sorting techniques and their applications.
2. Describe the linear and non-linear data structures, searching and sorting techniques.
3. Apply suitable data structures to solve problems.
4. Analyze various searching and sorting techniques.
5. Evaluate the linear and non-linear data structures.

CO-PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	1	-	-	-	-	-	-	-	-	-	1	1
CO4	2	3	1	-	-	-	-	-	-	-	-	-	1	1
CO5	2	2	-	-	-	-	-	-	-	-	-	-	1	1

UNIT – 1

Introduction: Data Types, Data structures, Types of Data Structures, Operations, ADTs, Algorithms, Comparison of Algorithms- Complexity- Time and space tradeoff.

Recursion: Introduction, format of recursive functions, recursion Vs. Iteration, examples.

UNIT – 2

Linked Lists: Introduction, Linked lists and types, Representation of linked list, operations on linked list, Comparison of Linked Lists with Arrays and Dynamic Arrays.

UNIT – 3

Stacks and Queues: Introduction to stacks, applications of stacks, implementation and comparison of stack implementations. Introduction to queues, applications of queues and implementations, Priority Queues and

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

applications

Searching and Sorting: Linear searching, binary Searching, sorting algorithms- bubble sort, selection sort, quick sort, heap sort

UNIT – 4

Trees: Definitions and Concepts, Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Representations of Trees, Tree Traversals, Binary search Tree.

Unit –5

Graphs: Introduction, Applications of graphs, Graph representations, graph traversals, Minimal Spanning Trees

Text Books:

1. NarasimhaKarumanchi "**Data Structures and Algorithms Made Easy**", CareerMonk Publications, 2017
2. E.Horowitz ,S. Sahni and Susan Anderson-Freed, "**Fundamentals of Data structures in C**", Silicon Pr; 2 edition (1 August 2007)
3. ReemaThareja, "**Data Structures using C**",Oxford, 2014

Suggested Reading:

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2. https://www.edx.org/course/foundations-of-data-structures
3. https://sites.google.com/site/merasemester/data-structures/data-structures-1#DS
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms
5. https://www.coursera.org/specializations/data-structures-algorithms

1/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20CHC01 CHEMICAL ENGINEERING THERMODYNAMICS-I

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: This course will help the students to understand the:

1. Basic thermodynamic laws and Principles.
2. Concept of energy conservation through the study of the First and Second laws of thermodynamics.
3. Concept of Entropy and its importance in energy conversion.
4. Chemical Engineering problems involving various types of systems and processes.
5. Application of Thermodynamics to flow process.

Course Outcomes: At the completion of this course, students will be able to:

1. Understand the fundamental concepts of thermodynamics to engineering applications.
2. Understand the relation between the measurable nature of P, V, T and the un-measurable nature of H,U,A, G
3. Calculate the thermodynamic properties of real gases by using EOS.
4. Understand and analyze the various thermodynamic processes involving ideal gases.
5. Analyze the power cycles; refrigeration cycles, and liquefaction processes.
6. Apply the energy balance equations to Open and Closed systems and also to evaluate the thermodynamic efficiency of nozzles, turbines and compressors.

CO-PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	-	-	-	-	-	-	-	2	-
CO2	2	1	2	-	-	-	-	-	-	-	-	-	1	-
CO3	-	2	1	2	-	-	-	-	-	-	-	-	-	-
CO4	2	3	1	2	-	-	-	-	-	-	-	-	-	-
CO5	-	3	1	1	-	-	-	-	-	-	-	-	-	2
CO6	2	1	1	-	-	-	-	-	-	-	-	-	-	1

UNIT – I: The First Law of thermodynamics and Other Basic Concepts: Joule‟s Experiments – Internal Energy - Formulation of the first law of the thermodynamics ,Energy balance closed systems- the thermodynamic state and state functions - Enthalpy - The steady state flow processes; Equilibrium - The phase rule - The Reversible processes - Constant V and constant P processes and Heat capacity.
Volumetric Properties of Pure Fluids: PVT behavior of pure substances, Ideal gas, Virial equations and their use in the calculation of P-V-T Properties; Cubic equations of state (Van der Waals and Redlich-Kwong), generalized correlations for gases.

UNIT – II: The Second law of thermodynamics: Statement of the second law, Heat engines and Heat Pumps, thermodynamic temperature scales, Carnot Engine with Ideal-Gas-State Working Fluid, Entropy, entropy changes of an ideal gas, mathematical statement of the second law, the third law of thermodynamics, entropy from the microscopic view point.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

UNTI – III: **Thermodynamic properties of fluids;** Fundamental property relationships among thermodynamic properties for a homogenous phase of constant composition; Maxwell relations, Residual properties; Residual properties from the virial equations of state, Generalized Property Correlations for Gases, Two-phase systems. Thermodynamic diagrams.

UNIT – IV: **Production of Power from Heat:** The Steam power plant; Carnot cycle; Rankine cycle; Internal Combustion engines -Otto engine, Diesel engine. **Refrigeration and Liquefaction**: The Carnot refrigerator, the vapor - compression cycle; comparison of Refrigeration cycles; the choice of refrigerant; absorption refrigeration; the heat pump; various processes for liquefaction.

UNIT V: **Applications of Thermodynamics to Flow Processes:** Energy balances for steady state flow process; Duct flow of compressible fluids, flow processes-Nozzles, turbines, Compressors and Pumps; Entropy balance for Open systems, Calculation of Ideal work and lost work for flow processes.

Text Books:

1. J M Smith and H C Van Ness and M M Abbott, Introduction to Chemical Engineering Thermodynamics (in SI units) , 8th edition, Mc-Graw Hill International Edition, 2018.
2. K.V.Narayanan, A Textbook of Chemical Engineering Thermodynamics, PHI Pvt. Ltd., 2013.

Suggested Reading:

1. Gopinath Halder, Introduction to Chemical Engineering Thermodynamics, 2nd Edition,2009
2. Y V C Rao, Chemical Engineering Thermodynamics, Universities Press, 1997
3. M J Moran, H N Shapiro, D D Boettner and M B Bailey, Principles of Engg. Thermodynamics, 8th Edition, Willey, 2018.

i/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad–75.

20CHC02 **FLUID MECHANICS**

Instruction	3L+1T Hours per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives: This course will help the students to understand the

1. Fluid flow phenomena for incompressible and compressible fluids.
2. Conservation of momentum principles to fluid flow.
3. Flow in Pipes, Channels and flow past immersed bodies.
4. Concepts of Compressible Fluids and Non Newtonian fluids
5. Fluidization phenomena and methods for transporting the fluids

Course outcomes: At the completion of this course, students will be able to

1. Distinguish different types of fluids, manometers
2. Apply Shell balances to illustrate fluid flow phenomena
3. Identify the concepts of incompressible flow in pipes, channels and associated frictional losses
4. Explain the concept of fluidization and flow through packed beds.
5. Choose the types of pumps for different fluids under different conditions such as toxic, acidic, slurry type.
6. Identify equipment to be used to measure fluid flow based on their properties

CO –PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	-	-	-	-	-	-	-	1	2	2
CO2	3	3	2	1	-	-	-	-	-	-	-	1	2	2
CO3	3	3	2	2	1	-	-	-	-	-	-	1	2	2
CO4	3	3	2	1	-	-	-	-	-	-	-	1	2	2
CO5	3	3	2	1	-	-	-	-	-	-	-	1	2	2
CO6	3	3	2	1	-	-	-	-	-	-	-	1	2	2

UNIT - I

Fluid Flow Phenomena and Fluid Statics: Definition of fluid, shear rate and shear stress, Newtonian and Non-Newtonian fluids, Time dependent flow, viscosity and momentum flux, compressible, incompressible, real and ideal fluids, viscosities of gases and liquids, Laminar and Turbulent flows, Reynolds experiment, Boundary layers, Hydrostatic equilibrium, U-tube manometer, inclined manometer and two fluid manometer and inverted manometer.

UNIT - II

Basic Equations of Fluid Flow: path lines, stream lines and stream tube, mass balance–equation of continuity, one dimensional flow, mass velocity, differential momentum balance- equations of motion, Couette flow, macroscopic momentum balances, momentum of stream and momentum correction factor, layer flow with free surface. Mechanical energy equation-Bernoulli equation- corrections for effects of solid boundaries, kinetic energy correction factor, corrections for fluid friction, pump work in Bernoulli equation.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

UNIT - III

Incompressible Flow in Pipes and Channels and Frictional Losses: Shear stresses and skin friction, fanning friction factor, flow in noncircular channels, laminar flow of Newtonian and Non-Newtonian fluids, velocity distribution, Hagen- Poiseuille equation, Turbulent flow, universal velocity distribution, Roughness, Moody‟s friction factor chart. Pipes and valves, fittings. Friction losses due to sudden expansion and contraction, Effects of fittings and valves, form frictional losses in the Bernoulli Equation. Dimensional analysis and Buckingham π -theorem and Rayleigh theorem its applications and limitations.

UNIT – IV

Compressible Fluids and Non Newtonian fluids (with Differential Pressure estimation) Flow past immersed bodies and Fluidization, Potential flow, vortisity. Differential analysis: mass and momentum balances, Navier-Stokes equation, Unidirectional flow, Viscous flow, Stokes law, Skin drag and pressure drag and drag coefficient, Flow through packed beds of solids – Kozeny Carman equation, Burke-Plummer equation and Ergun equation. Boundary layer theory, Blasius solution, Boundary layer separation, Drag and lift force on immersed body

UNIT – V

Transportation and Metering of Fluids: Centrifugal and Positive Displacement Pumps, Characteristics of pumps, selection and design of pumps, suction lift and cavitation, NPSH, Flow meters- Venturi meter, orifice meter, Pitot tube, Rotameter, Notches and Weirs, Compressors and blowers.

Text Books

1. W. L. McCabe, J. C. Smith and P.Harriott , Unit Operations of Chemical Engineering, 7th Ed., Tata-McGraw Hill Chemical Engineering Series, New Delhi, 2005.
2. C.J.Geankopolis, “Transport processes and unit operations”, 3rd Ed., Prentice Hall Publishers, USA, 1993.

Suggested Readings:

1. James O. Wilkes, “Fluid Mechanics for Chemical Engineers with Micro fluids and CFD”, 2nd Ed., University of Michigan, Prentice Hall Intl., 2006.
2. Kurmi, R.S., “Hydraulics, Fluid Mechanics and Hydraulic Machines”, 20th Ed., S. Chand and Company Pvt. Ltd., New Delhi, 2014.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20CHC03 **MATERIAL ENERGY BALANCE CALCULATIONS**

Instruction	3L+1T Hours per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives: This course helps the students to understand the

1. Basis for all further chemical engineering courses that are part of the curriculum.
2. Basic calculations of process engineering.
3. Material balance calculations for with and without chemical reactions.
4. Analysis methods for identifying vapors and liquids
5. Energy balance calculations and its importance.

Course Outcomes: Upon completing this course, students will be able to:

1. Convert physico-chemical quantities from one system of units to another and identify basis of calculation
2. Solve material balance problems without chemical reactions.
3. Solve material balance problems with chemical reactions
4. Solve material balance problems with recycle, purge and bypass
5. Analyze the ideal and real behavior of gases, vapors and liquids
6. Solve energy balance problems with and without chemical reaction

CO-PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	2	-	-	-	2	2	1	1	3	2
CO2	3	2	3	3	2	-	-	-	2	2	1	1	3	2
CO3	3	2	3	3	2	-	-	-	2	2	1	1	3	2
CO4	3	2	3	3	3	-	-	-	2	2	1	1	3	2
CO5	3	2	3	3	3	-	-	-	2	2	1	1	3	2
CO6	3	3	3	3	3	-	-	-	2	2	1	1	3	2

UNIT-I

Introduction to process calculations: Units and Dimensions - Conversion of Units; Process and process variables – process flow sheet, process unit, process streams, density, specific gravity, specific gravity scales, mass and volumetric flow rates, mole concept, molecular and equivalent weights; Composition of streams; other expressions for concentration

UNIT-II

Material Balance: Introduction, Solubility, dissolution and crystallization (single solute systems) – Solving material balance problems without chemical reaction. Unit operations like absorption, distillation, evaporation, crystallization, leaching, and extraction, drying and mixing units under steady state conditions.

UNIT-III

Material Balance with Chemical Reaction: Material Balance with chemical reaction, Concept of stoichiometry and mole balances, examples, including combustion-Proximate and ultimate analysis of coal and analysis of flue

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

gas. Material balances for by-pass, recycle and purge Operations.

UNIT-IV

Gases, Vapours and Liquids: Equations of state, mixture of ideal gases-Dalton"s and Amagat"s laws, Vapour pressure, Clausius- Clapeyron equation, Cox chart, Duhring"s plot, Raoult"s law. Humidity and Saturation, humid heat, humid volume, dew point, humidity chart and its use.

UNIT-V

Energy Balances: Thermophysics -Heat Capacity, Calculation of enthalpy changes without and with phase change, Heat of solution and mixing; Energy balances without chemical reactions; Thermochemistry - Energy balances with chemical reactions - Standard heat of reaction, formation and combustion, Hess Law, Effect of temperature; Simultaneous material and energy balances - Adiabatic flame temperature.

Text Books:

1. Himmelblau, D. M., Riggs, J. B. "Basic Principles and Calculations in Chemical Engineering", Eighth Ed., Pearson India Education Services,
2. Hougen O.A., Watson K.M., Ragatz R.A., Chemical Process Principles (Part-I): Material and Energy Balances, 2nd Edition, CBS Publishers, 2004

Suggested Reading:

1. Bhatt, B. I., Vora, S. M., "Stoichiometry", Fourth Edition, Tata McGraw Hill Publishing Company Ltd, 2004
2. Narayanan K.V., Lakshmikutty B., Stoichiometry and Process Calculations, PHI Learning Pvt. Ltd., 7th Edition, 2015.
3. Sikdar, D. C., "Chemical Process Calculations", Prentice Hall of India, 2013.
4. Felder, R. M.; Rousseau, R. W., "Elementary Principles of Chemical Processes", Third Edition, John Wiley & Sons, 2000

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20CHC04 **MECHANICAL UNIT OPERATIONS**

Instruction	3L Hours per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: This course helps the students to understand the:

1. Principles of size reduction using various equipment‟s.
2. Techniques for separating solids based on size by different methods.
3. Different kinds of filtration units.
4. Various aspects of Mixing and Agitation of solids and liquids.

Course Outcomes: At the end of the course, the students will be able to:

1. Decide the transport of solids based on their properties.
2. Select equipment for industrial application with respect to size reduction.
3. Design equipment for industrial application with respect to separation of solids.
4. Decide the necessary equipment to screen different particles based on their properties.
5. Apply different filtration techniques for industrial application
6. Identify the suitable technique for blending and mixing of liquids and solids.

CO-PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	2	1	2	2	1	-	1	1	3	2
CO2	3	3	2	2	2	1	2	1	1	-	1	1	3	3
CO3	3	3	3	3	3	1	2	2	2	1	1	2	3	3
CO4	3	3	2	3	2	1	2	2	1	-	1	1	3	2
CO5	3	3	2	2	3	1	2	1	1	-	1	1	3	3
CO6	3	3	2	3	3	1	2	2	1	-	1	1	3	2

UNIT-I

Particle Technology: Characteristics of solid particles – screen analysis, Differential and cumulative mean diameters for mixture of particles, properties of particulate masses. Handling and transport of solids, storage equipment for mechanical conveyors and elevators, pneumatic transport.

Communition: principles of Communition laws and energy requirements. Size reduction - Description and working of crushing and grinding equipment – jaw, Gyratory and Roll crusher, Hammer mill, Rod mill and Ball mill, Ultra-fine grinders. Cutting machines – Open and closed circuit grinding.

UNIT-II

Size Separation: Industrial screening equipment -Grizzlies, Tromels and gyratory. Capacity and effectiveness of screen. Flotation, Frothing and dispersing agents, magnetic separation, electrostatic precipitators.

Particle dynamics: Principles of motion of particles through fluids, drag coefficient for spheres, motion of spherical particles. Free and hindered settling. Classifiers, Jigging. Sorting classifiers – Heavy medium and differential settling methods. Principle and working of cyclones and hydro cyclones.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

UNIT-III

Solid-Liquid Separation Operations: Flocculation – Batch sedimentation – Thickeners – Thickener design. Principles of centrifugal sedimentation – Centrifugal classifiers and decanters – tubular, disc, bowl and scroll centrifuges.

UNIT-IV

Filtration: Equations for batch filtration. Description of plate and frame filter press, shell and leaf filters. Rotary vacuum drum filters. Membrane filtration, Centrifugal filters. Filter aids, Theory of constant rate and centrifugal filtration.

UNIT-V

Mixing and Agitation:

Agitation equipment for liquids – Circulation velocities and power consumption in agitated vessels. Scale up of agitation equipment – Equipment for blending and mixing of liquids – Suspension of solid particles. Critical speed – Dispersion of gas in liquids. Gas holdup and power requirement .Dispersion of liquids in liquids. Equipment for mixing of solids and pastes – Mixers for dry powders – mixing index.

Text Books:

1. W. L. McCabe, J. C. Smith and P. Harriott , Unit Operations of Chemical Engineering, 7thEd., Tata-McGraw Hill Chemical Engineering Series, New Delhi, 2005.
2. Foust A.S, Wenzel L.A., “Principles of Unit Operations”, 2nd Ed., John Wiley and sons, New York, 1981.

Suggested Reading:

1. Coulson, J. M., and Richardson, J. F., “Chemical Engineering Series”, Vol. 2, 4thEd., Pergamon Press Oxford, UK, 1991.
2. C M Narayanan and B C Bhattacharya, “Mechanical Unit Operation for Chemical Engineering”, Khanna Publishers, 3rd Ed, 2011.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20CSC07

Basics of Data Structures Lab
(Common for all Programmes except CSE & IT)

Instruction	2 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	50 Marks
Credits	1

Pre-requisites: Any Programming Language

Course Objectives:

1. Design and construct simple programs by using the concepts of Data structures as abstract data type.
2. To have a broad idea about how efficiently pointers can be used in the implement of data structures.
3. To enhance programming skills while improving their practical knowledge in data structures.
4. To strengthen the practical ability to apply suitable data structure for real time applications.

Course Outcomes: The students will be able to

1. Implement the abstract data type.
2. Demonstrate the operations on stacks, queues using arrays and linked lists
3. Apply the suitable data structures including stacks, queues to solve problems
4. Analyze various searching and sorting techniques.
5. Choose proper data structures, sorting and searching techniques to solve real world problems

CO-PO-PSO Matrix

BDS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO2	1	2	1	2	-	-	-	-	-	-	-	-	-	-
CO3	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO4	2	3	1	-	-	-	-	-	-	-	-	-	-	-
CO5	2	3	2	-	-	-	-	-	-	-	-	-	-	-

List of Experiments

1. Implementation of operations on arrays
2. Implementation of Stack.
3. Implementation of Queue.
4. Implementation of basic operations on Single Linked List.
5. Implementation of Searching techniques.
6. Implementation of Sorting Techniques
7. Case study like Banking System, Students Marks Management, Canteen Management, Library Management etc

Text Books

1. Brian W Kernighan, Dennis Ritchie, C Programming Language, PH PTR, 2nd Edition.
2. Richard M Reese, Understanding and Using C Pointers, O`Reily , 2013.

Web Links

https://nptel.ac.in/courses/106102064/

https://www.udemy.com/algorithms-and-data-structures-in-python/

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20CHC05 **FLUID MECHANICS LAB**

Instruction	3 P Hours per week
Duration of SEE	3Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

Course objectives: This course will help the students to

1. Gain knowledge in verification of principles of fluid flow
2. Achieve training to use various flow measuring devices
3. Practice estimating frictional losses
4. Accumulate knowledge in measuring pressure, discharge and velocity of fluid flow.
5. Gain knowledge in usage of pumps

Course Outcomes: After the completion of this course, students will be able to

1. Identify variable area flow meters and variable head flow meters
2. Explain the fluid flow characteristics.
3. Demonstrate the Bernoulli principle
4. Analyze the flow of fluids through closed conduits, open channels
5. Interpret the characteristics of pumps
6. Analyze the flow in packed beds.

CO-PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	2	-	-	-	1	2	1	-	1	2	2
CO2	2	2	-	2	-	-	-	1	2	1	-	1	2	2
CO3	2	2	-	2	-	-	-	1	2	1	-	1	2	2
CO4	2	2	-	2	-	-	-	1	2	1	-	1	2	2
CO5	2	2	-	2	-	-	-	1	2	1	-	1	2	2
CO6	2	2	-	2	-	-	-	1	2	1	-	1	2	2

List of experiments

(Minimum of 8 experiments in the list are to be performed)

1. Determination of discharge coefficient for Orifice meter and Venturi meter and their variation with Reynolds number
2. Determination of weir meter constant K for V notch / rectangular notch
3. Determination of discharge coefficient for Mouth piece under constant head and variable head
4. Calibration of rotameter and study of variation of flow rate with tube to float diameter.
5. Determination of friction factor for flow through straight pipes of different diameters and study of variation of friction factor with Reynolds number
6. Determination of friction losses in pipe fittings

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

7. Determination of characteristic curves for centrifugal pumps
8. Determination of friction factor for packed beds
9. Determination of velocity profile of air in pipe by pitot tube
10. Determination of critical velocity by Reynolds Experiment

Text Books:

W. L. McCabe, J. C. Smith and P. Harriott , Unit Operations of Chemical Engineering, 7 th Ed., Tata-McGraw Hill Chemical Engineering Series, New Delhi, 2005.

Suggested Reading:

Kurmi, R.S., “Hydraulics, Fluid Mechanics and Hydraulic Machines”, 20th Ed., S. Chand and Company Pvt.Ltd., New Delhi, 2014.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20CHC06 **MECHANICAL UNIT OPERATIONS LAB**

Instruction	3 P Hours per week
Duration of SEE	3Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

Course Objectives: This course will

1. Provide students the opportunity to acquire practical skills in mechanical unit operations.
2. Introduce students to the importance and principles of material handling.
3. Provide an overall view of size reduction equipment.
4. Demonstrate the techniques of separating solids based on size by different methods.
5. Impart the concept and functioning of the filtration unit.

Course Outcomes: At the end of the course, the student will be able to:

1. Understand mechanical unit operations and their role in process industries.
2. Understand the nature of solids, their characterization, handling and the processes involving solids.
3. Analyze the performance of size reduction equipment and calculate the power and efficiency requirements.
4. Understand the principle, construction and operation of various classification equipment.
5. Analyze Solid liquid separation in industrial equipment based on settling, density and centrifugal force.
6. Design and operate filtration equipment.

CO-PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	2	1	2	3	3	3	1	1	3	3
CO2	3	3	2	2	2	1	2	3	3	3	1	1	3	3
CO3	3	3	3	3	2	1	2	3	3	3	2	2	3	3
CO4	3	3	2	3	2	1	2	3	3	3	2	1	3	3
CO5	3	3	2	2	2	1	2	3	3	3	2	1	3	3
CO6	3	3	2	3	2	1	2	3	3	3	2	1	3	3

List of experiments

(Minimum of 8 Experiments in the list are to be performed)

1. Verification of the laws of size reduction using Jaw crusher.
2. Verification of the laws of crushing using drop weight crusher and determination of work index.
3. Determination of laws of crushing in a pulverizer.
4. Verification of the laws of crushing and determine angle of nip using roll crusher.
5. Verification of the comminution laws and critical speed of a ball mill.
6. Analysis of various sizes of given material by sieve analysis and determination of cumulative and differential analysis.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

7. Determination of the specific cake resistance and medium resistance in a vacuum filter or plate and frame filter press.
8. Calculation of the effectiveness of screen in horizontal and inclined position (vibrating screens)
9. Determination of separation factors of air and hydraulic classifiers.
10. Determine settling rate classification of particles using cyclone separator and to determine the efficiency.
11. Determination of the froth flotation characteristics in mineral concentration.

Text Books:

1. W. L. McCabe, J. C. Smith and P.Harriott , Unit Operations of Chemical Engineering, 7thEd., Tata-McGraw Hill Chemical Engineering Series, New Delhi, 2005.
2. Foust A.S, Wenzel L.A., "Principles of Unit Operations", 2nd Ed., John Wiley and sons, NewYork, 1981.

Suggested Reading:

1. Coulson, J. M., and Richardson, J. F., "Chemical Engineering Series", Vol. 2, 4thEd.,Pergamon Press Oxford, UK, 1991.
2. C M Narayanan and B C Bhattacharya, "Mechanical Unit Operation for Chemical Engineering",Khanna Publishers, 3rd Ed, 2011.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20CHC07 **CHEMICAL REACTION ENGINEERING-I**

Instruction	3 L+1T Hours per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives: This course helps the students to
1. Analyze experimental kinetic data to determine reaction mechanisms.
2. Design different types of chemical reactors (Batch, Tube, and CSTR).
3. Assess the advantages and disadvantages of reactor types.
4. Apply the concepts of heat effects on reactions.
5. Understand the concepts of non ideal reactors.

Course Outcomes: At the end of the course students will be able to:
1. Classify reactions, rate and forms of rate expressions.
2. Summarize fundamentals of kinetics and interpret the data including relationships between moles, Concentration, extent of reaction and conversion.
3. Explain Batch, CSTR, and PFR performance equations from general material balances for homogeneous and heterogeneous reactions.
4. Identify the right reactor among single, multiple, recycle reactors etc
5. Determine the effect of temperature on reactor performance for adiabatic and non adiabatic operation.
6. Analyze the non ideality of reactors.

CO-PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	1	-	1	-	-	-	-	1	1	2
CO2	3	3	3	3	2	-	1	-	-	-	-	1	2	2
CO3	3	3	3	3	1	-	1	-	-	-	-	2	3	3
CO4	3	3	3	3	2	-	-	-	-	-	-	2	3	3
CO5	3	3	3	3	1	-	1	-	-	-	-	-	3	2
CO6	3	3	3	3	1	-	3	-	-	-	-	1	2	2

UNIT-I

Analysis and Correlation of experimental kinetic data: Introduction: Classification of Reactions, Definition and variables affecting the rate of reaction. The rate equation and Stochiometric relations for a single phase reaction $aA+bB \rightarrow rR+sS$. Single and multiple reactions, Elementary and non-Elementary reactions, Molecularity and order of Reaction, Specific reaction rate constant, Testing kinetic models – Steady state approximation, Equilibrium treatment, Fitting a rate law for the given reaction mechanism, predictability of reaction rate from theory. Temperature dependency from Arrhenius‟ law, Thermodynamics, Collision theory and Transition state theory, Comparison of theories with Arrhenius‟ law.

UNIT-II

Analysis and Correlation of experimental kinetic data: Constant volume batch reactor: Analysis of total pressure data, conversion. Integral method of analysis of data for single reaction, multiple reactions, Homogeneous catalyzed reactions, Auto catalytic reactions, Reversible reactions, and Reactions of shifting orders. Half life method, Partial analysis of the rate equation. Differential method of analysis of data.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Variable Volume Batch Reactor: Fractional change in volume of the system, Differential method of analysis, Integral method of analysis.

UNIT-III

Introduction to Reactor Design: Ideal reactors for a single reaction, generalized material balance, design equations-Ideal batch reactor, Space time – space velocity, Steady state mixed flow reactor, Steady state plug flow reactor, Holding time and space time for flow reactors, graphical interpretation. Design for single reactions, Size comparison of single reactors, Multiple reactor systems, Recycle reactor, Auto catalytic reactions – optimum recycle operation, Reactor combinations.

UNIT-IV

Design for Multiple Reactions: Series, Parallel and Independent reactions, Selectivity, Yield, Qualitative discussion about product distribution, Quantitative treatment of product distribution and of reactor size.
Temperature and Pressure effects for single reactions, Heat of reaction from thermodynamics, Heat of reaction and Temperature, Equilibrium constants and equilibrium conversions from Thermodynamics. General graphical design procedure, Optimum temperature progression. Heat effects, Adiabatic Operations, Non adiabatic operations. Exothermic reactions in mixed flow reactors – a qualitative treatment.

UNIT-V

Basics of Non-Ideal flow: The residence time distribution (R T D), State of aggregation of the flowing stream, earliness of mixing, Role of R T D, state of aggregation and earliness of mixing in determining reactor behaviour. Exit age distribution of fluid, Experimental methods for finding E – pulse and step input experiments, Relationship between F and E curves. The convolution integral. Conversion in non- ideal flow reactors, Dispersion model-Axial dispersion and correlations for axial dispersion.

Text Books:

1. Octave Levenspiel, Chemical reaction Engineering, 3rd Ed, Wiley India Pvt. Ltd, New Delhi, 2006.
2. H. Scott Fogler, Elements of Chemical Reaction Engineering, Prentice Hall, Third Edition, 2002.

Suggested Reading:

1. J. M. Smith, Chemical Engineering Kinetics, McGraw – Hill , Third Edition, 1981
2. L. D. Schmidt, The Engineering of Chemical Reactions, Oxford Press, 2 nd Edition, 2004.

20CHC08

CHEMICAL TECHNOLOGY

Instruction	3 L Hours per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: This course will help the students to understand the:

1. Concept of unit operations and unit processes in chemical process industry.
2. Flow diagrams that explain the conversion of raw materials to finished products.
3. Exposure to Organic and Inorganic processes.
4. Process limitations and scale-up information.
5. Application of catalysts in various processes.

Course Outcomes: At the completion of this course, students will be able to:

1. Estimate the chemical industry growth and opportunities.
2. Differentiate between unit operation and unit processes.
3. Develop flow diagrams of different processes.
4. Classify between Inorganic and Organic processes.
5. Design processes based on conditions space time, yield, conversion, recycle methods, temperature and pressure.
6. Predict the process limitations and propose a model to overcome the limitations.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2	-	1	1	1	1	-	-	-	-	1	3
CO2	-	1	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	1	3	2	-	-	-	-	-	-	-	-	2	-
CO4	-	-	1	1	-	1	-	-	-	-	-	-	1	2
CO5	-	-	1	-	-	1	1	-	-	-	-	-	-	-
CO6	-	1	1	2	-	-	-	-	-	-	-	-	-	-

CO-PO-PSO Matrix

UNIT – I: Classification of Indian Chemical Industry, Introduction to unit operations and unit processes. Metallurgical Industry overview – classification of metals, manufacturing of pig Iron by blast furnace, Methods of Steel making– Steel alloys. Manufacturing of Copper and types of Copper alloys, Manufacturing of Aluminum and types of alloys. Over view of Pharmaceutical Industry with introduction and classification of pharmaceutical chemical forms.

UNIT – II: Manufacturing of H2 by Steam reforming of Hydrocarbons. NH3 Synthesis - methods and manufacturing. Urea manufacturing by various processes. Manufacturing of Mono ammonium Phosphate, Di ammonium Phosphate. Manufacturing of Single super Phosphate and Triple super Phosphate.

UNTI – III: Introduction to Ceramics and its applications, Cement: Raw materials, Manufacturing of Portland cement, Cement types and composition. Glass: Raw materials - Manufacturing – Types of glasses – uses.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

UNIT – IV: Classification of Plastics, Manufacturing of Phenol formaldehyde resin, Polyethylene, Polypropylene, PVC,PVA,Synthetic fibers-Manufacturing of Nylon–6-6, Polyester Fiber-Classification of rubbers and Manufacturing of SBR.

UNIT V: Natural products industry: Pulp and Paper-Methods of pulping production. Recovery of chemicals from black liquor. Production of paper. Oils, Soaps and Detergents: Definitions, constituents of oils, Extraction and expression of vegetable oil. Refining and Hydrogenation of oils. Continuous process for the production of Fatty acids and Soap. Sugar: Raw and refined sugar, Byproducts of sugar industries.

Text Books:

1. George T. Austin, ―Shreve's Chemical Process Industries‖, 5th edition. McGraw Hill Book Company, 1984.
2. Rao, M. G. and Sittig, M., "Dryden"s outlines of Chemical Technology for the 21st Century, 3rd Ed., Affiliated East-West Press, New Delhi, 1998.

Suggested Reading:

1. 1.Remington-The Science And Practice of Pharmacy (Vol.1& 2), David B.Troy, 21st edition,2006, Lippincott Williams &Wilkins
2. Andreas Jess and Peter Wasserscheid, "Chemical Technology: An Integral Textbook", John Wiley and Sons, Inc., New York, 2000.
3. Faith, W. L., Keys, D. B. and Clark, R. L., "Industrial Chemicals",4th Ed., John Wiley, 1980.
4. Fertilizer Association of India, "Handbook of Fertilizer Technology",2nd Ed.,Scientific Publisher, NewDelhi, 2009.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad–75.

20CHC09 **HEAT TRANSFER**

Instruction	3 L Hours per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: This course will help the students to understand the

1. Basic concepts of heat transfer
2. Convective Heat Transfer and the concept of dimensional analysis
3. Concept and functioning of different heat exchangers
4. Heat transfer with change of phase and the functioning of evaporators
5. Radiation laws and the concept of radiation shields.

Course Outcomes: Upon completing this course, students will be able to:

1. Distinguish between different types of heat transfer
2. Calculate heat transfer coefficients for forced and natural convection
3. Analyze and understand the concepts of Heat exchangers
4. Analyze the heat transfer phenomena in fluids involving phase changes
5. Identify the type of evaporator required for a specific purpose and design it
6. Explain the impact of radiation shields and laws of radiation.

CO-PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	1	2	2	-	2	2	1	1	3	2
CO2	3	3	3	1	1	2	2	-	2	2	1	1	3	2
CO3	3	3	3	1	1	2	3	-	2	2	1	1	2	3
CO4	3	3	2	1	1	2	2	-	2	2	1	1	2	2
CO5	3	3	3	1	1	2	3	-	2	2	1	1	2	3
CO6	3	2	2	1	1	2	3	-	2	2	1	1	3	2

UNIT-I

Fundamentals of Heat Transfer - Modes of Heat Transfer, Derivation of Heat conduction equations in rectangular co-ordinates, thermal diffusivity, Differential equations of heat transfer-special forms – cylindrical co-ordinates system. One dimensional problem, heat transfer from extended surfaces, two dimensional problems, Lumped capacity systems, Insulation.

UNIT-II

Convective Heat Transfer: - Natural and forced convection in laminar and turbulent flow over plates and tubes. Dimensional Analysis, Thermal Boundary layer, Analogies and correlations. Design of Heat Transfer Equipment - Double Pipe Heat Exchanger, Concept of LMTD, Shell and tube Exchanger – Kern"s method of design, Effectiveness - NTU methods

UNIT-III

Design aspects of finned tube and other compact heat exchangers. Basics of Heat Transfer with change of phase - Introduction to boiling. Types of boiling, Regimes of pool boiling and critical heat flux. Nucleate Boiling-Bubble formation, its growth and motion Introduction to condensation, Derivation of Nusselt"s equation. Design aspects of Condensers.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

UNIT-IV

Types of Evaporators, Capacity and Economy of Evaporators, Design aspects of Evaporators – Material and energy Balances of single and multiple effect evaporators. Heat Transfer to agitated vessels. Description and working of crystallizers

UNIT-V

Radiation – Fundamentals of Radiation Heat Transfer, Laws of black body Radiation, Radiating heat exchange between non black body surfaces, combined heat transfer by conduction, convection and radiation, Radiation Shields

Text Books:

1. W.L.McCabe, J.C.Smirh and P.Harriott, „Unit Operations of Chemical Engineering‟ 7th Edition, Tata-McGraw Hill, New Delhi , 2005
2. D.Q. Kern, „Process Heat Transfer‟1st Edition Tata-McGraw Hill Publishers, New Delhi, 2001

Suggested Reading:

1. Coulson JM and Richardson, J.F, Chemical Engineering Series,Vol 1, 4th Edition, Pergamon Press Oxford, UK, 1991
2. B K Dutta, Heat Transfer Principles and applications, PHI Learning Pvt Ltd, New Delhi, 2004
3. Holman, J.P.S. Bhattacharya. Heat Transfer, 10th Edition, Tata-McGraw Hill, 2011

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad–75.

20CHC10 **MASS TRASFER OPERATIONS - I**

Instruction	3 L Hours per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: This course helps the students to
1. Identify diffusion phenomena in various chemical processes.
2. Calculate mass transfer coefficients at interfaces of multiphase mass transfer systems
3. Design equipment for gas-liquid mass transfer operations.
4. Understand the humidification operation with design of cooling tower.
5. Understand the drying concept with its mechanism.

Course Outcomes: Upon completing this course, students will be able to:
1. Apply the concepts of diffusion mass transfer to fluids and solids
2. Write the rate equations for mass transfer operations
3. Estimate the mass transfer coefficients of mixtures
4. Design Absorber/Stripper by equilibrium methods
5. Design the cooling tower with the concept of humidification.
6. Interpret the drying mechanism by estimating total drying period

CO-PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	-	-	2	-	-	-	2	3	3	2
CO2	3	3	3	-	2	-	2	-	-	-	2	3	3	3
CO3	3	3	3	2	1	2	2	-	-	-	-	3	3	3
CO4	3	3	3	-	2	-	2	-	2	-	2	3	3	2
CO5	3	3	3	-	2	-	2	-	2	-	2	3	3	2
CO6	3	3	3	-	1	-	2	-	2	-	2	3	3	2

UNIT – I Diffusion Mass Transfer

Introduction of Mass transfer operations & their applications, Molecular and eddy diffusion –Fick‟s first and second law, Steady state molecular diffusion in binary mixtures of gases, liquids and solids, Gas and liquid phase diffusion coefficient measurement and prediction, diffusivity in solids and its applications, Film mass transfer coefficients for the cases of equimolar counter diffusion and diffusion of one component (A) in stagnant component (B) - Correlation‟s for mass transfer coefficients and Reynolds & Colburn analogies.

UNIT – II Mass Transfer coefficients & Interphase Mass Transfer

Mass transfer coefficients concepts and classifications, Mass Transfer Theories- Film theory, penetration theory, surface renewable theory, Interphase mass transfer theory, Overall mass transfer coefficients – Two resistance theory – Gas phase and liquid phase controlled situations. Gas – liquid contact: Description of Continuous and stage wise contact equipment, packing for packed columns – Liquid distribution. Mass transfer coefficients in packed columns, Flooding in packed and plate columns, Ideal stage, Murphree, point and overall column

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

efficiency, Comparison of packed and plate columns.

UNIT - III Absorption and Stripping

Introduction to absorption, Equilibrium in gas-liquid system, and minimum liquid rate, Design of packed column based on Individual and overall mass transfer coefficients, Counter current multistage operations, Determination of number of plates – absorption factor. Determination of number of transfer units and height of a continuous contact packed absorbers. Kremser – Brown equation

UNIT - IV Humidification

Basic concepts of vapor-gas mixtures- absolute humidity, relative humidity and adiabatic saturation temperature, dew point and wet bulb temperatures, psychometric charts – Enthalpy of gas vapor mixtures, Humidification and dehumidification – Operating lines and design for cooling towers.

UNIT - V Drying

Moisture contents of solids – equilibrium, bound and unbound moisture. Design conditions – Rate of batch drying under constant drying conditions – Mechanism of batch drying – total time for batch drying, Description of batch and continuous dryers.

Text Books:

1. R.E. Treybal, “Mass Transfer operations”, 3rd Edition, McGraw Hill Book Co., 1981
2. Christie John Geonkoplis “Transport Processes and Separation Process Principles”,4th edition. PHI, New Delhi.

Suggested Reading:

1. J Coulson and Richardson,”Fluid Flow, Heat and Mass Transfer”, Volume 1, 6th Edition, Pergoman Press, 2009
2. W.L.McCabe, Julian C. Smith, Peter Harriott, Unit Operations of Chemical Engineering, 7th Edition, 2005.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20EGM01 **INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES**

(BE/BTech III/IV Semester - Common to all branches)

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
Credits	NC

Course Objectives

The course will introduce the students to:

1. History of Indian Constitution and how it reflects the social, political and economic perspectives of the Indian society.
2. Growth of Indian opinion regarding modern Indian intellectuals‟ constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. Various Organs of Governance and Local Administration.

Course Outcomes

After successful completion of the course the students will be able to:

1. Understand the making of the Indian Constitution and its features.
2. Identify the difference among Right To equality, Right To freedom and Right to Liberty.
3. Analyze the structuring of the Indian Union and differentiate the powers between Union and States.
4. Distinguish between the functioning of Lok Sabha and Rajya Sabha while appreciating the importance of Judiciary.
5. Differentiate between the functions underlying Municipalities, Panchayats and Co-operative Societies.

CO-PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	1	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	1	-	1	-	-	-	-	-

Unit-I

Constitution of India: Constitutional history-Govt of India Act 1909, 1919 and 1935, Constitution making and salient features. Directive Principles of State Policy - Its importance and implementation.

Unit-II

Scheme of the Fundamental Rights & Duties: The Fundamental Rights **-** To Equality, to certain Freedom under Article 19, to Life and Personal Liberty Under Article 21. Fundamental Duties - the legal status.

Unit III

Union Government and its Administration **-** Structure of the Indian Union: Federalism, distribution of

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

legislative and financial powers between the Union and the States.
Parliamentary form of government in India: Executive-President‟s role, power and position.

Unit IV
Legislature and Judiciary: Central Legislature-Powers and Functions of Lok Sabha and Rajya Sabha. Judiciary: Supreme Court-Functions, Judicial Review and Judicial Activism

Unit V
Local Self Government - District‟s Administration Head (Collector): Role and Importance. Municipalities: Introduction, Mayor and Role of Elected Representative, CEO of Municipal Corporation. Panchayati Raj: Introduction, Zilla Panchayat, Elected Officials and their roles, CEO Zilla Panchayat: Position and Role. Block level: Organizational Hierarchy (Different departments). Village level: Role of Elected and Officials.

Text Books:

1. **Indian Government & Politics**, Ed Prof V Ravindra Sastry, Telugu Akademy, 2nd edition, 2018.
2. **Indian Constitution at Work,** NCERT, First edition 2006, Reprinted- January 2020.

Suggested Reading:

1. **The Constitution of India**, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, **Framing of Indian Constitution**, 1st Edition, 2015.
3. M. P. Jain, **Indian Constitution Law**, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu**, Introduction to the Constitution of India**, Lexis Nexis, 2015.

Online Resources:

1. http://www.nptel.ac.in/courses/103107084/Script.pdf

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20EEM01 **INDIAN TRADITIONAL KNOWELDGE**

Instruction		2 Hours per week
Duration of Semester End Examination		2 Hours
Semester End Examination		50 Marks
CIE 02	Mid sem assignments	[Optional]
Credits		No Credits

Course Objectives:

1. To get a knowledge in Indian Culture
2. To Know Indian Languages and Literature and the fine arts in India
3. To explore the Science and Scientists of Medieval and Modern India

Course Outcomes: After completion of this course, students will be able to:

1. Understand philosophy of Indian culture
2. Distinguish the Indian languages and literature
3. Learn the philosophy of ancient, medieval and modern India
4. Acquire the information about the fine arts in India
5. Know the contribution of scientists of different eras.

CO-PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	1	-	-	1	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	1	-	-	-	-	-	-	-	1	-	-

UNIT-I

Culture and Civilization: Culture, civilization and heritage, general characteristics of culture, importance of culture in human literature, Cultural diversity, Aesthetics, Women seers, Indus culture, Indian cuisine, Martial arts

UNIT-II

Education system: Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

UNIT-III

Linguistic Wealth: Indian Languages and Literature: the role of Sanskrit, Paleography, Significance of scriptures to current society, Indian semantics and lexicography, Bhakti literature, Darsanas

UNIT-IV

Art, Technology& Engineering: Sculpture, Painting and Handicrafts, Indian Music, Dance Drama and Theatre, Introduction to Mayamatam, Iron and steel technology, Use of metals in medicinal preparations

UNIT-V

Science and Logic: Helio-centic system, Sulbasutras, Katapayadi, Hindu calendar, 6 pramanas in Indian logic, Scientific method applied to therapeutics, Fallacies, Tarka – Induction&Deduction, Ayurvedic biology,

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Definition of health

Essential Readings:

1. Kapil Kapoor, Text and Interpretation: The Indian Tradition, ISBN: 81246033375, 2005
2. Samskrita Bharati,Science in Samskrit, ISBN-13: 978-8187276333, 2007
3. Satya Prakash, Founders of sciences in Ancient India, Govindram Hasanand, ISBN-10: 8170770009, 1989
4. Brajendranath Seal, The Positive Sciences of the Ancient Hindus, Motilal Banarasidass, ISBN-10: 8120809254, 1915

Suggested Readings:

1. Swami Vivekananda, *Caste, Culture and Socialism*, Advaita Ashrama, Kolkata ISBN-9788175050280
2. Swami Lokeswarananda, *Religion and Culture*, Advaita Ashrama, Kolkata ISBN-9788185843384
3. Kapil Kapoor,*Language, Linguistics and Literature: The Indian Perspective*, ISBN-10: 8171880649, 1994.
4. Karan Singh, *A Treasury of Indian Wisdom: An Anthology of Spiritual Learn*,ISBN: 978-0143426158, 2016
5. Swami Vivekananda, *The East and the West*, Advaita Ashrama, Kolkata 9788185301860
6. Srivastava R.N., *Studies in Languages and Linguistics*, Kalinga Publications ISBN-13: 978-8185163475
7. Subhash Kak and T.R.N. Rao, Computation in Ancient India, Mount Meru Publishing ISBN-1988207126
8. R.N Misra, *Outlines of Indian Arts Architecture, Painting, Sculpture, Dance and Drama,* IIAS, Shimla & Aryan Books International, ISBN 8173055149
9. S. Narain, *Examinations in ancient India*, Arya Book Depot, 1993
10. M. Hiriyanna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, ISBN-13: 978-8120810990, 2014
11. Ravi Prakash Arya, Engineering and Technology in Ancient India, Indian Foundation for Vedic Science, ISBN-10: 1947593072020

SWAYAM/Nptel:

1. History of Indian Science and Technology - https://onlinecourses.swayam2.ac.in/arp20_ap35/preview
2. Introduction to Ancient Indian Technology – https://onlinecourses.nptel.ac.in/noc19_ae07/preview
3. Indian Culture & Heritage - https://onlinecourses.swayam2.ac.in/nos21_sc11/preview
4. Language and Society - https://nptel.ac.in/courses/109/106/109106091/
5. Science, Technology & Society - https://nptel.ac.in/courses/109/103/109103024/
6. Introduction to Indian Philosophy - https://nptel.ac.in/courses/109/106/109106059/
7. Introduction to Indian Art - An appreciation - https://onlinecourses.nptel.ac.in/noc20_hs09/preview

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20CEM01

ENVIRONMENTAL SCIENCE

Instruction	2 L Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	NC

Course Objectives: To enable the student

1. Identify environmental problems arising due to over utilization of natural resources and understand the importance of use of renewable energy sources
2. Become aware about the importance of eco system and interlinking of food chain.
3. Identify the importance of biodiversity in maintaining ecological balance.
4. Learn about various attributes of pollution management and waste management practices.
5. Contribute for capacity building of nation for arresting and/or managing environmental disasters.

Course Outcomes: At the end of the course, student is able to

1. Identify the natural resources and realise the importance of water, food, forest, mineral, energy, land resources and affects of over utilisation.
2. Understand the concept of ecosystems and realise the importance of interlinking of food chains.
3. Contribute for the conservation of bio-diversity.
4. Suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
5. Follow the environmental ethics and contribute to the mitigation and management of environmental disasters.

CO-PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	3	-	-	-	-	1	-	-
CO2	1	-	-	-	-	-	2	1	-	-	-	1	-	-
CO3	1	-	-	-	-	-	2	1	-	-	-	1	-	-
CO4	1	-	-	-	-	1	2	1	-	-	-	1	2	2
CO5	1	-	-	-	-	1	2	1	-	-	-	1	1	1

UNIT- I:

Environmental Studies: Definition, Scope and importance, need for public awareness.

Natural resources: Use and over utilization of Natural Resources - Water resources, Food resources, Forest resources, Mineral resources, Energy resources, Land resources.

UNIT – II:

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, role of producers, consumers and decomposers, energy flow in an ecosystem, food chains, food webs, ecological pyramids, Nutrient cycling, Bio-geo chemical cycles, Terrestrial and Aquatic ecosystems.

UNIT – III:

Biodiversity: Genetic, species and ecosystem biodiversity, Bio-geographical classification of India, India as a Mega diversity nation. Values of biodiversity, hot-spots of biodiversity, threats to biodiversity, endangered and

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

endemic species of India, methods of conservation of biodiversity.

UNIT – IV:

Environmental Pollution: Cause, effects and control measures of air pollution, water pollution, marine pollution, soil pollution, noise pollution and Solid waste management, nuclear hazards

Environmental Legislations: Environment protection Act, Air, Water, Forest & Wild life Acts, issues involved in enforcement of environmental legislation, responsibilities of state and central pollution control boards

UNIT – V:

Social issues and the environment: Water conservation methods: Rain water harvesting and watershed management, Environmental ethics, Sustainable development and Climate change: Global warming, Ozone layer depletion, forest fires, and Contemporary issues.

Text Books:

1. Y. Anjaneyulu, "Introduction to Environmental Science", B S Publications, 2004.
2. Suresh K. Dhameja, "Environmental Studies", S. K. Kataria& Sons, 2009.

Suggested Reading:

1. C. S. Rao," Environmental Pollution Control Engineering", Wiley, 1991.
2. S. S. Dara, "A Text Book of Environmental Chemistry &Pollution Control", S. Chand Limited, 2006

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20CHE01 **ENERGY ENGINEERING**
(Professional Elective I)

Instruction	3 L Hours per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: This course helps the students to
1. Gain knowledge on various energy sources and their applications
2. know emerging technologies viz., fuel cells, bio fuels etc.
3. know the processes of crude fuels
4. understand the advantages and disadvantages of various energy sources
5. familiarize the concepts of energy audit and conservation

Course Outcomes: Upon completing this course, students will be able to:
1. Classify and explain energy sources
2. Summarize the basic principles and fundamentals of non-conventional energy sources
3. Summarize the basic principles and fundamentals of conventional energy sources
4. Outline the production and future perspectives of bio fuels
5. Relate the importance of future energy resources
6. Demonstrate the need for energy auditing and conservation

CO-PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	2	1	-	-	3	-	-	-	-	-	-	-	-
CO2	-	2	1	-	-	3	-	-	-	-	-	-	-	-
CO3	-	2	1	-	-	3	3	-	-	-	-	-	2	2
CO4	-	2	1	-	-	3	3	-	-	-	-	-	2	2
CO5	-	2	1	-	-	3	3	-	-	-	-	-	2	1
CO6	-	2	1	-	-	3	3	-	-	-	-	-	2	1

UNIT-I

Introduction:

Introduction to conventional and non conventional energy sources, alternative energy sources, their significance & availability, consumption patterns in India. Energy survey and policies for India

UNIT-II

Conventional Energy Sources: Wood and wood Charcoal, products of wood carbonization Coal and Coal derived fuels, characteristics, production methods and uses. Oil and Gases: Fuels derived from oil and gases, Characteristics, production methods and uses. Technology for combustion of fuels derived from oil and gas. Shale oil and gas, oil sands

UNIT-III

Non conventional Energy Sources:

Solar Energy: Basics, Types of Solar Energy Collectors, Applications- Solar Distillation, pumping, production

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

of hydrogen.
Photo Voltaic Cells: Introduction, Types of photo voltaic Cells, Applications, Electrical Storage and Future developments

UNIT-IV

Wind-Energy: Introduction, Basic principles of wind energy conversion. Types of wind machines
Hydropower: Introduction, Capacity and Potential, Small hydro, Environmental and social impacts.
Tidal Energy: Introduction, Capacity and Potential, Principle of Tidal Power, Components of Tidal Power Plant, Classification of Tidal Power Plants

UNIT-V

Bio Fuels: Introduction, Bio mass conversion technologies- Wet processes, dry processes, Bio-gas generation. Factors affecting bio-digestion, Classification of biogas plants Production methods, characteristics, uses of bio-diesel, bio-butanol and bio-ethanol, Second generation bio-fuel feed stocks
Energy Auditing and Conservation: Short term, medium term, long term schemes, energy conversion, energy index, energy cost, representation of energy consumption, Sankey diagram, energy auditing. Conservation methods in process industries, theoretical analysis, practical limitations

Text Books:

1. G D Rai, Non -conventional energy sources,Khanna Publishers, 4thedition,2000
2. Samir Sarkar, Fuels and Combustion, Universities Press, 3rd Edition, 2009

Suggested Reading:

1. S P Sukhatme, J Nayak, Solar Energy: Principles of Thermal Collection and Storage, Tata McGraw-Hill, 2008
2. S B Spandya, Conventional Energy Technology: Fuel and Chemical Energy,Tata McGraw-Hill, 1987
3. John Twidell and Tony Weir, Renewable Energy Resources, Routledge, 2015
4. W R Murphy , Energy management, 1st Edition, , G McKay Butterwolferand Co. Ltd.,2001

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20CHE02 **FOOD PROCESSING TECHNOLOGY**

(Professional Elective I)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: This course helps the students to understand the
1. Basic food processing methods.
2. Physical, chemical, and/or microbiological changes in food and mechanical manipulation.
3. Learn fundamentals of modifying food to meet current nutrition recommendations
4. Learn to find credible sources of information on food science and nutrition.
5. Food processing Applications and Packaging

Course Outcomes: Upon completing this course, students will be able to:
1. Understand food demand scenario with respect to world and India
2. Explain techniques in food processing
3. Design process equipment to achieve the desired quality of food.
4. Develop novel food processes that have a minimal effect on food quality
5. Select control strategies to maintain food quality
6. Apply the scientific method to food science problems.

CO-PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	2	2	3	3	3	3	3	2	2	1	2
CO2	3	2	2	2	3	2	1	1	1	-	-	3	3	2
CO3	3	3	3	3	3	2	2	1	1	-	-	3	3	3
CO4	3	3	3	3	3	2	2	1	1	-	-	3	3	3
CO5	3	3	2	3	3	2	2	1	1	-	-	3	3	3
CO6	3	3	2	3	2	1	2	2	1	-	-	3	3	2

UNIT – I

Introduction: General aspects of food industry, World food demand and Indian scenario, Constituents of food, Quality and nutritive aspects, Product and Process development, engineering challenges in the Food Processing Industry.

UNIT – II

Basic principles: Properties of foods and processing theory, Heat transfer, Effect of heat on micro-organisms, Basic Food Biochemistry and Microbiology: Food Constituents; Food fortification, Water activity, Effects of processing on sensory characteristics of foods, Effects of processing on nutritional properties, Food safety, good manufacturing practice and quality Process Control in Food Processing.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

UNIT – III

Ambient Temperature Processing: Raw material preparation, Size reduction, Mixing and forming, Separation and concentration of food components, Centrifugation, Membrane concentration, Fermentation and enzyme technology, Irradiation, Effect on micro-organisms, Processing using electric fields, high hydrostatic pressure, light or ultrasound.

UNIT – IV

Heat processing using steam, water and air: Blanching, Pasteurization, Heat sterilization, Evaporation and distillation, Extrusion, Dehydration, Baking and roasting, Heat processing by direct and radiated energy: Dielectric heating, Ohmic heating, Infrared heating, Gamma irradiation.

UNIT – V

Post Processing Applications Packaging: Coating or enrobing, Theory and Types of packaging materials, Printing, Interactions between packaging and foods, Environmental considerations.

Text Books:

1. Fellows P., Food Processing Technology: Principles and Practice, Wood head Publishing, 4th Edition, 2016.
2. Toledo R, Fundamentals of Food Process Engineering, Springer, 3rd Edition, 2010.

Suggested Reading:

1. Singh R.P. & Heldman D.R., Introduction to Food Engineering, Academic Press, 3rd Edition, 200

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad–75.

20CHE03 **MATERIAL SCIENCE FOR CHEMICAL ENGINEERS**

(Professional Elective I)

Instruction	3 L Hours per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: This course helps the students to understand the

1. Introduction to different types of engineering materials and alloys
2. Alloying elements and factors for material selection
3. Significant properties of engineering materials
4. Specific requirements of materials for high and low temperature applications.
5. Possible and latest alternatives available for standard engineering materials.
6. Material characterization

Course outcomes: Upon completing this course, students will be able to:

1. Classify different engineering materials as ferrous and non-ferrous alloys.
2. Select materials for design and fabrication of process equipment.
3. Understand the significance of mechanical, thermal and optical properties of engineering materials
4. Select materials for high and low temperature applications.
5. Identify new or alternate materials for development and operation of process industry.
6. Characterize material using different experimental techniques.

CO-PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	3	2	1	1	0	-	-	-	-	3	3
CO2	3	3	3	3	3	2	0	1	-	-	-	-	3	2
CO3	3	3	3	3	3	2	3	1	-	-	-	-	3	2
CO4	3	3	3	3	3	3	3	1	-	-	-	-	3	1
CO5	3	3	3	3	3	3	3	2	-	-	-	-	3	3
CO6	3	3	3	3	3	3	3	1	-	-	-	-	3	3

UNIT-I

Introduction to Engineering Materials: Classification – metals, non-metals, alloys; Ferrous metals and alloys - types of steels like mild, carbon and stainless steel, common grades of steel – 304 and 316; Non-Ferrous metals and alloys of Aluminium, Copper and Nickel; Criteria for material selection.

UNIT-II

General Properties of Engineering Materials: Mechanical Properties: Stress-strain diagram, Elastic, Plastic, Anelastic and Viscoelastic behavior. Creep, Fatigue and Fracture strengthening mechanisms; Thermal Properties: Conductivity, Expansion, Protection, Diffusivity, Stresses and Shock resistance; Optical behavior: Light & electro-magnetic spectrum, Luminescence, stimulated emission of Radiation, Lasers, Optical fibres.

UNIT-III

Materials for High and Low Temperature Applications: Classification, advantages, general properties and applications of engineering materials like Refractories, Ceramics, Super alloys, Composites; Nano-materials: carbon nanotubes, fullerene, nanosensors; Nanocomposites, role of reinforcement-matrix interface strength on composite behaviour

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

UNIT-IV

New materials: Biomaterials: Biocompatibility, advantages, properties, uses, Types- Nearly inert ceramics, surface active ceramics, resorbable ceramics. Smart materials Piezoelectrics, shape memory alloys, Magneto-strictive, electro-rheological materials, 3D printing.

UNIT-V

Material characterization: Study of material characterization using X-ray diffraction (XRD), Nuclear Magnetic Resonance (NMR) spectroscopy, Scanning electron microscopy (SEM), transmission electron microscopy (TEM).

Text Books

1. Materials Science and Engineering an Introduction, William D. Callister, Jr. 5thEd., John Wiley and Sons, Inc. 2002.
2. Materials Characterization - Introduction to Microscopic and Spectroscopic Methods, Yang Leng, 2nd ed., Wiley Publishers, USA, 2013.

Suggested Readings:

1. Fundamentals of Smart Materials, Mohsen Shahinpoor, The Royal Society of Chemistry Publishing, U.K, 2020.
2. B. S. Mitchell An Introduction to Materials Engineering and Science for Chemical and Materials Engineers, John Wiley & Sons, 2004.
3. S. Upadhyaya and A. Upadhyaya, Material Science and Engineering, Anshan Publications, 2007.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20CHE04 **PULP AND PAPER TECHNOLOGY**

(Professional Elective I)

Instruction	3 L Hours per week
Duration of SEE	3Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: This course helps the students to understand

1. Basic concepts of pulp and paper making processes
2. Comprehensive overview of products, process variables, equipment operation
3. Details of physical and chemical characteristics of fibrous raw materials and black liquor
4. Various types of pulping and bleaching methodologies
5. Recovery of energy and chemicals used in pulping processes with due techno-economic and environmental considerations.

Course Outcomes: At the end of the course students will be able to

1. Design the operation, maintenance and safety aspects for paper making
2. Identify the factors that drive industry trends
3. Evaluate different grades of paper and boards based on testing methods
4. Select appropriate bleaching technique for required paper quality
5. Distinguish the important wood and fiber properties that affect paper quality
6. Identify, formulate and solve design problems pertaining to pulp digester

CO-PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	2	3	1	-	-	-	-	2	2	2
CO2	2	2	2	2	2	-	1	-	-	-	-	1	2	3
CO3	3	2	2	1	1	-	1	-	-	-	-	2	2	2
CO4	3	1	2	2	1	-	1	-	-	-	-	2	3	3
CO5	3	1	2	2	-	-	2	1	-	-	-	2	2	2
CO6	3	2	3	2	2	-	1	-	-	-	-	3	3	3

UNIT I: Introduction

Importance of paper, Definition of pulp. Distribution of wood constituents – Cellulose, Hemi-cellulose, Lignin, Extractives and Inorganic components. Wood parts & types: Ultra structure of cell wall, Wood cell types, Early & Latewood, Softwoods & Hardwoods. Comparison of different raw materials for pulp & paper making.

UNIT II: Overview of pulping process

Mechanical Pulping: Pressurized ground pulping, Refiner Pulping, Chemo (thermo) mechanical pulping processes. Kraft Pulping: Composition & analysis of white liquor, Description of Kraft cooking process, Kraft recovery, process variables, Pulp yield, End uses of kraft pulps.

UNIT III: Pulp and black liquor characterization

Pulp testing methods – Kappa number, water retention value, CED viscosity, drainability, beater evaluation, zero span tensile strength.

Black liquor characterization - Chemical properties, viscosity, calorific value, thermal conductivity, specific heat, black liquor oxidation, desilication and concentration of black liquor.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

UNIT IV: Bleaching operations

Objective of bleaching – Elemental chlorine free and Total chlorine free bleaching; Bleaching agents – form, function, advantages & disadvantages, bleaching sequences, Bleachability and its measurement, factors affecting the bleaching process.
Stages of bleaching – Oxygen delignification, Chlorination, Extraction, Hypochlorite bleaching, Ozone bleaching, Peroxide bleaching, ECF and TCF bleaching systems for chemical and mechanical pulps.

UNIT V: Paper Making and its Properties

Paper Testing Methods – Flow sheet of overall pulp and paper making process, Strength properties, Surface properties, Optical properties & Absorption properties. Different grades of paper, boards & newsprint specifications; BIS and ISO standards of paper. Paper properties dependence on paper making processes.
Paper recycling process, Effluent treatment processes with environmental considerations.

Text Books:

1. Kenneth W. Britt, "Handbook of Pulp & Paper Technology", 2nd Edition, Reinhold Publishing Corporation, 2004.
2. G. A Smook., "Handbook for Pulp & Paper Technologists", 3rd Edition, Angus Wilde Publications, 2003.

Suggested Reading:

1. Hakan Karlsson, "Fiber Guide-Fiber analysis and process applications in the pulp & paper industry", Ab Lorentz & Wetre, 1st Edition, 2006.
2. Fengel D. and Wegener G, "Wood-Chemistry, Ultrastructure, Reactions", Walter de Gruyter, Berlin, 2nd Edition, 1989.
3. EIRI Board. "Handbook of Pulp & Paper, Paper board and Paper based Technology", Engineers India Research Institute, 2nd Edition, 2015.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20CHC11 **CHEMICAL REACTION ENGINEERING LAB**

Instruction	3 P Hours per week
Duration of SEE	3Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

Course Objectives: This course helps the students to understand to

1. Familiarize students with main type of chemical reactors.
2. Analyze the experimental data to obtain the reaction rate expression (reaction order and specific reaction rate constant).
3. Compare the conversion of reactants for a specific reaction in various types of reactor.
4. Understand the concept of residence time distribution in reactor systems.
5. Determine mass transfer coefficient of systems with and without chemical reaction.

Course Outcomes: At the end of the course students will be able to:

1. Compare the performance of ideal reactors.
2. Develop rate law for use in reactor design based on reaction data from a reactor.
3. Find the conversion of reactants for a particular reaction in different reactors.
4. Interpret the kinetics of an exothermic reaction.
5. Analyze laboratory reactors through residence time distributions.
6. Determine mass transfer coefficient of Solid-Liquid and Liquid-Liquid systems.

CO-PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	-	1	-	2	-	-	-	3	2
CO2	3	2	1	1	1	-	1	-	2	-	-	1	3	3
CO3	3	2	1	1	1	-	1	-	2	-	-	2	2	2
CO4	3	2	1	1	1	-	1	-	2	-	-	-	2	3
CO5	3	2	1	1	1	-	1	-	2	-	-	1	2	2
CO6	3	2	1	1	1	-	1	-	2	-	-	-	2	2

List of Experiments

(Minimum of 8 Experiments in the list are to be performed)

1. Studies in Batch Reactor: To find the Arrhenius form of temperature dependency of reaction.

2. Studies in Mixed Flow Reactor (CSTR): To find kinetics from reactor performance of CSTR.

3. Studies in Tubular Reactor: To determine the rate constant and to verify the order of reaction.

4. Mass Transfer with Chemical Reaction (Liquid – Liquid Reaction System): To find out the mass transfer coefficient in a stirred cell with chemical reaction and without chemical reaction.

5. Mass Transfer with Chemical Reaction (solid – Liquid Reaction System): To find the mass transfer coefficient with chemical reaction and without chemical reaction.

6. R.T D Studies in Packed bed reactor: To determine the axial mixing (axial dispersion) in the packed column.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

7. R T D Studies in Tubular Column: To determine the variance of residence time distribution and the dispersion number in a tubular column.
8. Studies in Batch Reactor: With Equimolar Feed (M = 1): To determine the rate constant and to verify the order of reaction by differential & integral methods of analysis.
9. Studies in Batch Adiabatic Reactor: To determine the kinetics of an exothermic reaction from the temperature of the reaction system.
10. Studies in Mixed Flow Reactors in series: To compare the actual & ideal performances of a reaction system.
11. Studies in Packed bed: To determine the rate constant and to verify the order of reaction from performance of the reactor.

Text Books:

1. Octave Levenspiel, Chemical Reaction Engineering, Wiley India Pvt. Ltd, New Delhi, 3rd Ed, 2006.
2. H. Scott Fogler, Elements of Chemical Reaction Engineering, Prentice Hall, 3rd Edition, 2002.

Suggested Reading:

1. J. M. Smith, Chemical Engineering Kinetics, McGraw – Hill, Third Edition, 1981.
2. L. D. Schmidt, The Engineering of Chemical Reactions, Oxford Press, 2nd Edition, 2004.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20CHC12 **HEAT TRANSFER LAB**

Instruction	3P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

Course Objectives: This course helps the students to understand to

1. Understand the fundamentals of heat transfer mechanisms in fluids and solids and their applications in various heat transfer equipment in process industries
2. Familiarize heat exchangers - working principles and basic geometries

Course Outcomes: Upon completing this course, students will be able to:

1. Demonstrate and evaluate heat transfer by conduction in solids for steady state conditions
2. Determine thermal conductivity of different materials of varying geometries
3. Estimate heat transfer coefficients and determine effectiveness of pin fin for free and forced convection
4. Determine surface emissivity of a test plane and Stefan-Boltzmann's constant and compare with theoretical values
5. Determine critical heat flux in pool boiling
6. Estimate heat transfer coefficients and determine effectiveness of heat exchangers to analyze their performance

CO-PO-PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	1
CO2	3	3	-	-	-	-	-	-	-	-	-	-	3	2
CO3	3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO4	3	3	-	-	-	-	-	-	-	-	-	-	1	1
CO5	3	3	-	-	-	-	-	-	-	-	-	-	1	1
CO6	3	3	-	-	-	-	-	-	-	-	-	-	3	3

List of Experiments

(Minimum of 8 Experiments in the list are to be performed)

1. Determination of Thermal conductivity of given insulating powder under steady state conditions
2. Determination of interface temperatures in composite wall under steady state conditions
3. Determination of Heat Transfer through Lagged Pipe.
4. Determination of Thermal Conductivity for a given Asbestos Insulating powder.
5. Determination of Critical Heat Flux for a given Nichrome wire
6. Determination of inside heat transfer coefficient in coil heat exchangers
7. Determination of overall heat transfer coefficient and effectiveness of a Double pipe heat exchanger
8. Determination of heat transfer area in a 1-2- shell and tube heat exchangers
9. Determination of heat transfer coefficient in a single tube by film wise and drop wise condensation
10. Determination of emissivity and Boltzmann"s constant of a sample body
11. Determination of heat transfer coefficient in forced convection
12. Determination of fin efficiency of longitudinal fins of extended surface
13. Determination of peak flux and critical temperature drop in pool boiling of saturated liquid
14. Determination of heat transfer coefficient of a pin fin under free convection
15. Determination of heat transfer coefficient of a pin fin under forced convection

Text Books:

1. W L McCabe, J C Smith and P Harriott, Unit Operations of Chemical Engineering, 7thEd., Tata-McGraw Hill Chemical Engineering Series, New Delhi, 2005

HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH C10 **CHEMICAL REACTION ENGINEERING I**

Instruction	3Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course helps the students to

1. Analyze experimental kinetic data to determine reaction mechanisms.
2. Design different types of chemical reactors (Batch, Tube, and CSTR).
3. Assess the advantages and disadvantages of reactor types.
4. Understand the concepts of non ideal reactors.

Course Outcomes: At the end of the course students will be able to

1. Classify reactions, rate and forms of rate expressions.
2. Summarize fundamentals of kinetics and interpret the data including relationships between moles, Concentration, extent of reaction and conversion.
3. Explain Batch, CSTR, and PFR performance equations from general material balances for homogeneous and heterogeneous reactions.
4. Identify the right reactor among single, multiple, recycle reactors etc.
5. Apply the concepts of heat effects on reactions.
6. Analyze the non ideality of reactors.

UNIT-I

Introduction: Classification of Reactions, Definition - Variables affecting the rate of reaction. The rate equation and Stochiometric relations for a single phase reaction aA+bB $\rightarrow$ rR+sS. Single and multiple reactions, Elementary and non-Elementary reactions, Molecularity and order of Reaction, Specific reaction rate constant, Testing kinetic models – Steady state approximation, Equilibrium treatment, Fitting a rate law for the given reaction mechanism, predictability of reaction rate from theory. Temperature dependency from Arrhenius' law, Thermodynamics, Collision theory and Transition state theory, Comparison of theories with Arrhenius' law.

UNIT-II

Analysis and Correlation of experimental kinetic data: Constant volume batch reactor: Analysis of total pressure data, conversion. Integral method of analysis of data for single reaction, multiple reactions, Homogeneous catalyzed reactions, Auto catalytic reactions, Reversible reactions, and Reactions of shifting orders. Half life method, Partial analysis of the rate equation .Differential method of analysis of data.

Variable Volume Batch Reactor: Fractional change in volume of the system, Differential method of analysis, Integral method of analysis.

UNIT-III

Introduction to Reactor Design: Ideal reactors for a single reaction, generalized material balance, design equations-Ideal batch reactor, Space time – space velocity, Steady state mixed flow reactor, Steady state plug flow reactor, Holding time and space time for flow reactors, graphical interpretation. Design for single reactions, Size comparison of single reactors, Multiple reactor systems, Recycle reactor, Auto catalytic reactions – optimum recycle operation, Reactor combinations.

UNIT-IV

Design for Multiple Reactions: Series, Parallel and Independent reactions, Selectivity, Yield, Qualitative discussion about product distribution, Quantitative treatment of product distribution and of reactor size.

Temperature and Pressure effects for single reactions, Heat of reaction from thermodynamics, Heat of reaction and Temperature, Equilibrium constants and equilibrium conversions from Thermodynamics. General graphical design procedure, Optimum temperature progression. Heat effects, Adiabatic Operations, Non adiabatic operations. Exothermic reactions in mixed flow reactors – a qualitative treatment.

UNIT-V

Basics of Non-Ideal flow: The residence time distribution (R T D), State of aggregation of the flowing stream, earliness of mixing, Role of R T D, state of aggregation and earliness of mixing in determining reactor behavior. Exit age distribution of fluid, Experimental methods for finding E – pulse and step input experiments, Relationship between F and E curves. The convolution integral. Conversion in non- ideal flow reactors,

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Dispersion model-Axial dispersion and correlations for axial dispersion.

Text Books:

1. Octave Levenspiel, Chemical reaction Engineering, 3rd Ed, Wiley India Pvt.Ltd, New Delhi, 2006.

Suggested Reading:

1. J. M. Smith, Chemical Engineering Kinetics, McGraw – Hill , Third Edition, 1981
2. H. Scott Fogler, Elements of Chemical Reaction Engineering, Prentice Hall, Third Edition, 2002.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH C11 **MASS TRANSFER I**

Instruction	3Hours per week
Duration of SEE	3 Hours
SEE	70Marks
CIE	30Marks
Credits	3

Course Objectives: This course helps the students to understand

1. Steady state, unsteady state diffusion mass transfer and determination of diffusivity in gas and liquids.
2. Mass transfer coefficients based on different mass Transfer Theories and their correlations with different analogies.
3. Description of Continuous and stage wise contact equipment- gas absorption and their equilibrium stages, number of transfer units.
4. Concept of distillation mass transfer operation and design the distillation column.
5. Concept of multi component distillation, azeotropic distillation and extractive distillation.

Course Outcomes: At the end of the course students will be able to

1. Apply the concepts of diffusion mass transfer to liquids and solids.
2. Estimate the mass transfer coefficients.
3. Design gas absorber by equilibrium method to find the number of theoretical stages.
4. Estimate the number of theoretical stages of distillation column using McCabe- Thiele and Ponchan-Savarit methods.
5. Explain extractive distillation and azeotropic distillation.

UNIT-I

Introduction: Diffusion and Mass Transfer – Mass transfer operations & their applications. Constitutive laws of diffusion, Molecular diffusion –Fick's first law – steady state molecular diffusion in binary3-\ mixtures of gases, liquids and solids – Determination of diffusivity in gases by Stefan-Maxwell method: estimation of diffusion coefficients in binary mixtures of liquids and gases by correlation; unsteady state diffusion

UNIT-II

Mass transfer coefficients: Convective mass transfer, inter phase mass transfer and mass transfer coefficients, Penetration theory, Surface Renewal Theory, Boundary Layer Theory. Mass transfer correlations for mass transfer coefficients and Reynolds & Colburn analogies. Effect of chemical reaction on mass transfer

UNIT-III

Gas – liquid contact: Description of Continuous and stage wise contact equipment, Equilibrium stages and transfer units: number and height of transfer units; stage efficiency.

Gas absorption plate and packed column design: Absorption and Stripping: counter current and co-current isobaric absorption and stripping of single component – Operating Lines – Minimum flow rates – Determination of number of plates – absorption factor. Determination of number of transfer units and height of a continuous contact plate and packed absorbers. Kremser – Brown equation for tray towers and packed towers, reactive absorption.

UNIT-IV

Distillation: VLE Phase diagrams – Tie lines and mixture rule – Flash vaporization and differential distillation for binary mixtures – Steam distillation. Batch distillation with reflux for binary mixtures. Continuous fractionation of binary mixtures, Ponchan – Savarit method, McCabe – Thiele method for determination of ideal plates for binary mixtures, Optimum reflux ratio, Use of total and partial condensers. Use of open steam, Packed bed distillation

UNIT-V

Introduction to multi component distillation, azeotropic distillation, extractive distillation

Text Books:

Binay K Dutta, Principles of Mass Transfer and Separation Processes,2nd edition, Prentice Hall of India,2007
R E Treybal, Mass Transfer Operations, 3rd Edition, McGraw Hill, New Delhi, 1983

Suggested Reading: C.J. Geankoplis, Transport Processes and Unit Operations, 3rd Edition, Prentice Hall, India, 1993

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH C 12 **HEAT TRANSFER**

Instruction	3L+1T Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	4

Course Objectives: This course will help the students to understand the
1. Basic concepts of heat transfer
2. Convective Heat Transfer and the concept of dimensional analysis
3. Concept and functioning of different heat exchangers
4. Heat transfer with change of phase and the functioning of evaporators
5. Radiation Laws and the concept of radiation shields, Design aspects of furnaces.

Course Outcomes: At the completion of this course students will be able to
1. Distinguish between different types of heat transfer
2. Analyze and understand the concepts of Heat exchangers
3. Calculate the rate of heat transfer with and without change of phase
4. Identify the type of evaporator required for a specific purpose and design it
5. Explain the impact of radiation shields and design aspects of furnaces.

UNIT - I

Fundamentals of Heat Transfer :- Modes of Heat Transfer, Derivation of Heat conduction equations in rectangular co-ordinates, thermal diffusivity, Differential equations of heat transfer-special forms – cylindrical co-ordinates system. One dimensional problem, heat transfer from extended surfaces, two dimensional problems, Lumped capacity systems, Insulation.

UNIT - II

Convective Heat Transfer: - Natural and forced convection in laminar and turbulent flow over plates and tubes. Dimensional Analysis, Thermal Boundary layer, Analogies and correlations. Design of Heat Transfer Equipment - Double Pipe Heat Exchanger, Concept of LMTD, Shell and tube Exchanger – Kern's method of design, Effectiveness - NTU methods, construction aspects in brief.

UNIT - III

Design aspects of finned tube and other compact heat exchangers. Basics of Heat Transfer with change of phase - Introduction to boiling. Types of boiling, Regimes of pool boiling and critical heat flux. Nucleate Boiling-Bubble formation, its growth and motion Introduction to condensation.

UNIT - IV

Derivation of Nusselt's equation. Design aspects of Condensers. Types of Evaporators, Capacity and Economy of Evaporators, Design aspects of Evaporators – Material and energy Balances of single and multiple effect evaporators. Heat Transfer to agitated vessels. Description and working of crystallizers

UNIT - V

Radiation – Fundamentals of Radiation Heat Transfer. Laws of black body Radiation. Radiation Shields .Radiating heat exchange between non black body surfaces. Design aspects of furnaces.

Text Books:

1. W.L.McCabe, J.C.Smirh and P.Harriott, 'Unit Operations of Chemical Engineering' 7th Edition,Tata-McGraw Hill, New Delhi , 2005
2. D.Q. Kern, 'Process Heat Transfer' 1st Edition Tata-McGraw Hill Publishers, New Delhi, 2001
3. Holman, J.P.S. Bhattacharya. Heat Transfer, 10th Edition, Tata-McGraw Hill, 2011

Suggested Reading:

1. Coulson JM and Richardson, J.F, Chemical Engineering Series,Vol 1, 4th Edition, Pergamon Press Oxford, UK, 1991
2. B K Dutta, Heat Transfer Principles and applications, PHI Learning Pvt Ltd, New Delhi, 2004
3. C P Gupta and Rajender Prasad, Engineering Heat Transfer, NemChand and Brothers , New Delhi, 2010

18CH C 13 **PARTICLE AND FLUID-PARTICLE PROCESSING**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course will help the students to understand the
1. Numerous industrial operations dealing with the particulate solids, their handling in various unit operations, and those in which particle-fluid interactions are important.
2. Fundamentals of fluid-particle mechanics, such as the notion of drag, and builds on those fundamentals to develop design concepts for various industrial processes like packed bed operation, fluidized operations, sedimentation, filtration, separation of solids and fluids, etc.
3. Industrial applications
4. Colloidal systems, soft materials and nano particles. Applications of these novel systems are discussed.
5. Concepts of Filtration and transport of fluid-solid systems

Course outcomes: After the completion of the course students will be able to
1. Identify and describe fluid-particle systems in terms of their basic physical properties
2. Explain size reduction energy requirements, estimate performance of equipment, selection and sizing of equipment.
3. Find drag force and terminal settling velocity for single particles.
4. Determine pressure drop in fixed and fluidized beds.
5. Apply separation techniques sedimentation, flocculation to separate a solid fluid mixtures
6. Analyze filtration data and select systems based on requirements, estimate filtration area for given requirements, understand filter aids and their usage.

UNIT- I

Introduction: Relevance of fluid and particle mechanics, and mechanical operations, in chemical engineering processes.
Introduction to nanoparticles: Properties, characterization, synthesis methods, applications.
Solid particle characterization: Particle size, shape and their distribution; Relationship among shape factors and particle dimensions; Specific surface area; Measurement of surface area. Size reduction, milling, laws of communition, classification of particles.
Size enlargement; Nucleation and growth of particles

UNIT- II

Flow around immersed bodies: Concept of drag, boundary layer separation, skin and form drag, drag correlations
Packed bed: Void fraction, superficial velocity, channeling, Ergun equation and its derivation, Kozeny Carman equation, Darcy's law and permeability, Blaine's apparatus.

UNIT- III

Fluidization: Fluidized bed, minimum fluidization velocity, pressure drop, Geldart plot etc. Types of fluidization: Particulate fluidization, Bubbling fluidization, Classical models of fluidization, circulating fluidized beds, Applications of fluidization.

UNIT- VI

Separation of solids from fluids: Introduction
Sedimentation: Free Settling, hindered settling, Richardson-Zaki equation, design of settling tanks.
Colloidal particles: stabilization, flocculation.
Centrifugal separation, design of cyclones and hydro cyclones

UNIT- V

Filtration: Concepts, design of bag filters, design of electrostatic filters.
Transport of fluid-solid systems: pneumatic and hydraulic conveying.

Text Books:
1. McCabe W, Smith J and Harriott, P. Unit Operations of Chemical Engineering, 6^{th} edition, McGraw Hill
2. Coulson and Richardson's Chemical Engineering, Vol. 2, Butterworth-Heinemann, 5^{th} edition 2002

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Suggested Reading:

1. Rhodes M J, Introduction to Particle Technology, 2^{nd} edition, John Wiley, Chichester; New York, 2008
2. Allen T, Powder Sampling and Particle Size Determination, Elsevier, 2003
3. Masuda H, Higashitani K., Yoshida H, Powder Technology Handbook, CRC, Taylor and Francis, 2006
4. Vollath D, Nanomaterials: An Introduction to Synthesis, Properties and Applications, 2nd Ed., Wiley, 2013

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH E 01 **WATER CONSERVATION AND MANAGEMENT**

(Core Elective I)

Instruction	3Hours per week
Duration of SEE	3 Hours
SEE	70Marks
CIE	30Marks
Credits	3

Pre-requisites: Environmental science (mandatory non-credit course)

Course Objectives: This course helps the students to understand:
1. Water sources, usage and need to protect them.
2. Water quality and standards
3. Water audits and testing methods.
4. Water management system.
5. Need for water conservation.

Course Outcomes: At the completion of this course, students will be able to
1. Identify the water storage methods in practice based on available sources and supply.
2. Understand the water quality parameters and analysis methods.
3. Classify the basic characteristics of water and their testing methods.
4. Explain the objectives of water harvesting and recycling methods.
5. Make use of water conservation methods at work place, agriculture, service and process industry.

UNIT – I Introduction:
Sources of water, Hydrologic cycle, multiple cycles – evaporation, precipitation, infiltration, runoff and subsurface flow. Composition of water sources like sea, rain, snow, river, lake. Need to protect water supplies, sources of water supply, types of water storage systems in practice.

UNIT – II Water quality and standards:
Physical, chemical and microbiological quality characteristics of water, water quality classification system in India, water quality parameters, standards of drinking water prescribed by different agencies, permissible limits of constituents of raw water supplied to industries, tolerance limits of industrial effluents, tolerance limits of inland surface water.

UNIT – III Water audits and testing:
Water rights and laws, water policy objectives, water quality related issues in India, major factors for water quality degradation, water quality – testing, preserving and control methods. Analysis of water –Physical, chemical and bacteriological tests practiced.

UNIT – IV Water management:
Water management services in India, key issues and principles of water management, integrated water resource management in India. Necessity and objectives of watershed management, approaches and practices, types of water harvesting– afforestation and rainwater harvesting, benefits, identifying locations. Water recycling – benefits, reuse drives.

UNIT – V Water conservation:
Water use, impacts and benefits, Water conservation methods, minimizing evaporation, water conservation practices and case studies in fields of agriculture, work place, service industry, process industry.

Text Books:
1. Elements of Water Pollution Control Engineering, OP Gupta, Khanna Publishing House, Delhi, 2019.
2. Glenn O. Schwab and R K Frevert, Water Conservation and Management Soil and Water Conservation Engineering, 3rd Ed., John Wiley & Sons, 1981

Suggested reading:
1. Water Supply and Sanitary Engineering, Rangwala, Charotar Publications, 2006.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH E 02 **RENEWABLE ENERGY**

(Core Elective I)

Instruction	3Hours per week
Duration of SEE	3 Hours
SEE	70Marks
CIE	30Marks
Credits	3

Course Objectives: This course will help the students to understand

1. Concept of various forms of Renewable energy resources and Non-Renewable energy resources.
2. Outline division aspects and utilization of renewable energy sources for both domestics and industrial applications.
3. Identify Wind energy as alternate form of energy and to know how it can be tapped.
4. Concepts of thermo and bio-chemical process along with novel technologies to conversion of biomass to Bio fuel.
5. Environmental and cost economics of using renewable energy sources.

Course Outcomes: At the end of the course students will be able to

1. Describe the environmental aspects of non-conventional energy resources compared with various conventional energy systems, their prospects and limitations.
2. Explain the use of solar energy and the various components used in the energy production with respect to applications.
3. Find out the need of Wind Energy and the various components used in energy generation and know the classifications.
4. Understand the concept of Biomass energy resources and their classification, types of biogas Plants-applications
5. Summarize the knowledge of Ocean energy, tidal energy, Geothermal energy.
6. Understand the Fuel cells principles and applications.

UNIT- I

Introduction: Renewable and Non Renewable Energy Resources, World energy status, Current energy scenario in India, Environmental aspects of energy utilization, Energy and sustainable development.

UNIT- II

Solar energy basic concepts, Flat plate and Concentrating collectors, Solar Thermal Applications-Heating, Cooling, Desalination, Drying, Cooking etc. Solar pumping, Solar photo voltaic conversion, Solar cells.

UNIT- III

Wind energy availability, Wind power plants, Wind energy conversion systems, Site characteristics, Types of wind turbines.

UNIT- IV

Energy from biomass, Biomass resources, Biomass conversion technologies - Direction combustion, Pyrolysis, Gasification, Anaerobic digestion, Biogas Plants, Bioethanol and Biodiesel production

UNIT- V

Other Renewable Sources –Ocean Energy Resources, Principle of OTEC, Tidal energy, Geothermal energy, Hydroelectric Power. Fuel cell –Principle of working -Various types -Construction and applications

Text Books:

1. Bent Sorensen, Renewable Energy, Elsevier, Academic Press, 2011
2. Bridgurater A V, Thermochemical processing of Biomass, Academic Press, 1981
3. Kishore V V N, Renewable Energy Engineering and Technology", Teri Press, New Delhi, 2012
4. Kreith F and Kreider J F, Principles of Solar Engineering, McGraw-Hill, 1978

Suggested Reading:

1. Godfrey Boyle, Renewable Energy Power for a Sustainable Future, Oxford University Press, U.K, 1996
2. Peter Gevorkian, Sustainable Energy Systems Engineering, McGraw Hill,2007

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

3. Sukhatme S.P., Solar Energy, Tata McGraw Hill, 1984
4. Twidell J W and Weir A, Renewable Energy Sources, EFN Spon Ltd., 1986.10.Veziroglu T.N., Alternative Energy Sources,Vol 5 and 6, McGraw-Hill, 1990
5. Anthony San Pietro, Biochemical and Photosynthetic aspects of Energy Production, Academic Press, 1980

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH E 03 **EXPERIMENTAL AND ANALYTICAL TECHNIQUES**
(Core Elective I)

Instruction	3Hours per week
Duration of SEE	3 Hours
SEE	70Marks
CIE	30Marks
Credits	3

Course Objectives: This course will help the students to
1. Acquire knowledge about the widely used analytical Instruments
2. Essential chemical and physical principles of analytical techniques
3. Understand & select Instrument for a particular analysis with some idea of its merits, demerits and limitations
4. Practical aspects of classical chemical analysis
5. Work as a service and maintenance engineering for these Instruments

Course outcomes: At the end of the course students will be able to
1. Build basic knowledge of analytical techniques
2. Distinguish the applicability of Microscopy techniques
3. Identify the suitable spectroscopy methods
4. Select the electro-analytical techniques
5. Infer the role of different separation techniques

UNIT-I
Microscopy Techniques: scanning electron microscopy (SEM); secondary Auger microscopy (SAM); scanning probe microscopy (SPM); scanning tunneling microscopy (STM); transmission electron microscopy (TEM); upright microscope, inverted microscope, image analysis.

UNIT-II
Spectroscopy methods: FTIR, AAS, UV-VIS, UV-fluorescent, Wavelength and energy dispersive X-ray fluorescence spectroscopy (WDS and EDS); X-ray absorption spectroscopy (XANES and EXAFS); secondary ion mass spectrometry (SIMS); temperature programmed desorption (TPD); thermal desorption spectroscopy TDS), ICP-OES, XRD.

UNIT-III
Atomic absorption spectroscopy (AAS); inductively coupled plasma-atomic emission spectroscopy (ICP-AES).

UNIT-IV
Electro analytical Techniques: Voltametry; coulometry; amperometry; potentiometry; polarography; electrolytic conductivity; impedance spectroscopy, rotating disc electrode, rotating ring disc electrode.

UNIT-V
Separation Methods: Normal and reversed phase liquid chromatography (NP-& RP-LC); Gas Chromatography (GC); GC-MS; High Performance Liquid Chromatography (HPLC); Size-Exclusion Chromatography (SEC); Ion Chromatography (IC)

Text Books:

1. Wiesendanger, Scanning Probe Microscopy and Spectroscopy, Cambridge University Press, 1994
2. Frank A Settle, Handbook of instrumental techniques for analytical chemistry, Prince Hall, New Jersey, 1997

Suggested Reading:

1. D A Skoog, D M West, F. J. Holler and S. R. Couch, Fundamentals of analytical chemistry. Brooks/Cole Cengage learning, New Delhi, 2004
2. P Atkins and J de Paula, Atkins' Physical Chemistry, Oxford University Press, New Delhi, 8th Edition, 2008
3. K W Kolasinski, Surface Science: Foundations of Catalysis and Nano science, John Wiley and Sons, 2002

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH E 04 **POLYMER SCIENCE AND TECHNOLOGY**

(Core Elective II)

Instruction	3Hours per week
Duration of SEE	3 Hours
SEE	70Marks
CIE	30Marks
Credits	3

Course objectives: This course helps the students to understand

1. The fundamental - chemical, physical and mechanical behaviour of polymers.
2. The structure-processing-property relationship of polymers.
3. The processing techniques, along with the production of polymers.
4. The synthesis, manufacture, processing and characterization of different polymers
5. The basic issues involved in polymer blends, composites and nano composites.

Course Outcomes: At the end of the course students will be able to

1. Explain the basic concepts of polymers, polymerization techniques and behaviour in polymers
2. Distinguish different types of polymerization.
3. Determine the molecular weight of polymers by different techniques
4. Familiarize with various processing techniques for polymers, rubbers and fibers
5. Summarize the manufacturing and characterization of various industrially important polymers

UNIT - I

Definitions and concepts of terms used in polymer engineering, Classification of polymers; Polymer structures, functionality; polymerization reactions – mechanism of polymerization; stereospecific polymerization, copolymerization. Polymer material structure and Properties: Deformation, flow and melt characteristics. Morphology and order in crystalline polymers. Rheology and the mechanical properties of polymers. Polymer structure and physical properties

UNIT - II

Polymerization reactors, polymerization processes, characterization of polymers, analysis of polymerization reactions, polymer degradation, Condensation polymerization, Addition polymerization, Ionic and coordination polymerization.

UNIT - III

Molecular weight and molecular weight distribution in polymers, properties of polymers – physical, chemical, mechanical and electrical properties of polymers, elementary idea on polymer rheology, polymer blends. Experimental methods for molecular weight determination: cryoscopy, ebulliometry, membrane osmometry, light scattering method, viscometry, intrinsic viscosity measurement, gel permeation chromatography. Structure and Properties: Thermal transitions, Crystallinity, Molecular weight characterization, Nuclear Magnetic Resonance (NMR) and Fourier Transform Infrared (FTIR) techniques.

UNIT – IV

Polymer processing: modeling – compression & transfer, injection & jet; casting; extrusion, calendaring, lamination, spinning & finishing. Processing methods , effect of additives used, plasticizers, colourants, heat stabilizers, antioxidants, ultraviolet absorbers, antistatic agents, flame retardants, blowing agents, fillers etc. Molding techniques for plastics, injection molding, compression molding, calendaring, blow moulding, extrusion, thermoforming, spinning methods for fibres, compounding methods for elastomers, general study of elastomer processing methods.

UNIT - V

Industrial polymers: Manufacturing processes, properties and uses of Polyethylene, Polypropylene, Polyvinylchloride, Polystyrene, Nylon, Polyethylene terephthalate. Hydrocarbon plastics and elastomers. Other carbon chain polymers. Heterochain thermoplastics. Thermosetting resins. Polymer Blends: Types, Compatibility, Thermal and Mechanical Properties. Polymer Composites: Types, Properties, Preparation, Fibre-reinforced composites, In-situ composites. Polymer Nanocomposites: Basic concepts, Processing, Characterization.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Text Books:

1. Text Book of Polymer Science, F. W. Billmeyer, John Wiley, New York, 1962
2. Polymer Science &Technology, P.Ghosh, TMC, 2001

Suggested Reading:

1. The elements of Polymer Science & Engineering, Alfred Rudin, Academic Press, 2nd Edition,1998
2. Introduction to Polymers, R. J. Young, Chapman & Hall, London, 1991

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH E 05 **GREEN TECHNOLOGY**

(Core Elective II)

Instruction	3Hours per week
Duration of SEE	3 Hours
SEE	70Marks
CIE	30Marks
Credits	3

Course Objectives: This course helps the students to understand

1. Green systems and the environment
2. Life cycle assessment
3. Environment sustainability
4. Alternative energy technologies and efficient process systems
5. Sustainable product production and utilization

Course Outcomes: At the end of the course students will be able to

1. Describe the principles of green chemistry
2. Identify manufacturing processes for waste minimization
3. Identify technologies to reduce the level of emissions
4. Understand the importance of eco-friendly solvents
5. Apply principles of green chemistry to design greener processes

UNIT – I

Principles and Concepts of Green Chemistry: Introduction, Sustainable Development and Green Chemistry, Rearrangement Reactions, Addition Reactions, Atom Un-economic Reactions, Substitution Reactions, Elimination Reactions, Wittig Reactions, Toxicity.

UNIT – II

Waste - Production, Problems and Prevention: Introduction, Some Problems Caused by Waste, Sources of Waste from the Chemical Industry, the Cost of Waste, Waste Minimization Techniques.
Measuring and Controlling Environmental Performance: The Importance of Measurement, Introduction to Life Cycle Assessment, Green Process Metrics and Environmental Management Systems.

UNIT – III

Emerging Greener Technologies and Alternative Energy Solutions: Design for Energy Efficiency, Photochemical Reactions, Advantages and Challenges Faced by Photochemical Processes, introduction to microwave heating and sonochemistry, Electrochemical Synthesis.

UNIT – IV

Organic Solvents and Volatile Organic Compounds: Solvent-free Systems, Water as a Reaction Solvent, Water-based Coatings, Ionic Liquids as Catalysts and Solvents.

UNIT – V

Designing Greener Processes: Conventional Reactors - Batch and Continuous, Inherently Safer Design, Process Intensification.
Inherently Safer Design: safety in design, case studies of major accidents
An Integrated Approach to a Greener Chemical Industry: Society and Sustainability, Barriers and Drivers, EU White Paper on Chemicals Policy, Green Chemical Supply Strategies.

Text Books:

1. Mike Lancaster, Green Chemistry, Royal Society of Chemistry,2010
2. Paul T Anastas, John C Warner, Green Chemistry: Theory and Practice, Oxford University Press,2000

Suggested Reading:

1. Jay Warmke, Annie Warmke, Green Technology, Educational Technologies Group, 2009
2. James Clark and Duncan Macquarrie, Handbook of Green Chemistry & Technology, Blackwell Publishing, 2002

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH E 06 **CATALYSIS**

(Core Elective II)

Instruction	3Hours per week
Duration of SEE	3 Hours
SEE	70Marks
CIE	30Marks
Credits	3

Course objectives: This course helps the students to understand

1. Different types of catalysts, their structures and synthesis processes
2. Mechanism and kinetics of heterogeneous catalysts
3. Physical and chemical catalytic properties
4. Applications of catalysis in processes
5. Catalytic reactions and reactor design

Course Outcomes: At the end of the course, student will be able to

1. Explain the basic concepts of catalysis
2. Summarize the methods of preparation and characterization of catalysts
3. Analyze the role of heat and mass transfer in the catalytic reactor design
4. Distinguish the performance of catalytic reactors
5. Identify the role of catalysts in the environmental protection
6. Explain the commercial aspects of catalytic reactors

UNIT – I

Catalysis: Introduction to Catalysis, Comparison of Catalyst Types, Basics of Heterogeneous and Homogeneous Catalysis.

UNIT – II

Basic concepts in heterogeneous catalysis: Catalyst preparation and characterization, Optimal distribution of catalyst in a pellet. Surface reactivity and kinetics of reaction on surfaces, poisoning and regeneration.

UNIT – III

Heat and mass transfer and its role in heterogeneous catalysis. Calculations of effective diffusivity and thermal conductivity of porous catalysts

UNIT – IV

Industrially important catalysts and processes such as oxidation, processing of petroleum and hydrocarbons, synthesis gas and related processes, Environmental catalysis. Zeolite catalysts, preparation, characterization and applications

UNIT – V

Commercial Catalytic Reactors (Adiabatic, fluidized bed, trickle bed, slurry etc.). Selection and design and preparation of catalysts

Text Books:

1. John Meurig Thomas, W. J. Thomas, Principles and Practice of Heterogeneous Catalysis, Wiley VCH; 2nd Edition, 2014
2. James John Carberry, Chemical and Catalytic Reaction Engineering, Dover Publications, INC,2001

Suggested Readings:

1. L K Doraiswamy, M MSharma, Heterogeneous Reactions: Fluid-fluid- solidReactions,Wiley,1984
2. B Viswanathan, S Sivasanker, and A V Ramaswamy, Catalysis: Principles and Applications ,Narosa Publishing House, 2002

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH C 14 **CHEMICAL ENGINEERING LAB I A (MECHANICAL UNIT OPERATIONS)**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

List of Experiments

1. Verification of the laws of size reduction using Jaw crusher.
2. Verification of the laws of crushing using drop weight crusher and determination of work index.
3. Determination of laws of crushing in a pulverizer.
4. Verification of the comminution laws and critical speed of a ball mill
5. Analysis of various sizes of given material by sieve analysis and determination of cumulative and differential analysis.
6. Determination of the specific cake resistance and medium resistance in a vacuum filter or plate and frame filter press.
7. Calculation of the effectiveness of screen in horizontal and inclined position (vibrating screens)
8. Determination of separation factors of air and hydraulic classifiers.
9. Determine settling rate classification of particles using cyclone separator and to determine the efficiency
10. Determination of the froth flotation characteristics in mineral concentration

Text Books

1. W. L. McCabe, J. C. Smith and P.Harriott , Unit Operations of Chemical Engineering, 7th Ed., Tata-McGraw Hill Chemical Engineering Series, New Delhi, 2005.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH C 15 **CHEMICAL ENGINEERING LAB I B**
(FLUID MECHANICS AND HEAT TRANSFER)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

List of Experiments

Fluid Mechanics

1. Determination of critical velocity by Reynolds Experiments.
2. Determination of friction factor for flow through pipes with bends of different diameters and study of variation of friction factor with Reynolds number.
3. Determination of friction factor for flow of water through annulus using Fanning's and Darcy's equations.
4. Determination of characteristic curves for centrifugal pumps.
5. a) Determination of friction factor for packed beds.
   b) Determination of minimum fluidization velocity

.

Heat Transfer

1. Determination of interface temperatures in composite wall under steady state conditions.
2. Determination of heat transfer coefficient in Natural convection.
3. Determination of heat transfer coefficient in forced convection.
4. Determination of emissivity and Boltzmann's constant of a sample body
5. Determination of heat transfer area in a 1-2- shell and tube heat exchangers

Text Books:

1. B.K. Dutta, 'Heat Transfer Principles and applications', PHI Learning Pvt Ltd, New Delhi,2004.
2. W. L. McCabe, J. C. Smith and P.Harriott , Unit Operations of Chemical Engineering, 7th Ed., Tata- McGraw Hill Chemical Engineering Series, New Delhi, 2005.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH C16 **CHEMICAL REACTION ENGINEERING – II**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives This course helps the students to understand

1. Basic Concepts of Catalysis
2. Kinetics and Mechanistic aspects of Catalysts
3. Design and Rating of Catalytic Reactors
4. Design Aspects of Gas-Liquid Reactors

Course Outcomes At the end of the course, a student will be able to

1. Indentify and characterize solid catalysts
2. Explain the kinetics for solid catalyzed reactions
3. Interpret the kinetics of fluid and particle reactions
4. Identify regions of mass transfer control and reaction rate control in fluid-fluid reactions
5. Apply the concepts to Gas fluid and catalytic reactors

UNIT – I

Solid Catalysts - Adsorption, adsorption isotherms, surface area, void volume and solid density, pore volume distribution. Theories of heterogeneous catalysis, classification of catalysts, catalyst preparation, promoters and inhibitors

UNIT – II

Solid Catalyzed Reactions - Introduction; Development of rate expressions from L- H - H - W models for reaction A + B ↔ R + S under adsorption, surface reaction and desorption controlling condition. Pore diffusion resistance combined with surface kinetics (Single cylindrical pore, first order reaction) Porous catalyst particles, mass and heat transfer within catalyst pellets. Experimental methods for finding rates.

UNIT – III

Kinetics of fluid-particle reactions: selection of a model, PCM, SCM, comparison of models with real situations. Shrinking core model for spherical particles of unchanging size: Diffusion through gas film controls, Diffusion through ash layer controls, chemical reaction controls. Rate of reaction for shrinking spherical particles.

UNIT – IV

Kinetics of fluid - fluid reactions: The rate equation for straight mass transfer of A (absorption). The general rate equation and the rate equation for reaction with mass transfer.

UNIT V

Fluid Fluid Reactors: Design of reactors for straight mass transfer and mass transfer plus not very slow reaction cases

Catalytic gas solid reactors: Design of single adiabatic fixed bed catalytic reactor

Text Books

1. Levenspiel O., “Chemical Reaction Engineering”, 3rdEdition, John Wiley & Sons, Singapore, (1999).
2. Fogler H. S., “Elements of Chemical Reaction Engineering”, 3rdEdition, Prentice Hall Inc., (1999)
3. Smith J. M., “Chemical Engineering Kinetics”, 3rdEdition, McGraw Hill, (1981).

Suggested References Books

1. Chemical and Catalytic Reaction Engineering, Carberry, J. J., Dover Books on Chemistry, 2001.
2. Chemical Reactor Analysis and Design Gilbert F. Froment, Kenneth B. Bischoff, Juray De Wilde, John Wiley & Sons, Incorporated, 2010

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH C17 **MASS TRANSFERS- II**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course will help the students to understand the
1. Principles of mass transfer operations to specific applications, separation and/or purification processes.
2. Theoretical/analytical aspects to design mass transfer equipments and to deal with complex problems of separations.
3. Suitable equipment required for various types of mass transfer operations.
4. Different types of Membrane process
5. Given industrial problem and apply concepts of mass transfer operations

Course outcomes: At the completion of this course, students able to
1. Understand the concept of different mass-transfer operations and their concerned equipment used in the chemical industries.
2. Interpret the importance and the role of liquid–liquid extraction and leaching in Separation Process
3. Articulate the process of adsorption and the equipment used in chemical industry
4. Calculate the enthalpies and interpret psychometric charts and design of cooling towers and drying equipment.
5. Distinguish among micro-filtration, ultra-filtration, nano-filtration, and reverse osmosis

UNIT – I: Introduction: Perspective on unified approach to operations.
Liquid – Liquid Extraction: Solubilities of ternary liquid systems. Triangular and solvent free coordinate systems. Choice of solvent. Extraction with insoluble and partially soluble systems – single stage, multistage cross-current and multistage counter-current extraction without reflux and Continuous contact extraction (packed beds). Equipment's for liquid – liquid extraction operation. Solid-Liquid Extraction:
Leaching: Preparation of solid, unsteady state operation, in-place leaching, heap leaching, percolation leaching, Shanks system, agitated vessels, percolation in closed vessels, Percolation Vs Agitation. Steady state continuous operation–equipment, methods of calculation of stage efficiency and practical equilibrium. Single stage leaching, multistage cross current leaching, multistage counter current leaching.

UNIT-II: Adsorption:
Principles of Adsorption and their applications – Types of adsorption – Adsorbents – Adsorption equilibrium – Adsorption Isotherms for vapor and dilute solutions. Single stage and multistage adsorption, Adsorption wave and breakthrough curve and fixed bed adsorption. Equipment for Adsorption operation, fixed bed adsorbers, break through . **Ion Exchange**: Principles of ion exchange, analogy between adsorption and ion exchange.

UNIT–III: Simultaneous Heat and Mass Transfer:
Humidification & Dehumidification: Vapour, gas mixtures – Humidity and relative saturation. Dew point adiabatic saturation and wet bulb temperatures – psychometric charts – Enthalpy of gas vapor mixtures. Humidification and Dehumidification techniques.
Design of Cooling Towers: Design calculations of cooling tower, Key points in the design of cooling tower step by step procedure of cooling tower.

UNIT-IV: Drying:
Equipments for Drying, moisture contents of solids – equilibrium, bound and unbound moisture. Design conditions – Rate of batch drying under constant drying conditions – Mechanism of batch drying – total time for batch drying.

UNIT-V: Membrane Process:
Types and choice of Membranes, Plate and Frame, tubular, spiral wound and hollow fiber Membrane Reactors and their relative merits, commercial, Pilot Plant and Laboratory Membrane permeators involving Dialysis, Reverse Osmosis, Nanofiltration, Ultra filtration and Micro filtration.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Text Books

1. R.E.Treybal, Mass Transfer Operations, 3rd Edition, McGraw Hill, New Delhi, 1983
2. Binay K.Dutta, Principles of Mass Transfer and Separation Processes,2nd edition, Prentice Hall of India,2007

Suggested Readings:

1. C.J. Geankoplis, Transport Processes and Unit Operations, 3rd Edition, Prentice Hall, India, 1993

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH C 18 **PROCESS CONTROL**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Material and Energy Balance Calculations, Chemical Reaction Engineering - I

Course Objectives: To provide a conceptual and methodological framework to
1. Mathematical modeling based on transfer function approach for single loop systems
2. Feedback control of processes - concepts, terminology, methods, and performance
3. Obtain dynamic response of open loop and closed loop systems
4. Stability analysis in transient and frequency domains
5. Controller tuning methods and advanced control strategies

Course Outcomes: At the end of the course the student will be able to:
1. Characterize and analyze the dynamic behavior of linear systems (First and Second order)
2. Build block diagrams for simple chemical processes
3. Analyze stability, speed of response, frequency response, of simple feedback control systems
4. Analyze and tune process controllers
5. Empirically identify process dynamics

UNIT – I
Introduction: Need for control and automation, Laplace transforms, solution of ODEs using Laplace transform, Response of First order system, Transfer Function, Transient response to step, impulse, sinusoidal forcing function, physical examples of first order systems, liquid level, mixing process, concept of time constant, linearization, response of first order systems in series, interacting and non-interacting systems

UNIT – II
Response of Second Order Systems: Transient response of under damped, critically damped, over damped systems to step, impulse and sinusoidal forcing functions. Transportation lag
Control Systems: Negative and Positive feedback control systems, Servo and Regulatory control problems, Development of Block diagram, Controllers and final control elements, Ideal transfer functions of P, PI, PD and PID controllers

UNIT – III
Reduction of physical control systems to block diagrams, closed loop transfer functions for servo and regulator problems. Overall Transfer functions for multi loop control systems. Transient response of simple control systems for servo and regulator problems, measurement lags. Stability of a control system by Routh's Criterion

UNIT – IV
Root Locus: concept of root locus, plotting of the root locus diagram for feedback control systems, Transient response of control system from root locus plot.
Frequency response: Bode diagrams for first order, first order system in series, second order systems and for controllers and transportation lag. Bode stability criterion, Introduction to Nyquist stability criterion

UNIT – V
Advanced Control Strategies: Cascade Control, Feed Forward Control, Ratio control, Smith-predictor, IMC, MPC, dead-time compensation
Controller Tuning and Process Identification: ISE, ITAE, IAE, Ziegler – Nicholas and Cohen-Coon tuning methods, process identification by step testing

Text Books:
1. Donald R. Coughanowr , Steven E LeBlanc, "Process Systems Analysis and Control", 3rd edition, McGraw Hill Education (India) Edition 2013

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Suggested Reading:

1. George Stephanopoulos , "Chemical Process Control: An Introduction to Theory and Practice", Prentice-Hall of India, 1984
2. Peter Harriott , "Process Control", Tata McGraw – Hill Ltd.
3. Seborg, Edgar, Mellichamp and Doyle, "Process Dynamics and Control", 3rd Edition, Wiley India Pvt. Ltd., 2014

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH E07 **FLUIDIZATION ENGINEERING**
(Core Elective III)

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course helps the students to understand:

1. Basic fundamentals of fluidization and fluidized bed behavior.
2. Minimum fluidization and pressure drop across the bed.
3. Various models to analyze the behavior and mixing patterns.
4. Heat and mass transfer aspects of fluidized bed.
5. Concepts of fluidized bed combustion chamber.

Course Outcomes: At the end of the course, the students will be able to:

1. Determine the minimum fluidization velocity and optimum operating fluidization velocity.
2. Design the fluidized bed in terms of pressure drop across the bed
3. Construct the distributors, TDH, height, diameter, power consumption of compressor for air.
4. Distinguish between boiler and furnaces, methods of starting up.
5. Estimate the amount of chemicals required to control the emission like SO_2.

UNIT – I: INTRODUCTION:
Processes involving contact between solid particles and a Fluid, Packed Beds, Fluidized Beds advantages and disadvantages of fluidized beds for industrial applications. Fundamental fluidized bed behavior, Fast fluidization, circulating fluidized beds. Particles and Fluidization: Physical properties of solid particles, size and shape, size range, surface area of particles in a bed, Bed voidage, classification of particles according to Fluidization characteristics, pressure drop across packed beds, minimum fluidization velocity and its determination.

UNIT – II: TWO – PHASE THEORY OF FLUIDIZATION:
Bubbles and Fluidization Regimes, Bubble rise velocity, Bed expansion, Bubble growth and slugging, Mixing, Elutriation and Transport of solids, General mechanism of mixing of particles, mixing and segregation of particles, Terminal velocity of particles, Elutriation, transport disengaging height, solids transport. Davidson’s Model, Diffusion model, Bubbling bed model ideal mixing stage model, two regime models.

UNIT – III: FLUIDIZED BED HEAT TRANSFER:
Heat Transfer in Beds of Particles, Gas -to- particle heat transfer, Bed – to- surface heat transfer, particle convection component, interphase gas connective component, Radioactive component, Estimation of Bed–to surface Heat Transfer coefficient, Heat Transfer between the Bed-Distributor, side walls, immersed tubes or components, Heat Transfer to surfaces located above the Bed, Free surface.

UNIT IV: DESIGN OF SIMPLE FLUIDIZED BEDS:
Introduction, Estimation of Bed Dimensions and Fluidizing velocity, Transport disengaging Height, Distributors, Heat removal from fluidized beds from cooling tubes in the bed, optimum size of a fluidized bed reactor. Power consumption.

UNIT – V: FLUIDIZED BED COMBUSTION:
Introduction, combustion systems for solid fuels combustors and the first law of thermodynamics, fluidized Bed combustion of solid fuels size of fluidized bed combustion system, size of inert particles in the bed, turndown efficiency of fluidized bed combustion, Equipment, combustion of fuel particles in a fluidized bed, Distinguish between boiler and furnaces, methods of starting up, circulating or fast fluidized bed combustion systems, control of emission of SOx ,CO and CO2

Text Books:
1 . J.R. Howard Adam Hilger, “Fluidized Bed Technology -Principles & Applications”, IOP, Pub Ltd., NY. 1989.

Suggested Readings:
1. Diazo Kuni & Octave Levenspiel, “Fluidization Engineering”, 2nd Edition, John Wiley and Sons, 2002.
2. John M. Matsen, Grace John R , “Fluidization”, Springer-Verlag New York Inc., 1980.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH E 08 **PETROCHEMICAL TECHNOLOGIES**

(Core Elective III)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course objectives: This course helps the students to understand the
1. Petroleum refineries worldwide.
2. Extraction and production of oil and gas to meet energy needs.
3. Importance of refining crude oil for a wide spectrum of useful products such as petrochemicals, plastics.

Course Outcomes: At the end of the course, the students will be able to
1. Explain the composition, applications and formation theories of crude
2. Summarize the refining process of crude oil.
3. Classify Ethylene derivatives and summarize their manufacturing processes.
4. Outline Propylene and C_4 derivatives and explain their manufacture processes.
5. Classify higher paraffin derivatives and outline manufacturing processes.
6. Identify Aromatic derivatives sources and separation methods for aromatics.

UNIT–I

Origin and formation of petroleum:- Organic theories, Inorganic theories and biological methods for explaining the formation of Crude oil. **Definition of refining terms :-** API Gravity, Aniline point, Octane number, Cetane number, Smoke point, Fire point, Flash point, Diesel Index, Naphtha, Types of Naphtha etc. Composition and applications of crude oil. **Petroleum Refining: -** Overall refining of crude petroleum. Production of gasoline, kerosene and lubricating oils.

UNIT– II

Rebuilding of Hydrocarbons and techniques involved: **Naphtha cracking:** Definition, types, reactions, fluidized bed cracking, description of the reactors. **Alkylation:-** Hydrofluoric acid process and sulphuric acid process **Isomerization:-** Aluminum chloride process and isomerization with platinum catalyst. **Polymerization:** - Types of polymerizations,

mechanism of polymerization, polymerization in presence of sulphuric acid, polymerizations in presence of phosphoric acid.

UNIT– III

Ethylene Derivatives: - various products with ethylene as the starting materials. **Manufacturing of the following:-** Vinyl Chloride Monomer, Perchloroethylene – pyrolysis of carbon tetra chloride, chlorination and pyrolysis method, Ethyl alcohol by direct hydration and liquid phase hydration methods, Vinyl acetate monomer, Ethylene oxide and its applications , Polyethylene, Styrene.

UNIT – IV

Propylene derivatives: - list of propylene derivatives. **Manufacturing of the following:-** Isopropyl alcohol, Acetone by catalytic dehydrogenation, Propylene oxide, Glycerine by Acrolein, allyl chloride and by isomerization of propylene oxide methods. **Derivatives of C_4 Hydrocarbons:** List of butadiene derivatives, Manufacturing of butadiene from n-butylene and by oxidative dehydrogenation. Purification of butadiene

UNIT –V

Derivative of Higher Paraffins: Manufacturing of Isoprene, olefins of C5 , C6,long chain and straight chain Olefins.

Derivatives of Aromatics: - Sources of aromatic compounds, production of aromatics. Effect of temperature, pressure and catalyst on dehydrogenation process. Separation of aromatics from Non-aromatics and separation of aromatics into individual streams

Text Books:

1. W.L.Nelson, "Petroleum refinery engineering" 4th ed., McGraw Hill company, 2013.
2. B.K.Bhasker Rao, "Modern petroleum refining process", 5th ed., Oxford and IBH, 2008.

Suggested Reading

1. N.K.Sinha, "Petroleum Refining and Petro Chemicals", 1st edition, Umesh publications , 2003.
2. Kirk-Othmer, "Encyclopedia of Chemical Technology", 3rd Ed..John Wiley and sons.Inc, 2004.
3. Meyers Robert, "Hand Book of Petroleum Refining Processes", 3rd edition McGraw Hill, 2003

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH E 09 **BIOCHEMICAL ENGINEERING**
(Core Elective III)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course helps the students to

1. understand the functions of living cells
2. apply the principles of Chemical Engineering to bioprocesses.
3. conduct analysis on the biological factors that are important in the design, operation, performance and/or monitoring of a biological process
4. understand the significance of microbes and enzymes
5. understand the applications of different bio processes

Course Outcomes: On successful completion of this module, students should be able to

1. Describe the basic structure and function of cells & relate cell function to products and processes useful to man
2. Explain classification, growth concepts and various types of interactions in microbes
3. Illustrate the significance of enzymes as biocatalysts and immobilized enzymes.
4. Identify and explain the basic features of bioreactors
5. Describe the principles of the various separation procedures involved in the downstream processing of products
6. Summarize the principles of Fermentation technology and products from Industrial biotechnology

UNIT – I Introduction to Biochemical Engineering, Molecular Biology& Bio Chemistry

Biochemical Engineering Principles, Biophysics and cell doctrine: Atomic Theory and Cell Theory, Important cell types, structure and functions of a typical cell and their components, Transport across cell membranes: Passive and facilitated diffusion, Active transport Structure and functions of Bio Molecules: Carbohydrates, lipids, Nucleotides to Nucleic Acids – RNA and DNA, Amino acids to Proteins - the building blocks of biochemical life Biosynthesis and Metabolic Pathways: Biosynthesis of Small and Macro Molecules Introduction of metabolic pathways and end products of glucose metabolism.

UNIT – II Introductory Microbiology

Introduction to Microbiology: Classification and Industrial uses of Microorganisms Growth and Reproduction of Microbes: Growth cycle phases for batch cultivation. Monod's growth kinetics – Growth Rate dependant classification of Microorganisms.

Microbial Genetics: Recombinant DNA technology and mutant populations. Multiple Interacting Microbial populations: Neutralism, Mutualism, Commensalism, Amesanalism, Predatism and Parasitism

UNIT – III Enzyme Technology

Enzymology: Enzymes as Biocatalysts - The enzyme substrate complex and enzyme action and Classification of Enzymes based on Functions.

Kinetics of Enzyme Catalyzed Reactions: Simple enzyme kinetics with one and two substrates. Determination of rate constants, substrate activation and inhibition, modulation and regulation of enzyme activity / effect of PH and temp on enzyme activity.

Immobilized Enzyme Technology: Types of Enzyme immobilization, Immobilized enzymes in industrial processes,

Cofactors, Apo-enzymes and Coenzymes utilization and regeneration

UNIT – IV Bioreactors and Down Stream Techniques - Introduction

Design and Analysis of Biological Reactors: Batch and Continuous Stirred Tank Reactors, Enzyme reactors Ideal

Reactors for kinetic measurements: The ideal batch reactor / The ideal continuous flow stirred tank reactor - Alternate bio-reactor configurations

Separation Processes: Filtration, Centrifugation, Adsorption, Reverse osmosis, Dialysis, Electrophoresis, Sedimentation and Extraction Purification Processes: Precipitation, Crystallization, and Chromatography

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

UNIT – V Bioprocess Technology

Fermentation Technology: Types of Fermentation, Medium formulation and Culture Propagation, Environmental Biotechnology: Effluent treatment.

Industrial Biotechnology: Commercial enzymes, Antibiotics and single cell protein

Text Books:

1. James, E Bailey and David F Ollis, "Biochemical Engineering fundamentals", 2nd Edition, McGraw-Hill Internal Edition.1986
2. Prof. Shigeo Katoh, Prof. Fumitake Yoshida, "Biochemical Engineering: A Textbook for Engineers, Chemists and Biologists", First Edition, Wiley-VCH Verlag GmbH & Co. 2010

Suggested Reading:

1. Michael L Shuler and Fikret Kargi, "Bioprocess Engineering: Basic Concepts". Second Edition Prentice Hall, 2002

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH E10 **SUGAR TECHNOLOGY**

(Core Elective IV)

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course helps the students to understand**:**

1. The performance measures of different types of unit operations in sugar processing.
2. Applications, advantages and limitations of the processing procedure.
3. The competence and optimization of advanced technology in sugar processing.
4. The possible by-products of any sugar industry and production of saleable derivatives.

Course Outcomes: At the end of the course, the student able to:

1. Apply Principles and skills of work in sugar cane milling, processing and refining in practical settings.
2. Determine the composition of different types of sugars by volumetric and gravimetric methods.
3. Explain the unit operations for effective processing of cane juice, Batch and continuous methods
4. Identify the concepts of quality assurance and control in industry as per Indian regulations and practices.
5. Summarize the methods to reclaim by-products.

UNIT - I

Importance of sugar industry. Different raw materials for sugar manufacturing, composition of raw materials, history, origin and distribution of sugarcane, production and productivity of sugarcane in India. Indian sugar industry on global screen. Manufacturing processes of raw sugar and crystalline white sugar. Reducing sugars - composition, volumetric and gravimetric determination methods.

UNIT - II

Conveying of raw materials - cane carrier and feeding table working principles. Cane preparation – objective, sieving, preparation index, cane knives, crushing and shredding applications. Extraction of cane juice by milling operation - basic concept of roller mills, working principles, conditions for good milling operation, milling efficiency, maceration and imbibitions – importance, effect, method, objective and efficiency. Cane juice clarification – simple, compound and neutral defaction procedures. Sulphitation and carbonation - batch and continuous methods. Single and double carbonation process, De-Hans‟ process, comparison of different clarification modern techniques.

UNIT - III

Juice heaters - construction and working principles. Juice filtration - plate and frame filter presses, RVDF, types of filter cake washing. Evaporation- multiple effect evaporators - construction and operation. Steam economy and capacity. Vacuum pan boiling - construction, types of pans, speed of circulation, heating surface to volume ratio, pan boiling techniques, different boiling schemes.

UNIT - IV

Crystallization – nucleation, graining methods, advantages and disadvantages of graining. Theory of crystallization, crystallization zone, crystal growth. centrifuge –construction & working, factors influences on time of curing. Advantages and disadvantages of batch / continuous centrifugal machine. Separation of molasses-different molasses conditioning methods, precautions during molasses conditioning. Sugar drying - various aspects regarding drying and cooling, rotary dryer. Packing of sugar -types of sugar grader, dilution indicator, quality and safety factors, location and stalking of sugar bags.

UNIT - V

Sugar by-products: bagasse, press mud and molasses- their composition and applications. Production of bio-gas, fiber board, furfural filter mud, extraction of cane wax, manure, industrial alcohol and rectified spirit. Sugar scales and normal weight.

Text Books:

1. Meade and Chen, “Hand of book of cane sugar”, 11th Ed, Wiley Inter science, New York, 2001.
2. James C.P Chen, “Cane Sugar Hand book”, 12th Ed, Elsevier Pub. Co., New York, 1993.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Suggested Readings:

1. R B L Mathur, Hand Book of Cane Sugar Technology", 2nd Ed, Oxford & IBH, 1978. 2. 2.John H. Payne, "Unit operation in cane sugar production", Sugar series book 4, Elsevier Pub. Co., New York, 1982.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH E11 **PULP AND PAPER TECHNOLOGY**
(Core Elective IV)

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course will help the students to understand the
1. Basic concepts of Pulp and Paper making processes.
2. Overview of pulping process.
3. Details of physical and chemical characteristics of fibrous raw materials and black liquor.
4. Various types of cooking and bleaching methodologies.
5. Recovery of energy and chemicals used in pulping processes with due techno-economic and environmental considerations.

Course Outcomes: At the completion of this course, the students able to:
1. Design the operation, maintenance and safety aspects for paper making.
2. Identify grade paper and boards based on different testing methods.
3. Select appropriate bleaching technique for required paper quality.
4. Differentiate the important wood and fibre properties that affect paper quality.
5. Identify, formulate and solve design problems pertaining to pulp digesters.

UNIT – I: Introduction
Importance of Paper, Definitions of Pulps
Wood Parts & Types: Ultra structure of Cell Wall, Wood cell types, Early & Latewood, Softwoods, Hard woods & Non-woods. Comparison of different raw materials.
Distribution of Wood Constituents – Cellulose, Hemi-cellulose, Lignin, Extractives and Inorganic components.

UNIT – II: Overview of pulping process
Mechanical Pulping: Pressurized ground pulping, Refiner Pulping, Chemo (thermo) mechanical pulping processes.
Kraft Pulping: Description of Kraft Cooking Process, Kraft recovery, Composition & Analysis of white liquor, Chemical reactions & process variables. Pulp yield, End uses of kraft pulps.

UNIT – III: Pulp and black liquor characterization
Pulp testing methods - Kappa number, water retention value, CED viscosity, drainability, beater evaluation, zero span tensile strength.
Black liquor characterization - Chemical properties, viscosity and rheological behavior at different concentrations, thermal properties, calorific value, thermal conductivity, specific heat, black liquor oxidation, desilication and concentration of black liquor.

UNIT IV: Bleaching operations
Objectives of bleaching – Elemental chlorine free and total chlorine free bleaching; Bleachability and its measurement, bleaching reactions, reaction kinetics and operating variables for different bleaching agents like ClO_2, O_2, O_3, hypochlorite, H_2O_2.
Stages of bleaching – Oxygen delignification, Chlorination, Extraction, Hypochlorite bleaching, Ozone bleaching, Peroxide bleaching, Operating variables for different bleaching stages; ECF and TCF bleaching systems for chemical pulps; bleaching systems for mechanical and high yield pulps.

UNIT – V: Paper Making and its Properties
Paper Testing Methods – Flow sheet of complete pulp and paper making process, Strength properties, Surface properties, Optical properties & Absorption properties. Different grades of paper, boards & newsprint specifications; BIS and ISO standards of paper. Paper properties dependence on paper making processes, Calibration of instruments. Paper recycling process, Effluent treatment processes with environmental considerations.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Text Books:

1. Kenneth W. Britt, "Handbook of Pulp & Paper Technology", 2nd Edition, Reinhold Publishing Corporation, 2004.
2. G. A Smook., "Handbook for Pulp & Paper Technologists", 3rd Edition, Angus Wilde Publications, 2003.

Suggested Readings:

1 .Hakan Karlsson, "Fiber Guide-Fiber analysis and process applications in the pulp & paper industry", Ab Lorentzen & Wetre, 1st Edition, 2006.

2. EIRI Board ., "Handbook of Pulp & Paper, Paper board and Paper based Technology", Engineers India Research Institute, 2nd Edition, 2015 .

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH E 12 **FOOD TECHNOLOGY**

(Core Elective IV)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course objectives: This course helps the students to understand the

1. Basic food preparation techniques. Food quality.
2. Physical, chemical, and/or microbiological changes in food and mechanical manipulation.
3. Learn fundamentals of modifying food to meet current nutrition recommendations
4. Learn to find credible sources of information re. food science and nutrition.
5. Food processing Applications and Packaging

Course Outcomes: At the end of the course, student will be able to

1. Explain techniques in food processing
2. Design process equipment to achieve the desired quality of food.
3. Develop novel food processes that have a minimal effect on food quality
4. Select control strategies to maintain food quality.
5. Apply the scientific method to food science problems.

UNIT – I

Introduction: General aspects of food industry, World food demand and Indian scenario, Constituents of food, Quality and nutritive aspects, Product and Process development, engineering challenges in the Food Processing Industry.

UNIT – II

Basic principles: Properties of foods and processing theory, Heat transfer, Effect of heat on micro-organisms, Basic Food Biochemistry and Microbiology: Food Constituents; Food fortification, Water activity, Effects of processing on sensory characteristics of foods, Effects of processing on nutritional properties, Food safety, good manufacturing practice and quality Process Control in Food Processing.

UNIT – III

Ambient Temperature Processing: Raw material preparation, Size reduction, Mixing and forming, Separation and concentration of food components, Centrifugation, Membrane concentration, Fermentation and enzyme technology, Irradiation, Effect on micro-organisms, Processing using electric fields, high hydrostatic pressure, light or ultrasound.

UNIT – IV

Heat processing using steam, water and air: Blanching, Pasteurization, Heat sterilization, Evaporation and distillation, Extrusion, Dehydration, Baking and roasting, Heat processing by direct and radiated energy: Dielectric heating, Ohmic heating, Infrared heating, Gamma irradiation.

UNIT – V

Post Processing Applications Packaging: Coating or enrobing, Theory and Types of packaging materials, Printing, Interactions between packaging and foods, Environmental considerations.

Text Books:

1. Fellows P., Food Processing Technology: Principles and Practice, Wood head Publishing, 4th Edition, 2016.
2. Toledo R, Fundamentals of Food Process Engineering, Springer, 3rd Edition, 2010.

Suggested Readings:

1. Singh R.P. & Heldman D.R., Introduction to Food Engineering, Academic Press, 3rd Edition, 2001.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18EEO 05 **WASTE MANAGEMENT**

(Open Elective I)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To Imbibe the concept of effective utilization of any scrap
2. To become familiar with the processes of all disciplines of engineering.
3. To learn the technique of connectivity from waste to utility.

Course Outcomes:

1. Understand the various processes involved in allied disciplines of engineering
2. Infer the regulations of governance in managing the waste
3. Distinguish the nature of waste materials concerned to the particular branch of engineering
4. Explore the ways and means of disposal of waste material
5. Identify the remedies for the disposal of a selected hazardous waste material

UNIT-I

Introduction to waste management: Relevant Regulations Municipal solid waste (management and handling) rules; hazardous waste (management and handling) rules; biomedical waste handling rules; fly ash rules; recycled plastics usage rules; batteries (management and handling) rules. Municipal Solid Waste Management – Fundamentals Sources; composition; generation rates; collection of waste; separation, transfer and transport of waste; treatment and disposal options.

UNIT-II

Hazardous Waste Management : Fundamentals Characterization of waste; compatibility and flammability of chemicals; fate and transport of chemicals; health effects, Radioactive Waste Management – Fundamentals Sources, measures and health effects; nuclear power plants and fuel production; waste generation from nuclear power plants; disposal options.

UNI-III

Environmental Risk Assessment: Defining risk and environmental risk; methods of risk assessment; case studies, Physicochemical Treatment of Solid and Hazardous Waste Chemical treatment processes for MSW (combustion, stabilization and solidification of hazardous wastes); physicochemical processes for hazardous wastes (soil vapor extraction, air stripping, chemical oxidation); ground water contamination and remediation

UNIT-IV

Biological Treatment: Solid and Hazardous Waste Composting; bioreactors; anaerobic decomposition of solid waste; principles of biodegradation of toxic waste; inhibition; co-metabolism; oxidative and reductive processes; slurry phase bioreactor; in-situ remediation.

UNIT-V

Landfill design aspects: Landfill design for solid and hazardous wastes; leachate collection and removal; landfill covers; incineration

Text Books:

1. John Pichtel Waste Management Practices CRC Press, Taylor and Francis Group 2005.
2. LaGrega, M.D.Buckingham,P.L. and Evans, J.C. Hazardous Waste Management, McGraw Hill International Editions, New York, 1994
3. Richard J. Watts, Hazardous Wastes - Sources, Pathways, Receptors John Wiley and Sons, New York, 1997

Suggested Reading:

1. Basics of Solid and Hazardous Waste Mgmt. Tech. by Kanti L.Shah 1999, Prentice Hall.
2. Solid and Hazardous Waste Management 2007 by S.C.Bhatia Atlantic Publishers & Dist.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18ME O04 **ENTREPRENEURSHIP**

(Open Elective I)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives:

1. Concept and procedure of idea generation.
2. The nature of industry and related opportunities and challenges.
3. Elements of business plan and its procedure.
4. Project management and its techniques.
5. Behavioral issues and Time management.

Outcomes: At the end of the course, the students are able to

1. Understand the concept and essence of entrepreneurship. (BL-2)
2. Identify business opportunities and nature of enterprise. (BL-3)
3. Analyze the feasibility of new business plan. (BL-4)
4. Apply project management techniques like PERT and CPM for effective planning and execution of Projects (BL-3)
5. Use behavioral, leadership and time management aspects in entrepreneurial journey (BL-3)

UNIT-I

Entrepreneurship: Definition, functions of entrepreneurship, qualities of entrepreneurs, identification and characteristics of entrepreneurs, entrepreneur vs. intrapreneur, first generation entrepreneurs, women entrepreneurs, conception and evaluation of ideas and their sources.

UNIT-II

Indian industrial environment: Competence, opportunities and challenges, entrepreneurship and economic growth, small scale industry in India, objectives, linkage among small, medium and heavy industries, types of enterprises, corporate social responsibility.

UNIT-III

Business plan: Introduction, elements of business plan and its salient features, business model canvas, technical analysis, profitability and financial analysis, marketing analysis, feasibility studies, executive summary, selection of technology and collaborative interactions.

UNIT-IV

Project management: During construction phase, project organization, project planning and control using CPM, PERT techniques, human aspects of project management, assessment of tax burden.

UNIT-V

Behavioral aspects of entrepreneurs: Personality, determinants, attributes and models, leadership concepts and models, values and attitudes, motivation aspects, time management: approaches of time management, their strengths and weaknesses. time management matrix and the urgency addiction .

Text Books:

1. Vasant Desai, “Dynamics of Entrepreneurial Development and Management”, Himalaya Publishing House, 1997.
2. Prasanna Chandra, “Project-Planning, Analysis, Selection, Implementation and Review”, Tata Mcgraw-Hill Publishing Company Ltd.1995.
3. S.S. Khanka, “Entrepreneurial Development”, S. Chand & Co. Pvt. Ltd., New Delhi,2015.

Suggested Reading:

1. Robert D. Hisrich, Michael P. Peters, “Entrepreneurship”, 5/e, Tata Me Graw Hill Publishing Company Ltd., 2005.
2. Stephen R. Covey and A. Roger Merrill, “First Things First”, Simon and Schuster Publication,1994.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18ME O06 **NANO MATERIALS AND TECHNOLOGY**

(Open Elective I)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives:

1. Nanotechnology approach and challenges.
2. Materials and characterization procedures.
3. Zero and one dimensional nanostructures.
4. Various fabrication techniques.
5. Special nano materials and nano biomaterials.

Outcomes: At the end of the course, the students are able to

1. Understand the basic concepts, developments and challenges in nanotechnology. (BL-2)
2. Describe the methods of evaluating magnetic and electronic properties, microstructure by SPM and atomic force microscopy. (BL-2)
3. Apply heterogeneous methods and characterization techniques of zero & one dimensional nanostructure (BL-3)
4. Evaluate various nano material fabrication techniques. (BL-5)
5. Analyze nano materials and nano biomaterials for obtaining solutions to societal problems. (BL-4)

UNIT - I

Introduction: Nanoscale, properties at nanoscale, advantages and disadvantages, importance of nanotechnology, bottom-up and top-down approaches, challenges in nanotechnology.

UNIT - II

Materials of Nanotechnology: Introduction, Si-based materials, Ge-based materials, ferroelectric materials, polymer materials, GaAs &InP (HI-V) group materials, nano tribology and materials, characterization using scanning Probe microscope, AFM.

UNIT - III

Nano structures: Zero dimensional nanostructure, synthesis procedure by heterogeneous method, characterization techniques, properties and applications of nano particles

One dimensional nanostructures: Synthesis procedure, characterization procedure and principles involved, properties and applications of nanowires .

UNIT - IV

Nano fabrication: Introduction, basic fabrication techniques by lithography and doping, MEMS fabrication techniques, nano fabrication techniques by E-beam, nano-imprint fabrication, epitaxy and strain engineering.

UNIT - V

Special nano materials: Introduction, synthesis procedure by metal-polymer, characterization procedures, applications.

Nano biomaterials: Introduction, biocompatibility, anti-bacterial activity, applications.

Text Books:

1. Dieter Vollath, “Nanomaterials: An introduction to Synthesis, properties and applications”, Wiley,2013.
2. GuozhongCao,“NanostructuresandNanoMaterials,Synthesispropertiesandapplications”,ImperialCollege Press,2004.
3. Carl C Koch, “Nano materials Synthesis, Properties and applications”, Jaico Publishing House,2008.

Suggested Reading:

1. Willia Tllsey Atkinson, “Nano Technology”, Jaico Publishing House,2009.
2. George W. Hanson, “Fundamentals of Nanoelectronics”, Pearson Education,2009.

18ME O07 **INTELLECTUAL PROPERTY RIGHTS**

(Open Elective I)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives:

1. Fundamental aspects of IP.
2. Salient features of IPR acts.
3. The methods of registrations of Intellectual property.
4. Awareness for innovation and its importance of protection.
5. The changes in IPR culture and techno-business aspects of IPR.

Outcomes: At the end of the course, the students are able to

1. Understand the evolution of IP, working of organization's at global level to protect and promote IP (BL-2)
2. Familiarize with the patent filing process at national and international level. (BL-2)
3. Draw the logical conclusion of research, innovation and patent filing. (BL-3)
4. Compare different kinds of IP and their patenting system. (BL-4)
5. Understand the techno-legal-business angle of IP, infringement and enforcement mechanisms for protection. (BL2)

UNIT I

Introduction: Definition of intellectual property, the need for intellectual property rights (IPR), kinds of intellectual property rights, IPR in India – genesis and development, IPR abroad, importance of WTO, TRIPS agreement, patent cooperation treaty, Berne and universal copyright conventions.

UNIT-II

Patents: Definition of patent, commercial significance , term of patent, patentable subject- matter, rights and obligations of patentee, searching of existing patents, drafting of patent, specification of patent, filing of a patent, the different layers of the patent system (national, regional and international options), compulsory licensing and licenses of rights, revocation of patents, differences between utility model and patent.

UNIT-III

Industrial designs: Definition of designs, registration of design, rights and duties of proprietor of design, piracy of registered design.

Trademarks: Meaning of trademarks, purpose of protecting trademarks, registration of trademarks, passing off, assignment and licensing of trademarks, infringement of trademarks.

Geographical indications: Definition, differences between GI and trademarks.

UNIT-IV

Copy right: Nature and scope of copy right, term of copyright, subject matter of copyright, rights conferred by copyright ,publication, broad casting, telecasting, computer program, database protection, assignment and transmission of copyright, infringement of copy right trade secrets and know-how agreement.

UNIT-V

Enforcement of intellectual property rights: Infringement of intellectual property rights, enforcement measures, emerging issues in intellectual property protection, case studies of patents and IP Protection.

Unfair competition: What is unfair competition, relationship between unfair competition and intellectual property law

Text Books:

1. Ajit Parulekar and Sarita D"Souza, "Indian Patents Law-Legal& Business Implications ",Macmillan India Ltd., 2006.
2. B.L.Wadehra, "Law relating to Patents, Trade Marks, Copyright, Designs &Geographical Indications", Universal law Publishing Pvt Ltd., India, 2000.
3. P. Narayanan, "Law of Copyright and Industrial Designs"; Eastern law House, New Delhi,2010.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Suggested readings:

1. Cronish W.R, “Intellectual Property Patents, Copyright, Trade Marks and Allied rights”, Sweet Maxwell,1993.
2. P. Narayanan, “Intellectual Property Law” Eastern Law Edn., 1997.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CSO 09 **BASICS OF ARTIFICIAL INTELLIGENCE**

(Open Elective I)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Basic Mathematics.

Course Objectives: The main objectives of this course are:

1. To Provide fundamental concepts in Artificial Intelligence.
2. Discuss the various paradigms involved in solving an AI problems which involve perception, reasoning and learning
3. Apply the AI concepts to build an expert system to solve the real-world problems.

Course Outcomes: On Successful completion of this course, student will be able to

1. Identify various search strategies to solve problems.
2. Compare and contrast knowledge representation schemes.
3. Apply Bayesian Networks and Dempster Shafer theory for reasoning.
4. Explain the role of agents and interaction with the environment.
5. Determine different learning paradigms.
6. Explain robotic architectures and expert systems.

UNIT - I

Introduction: Definition, history, applications. Problem Solving: AI problems, AI Technique, Defining problem as a State-Space Search, Problem Characteristics. Heuristic Search Techniques: Generate–and–test, Hill Climbing, Constraint Satisfaction.

UNIT - II

Knowledge Representation (Logic): Representing facts in logic, proposition logic, predicate logic, resolution and unification. Knowledge Representation (Structured): Declarative representation, Semantic nets, procedural representation, frames.

UNIT - III

Reasoning: Probability and Bayes theorem, Certainty factors and Rule based systems, Bayesian Networks, Dempster-Shafer Theory. Planning: Components, goal stack planning, nonlinear planning, hierarchical planning.

UNIT - IV

Learning: Introduction, Rote learning, learning by taking advice, learning in problem solving and learning from examples: Decision tree. Intelligent Agents: Classification, Working of an agent, single agent and multi agent systems, multi agent application.

UNIT - V

Expert System: Representing and Using Domain Knowledge, Expert systems shells, Explanation, Knowledge Acquisition. Perception and Action: Real Time Search, Vision, Speech Recognition, ACTION: Navigation, Manipulation, Robot architectures.

Text Books:

1. Elaine Rich, Kevin Night, Shivashankar B Nair, “Artificial Intelligence”, 3rd Edition, 2008
2. Russell Norvig, “Artificial Intelligence-Modern Approach”, 3rd edition, 2010.

Suggested Reading:

1. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2012.
2. Nelson M. Mattos, “An Approach to Knowledge Base Management”, Springer Berlin Heidelberg, 1991.

Online Resources:

1. http://nptel.ac.in/courses/106106126/
2. http://nptel.ac.in/courses/106105077/

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH C 19 **CHEMICAL ENGINEERING LAB II A**
(CHEMICAL REACTION ENGINEERING)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

List of Experiments

Chemical Reaction Engineering

1. Studies in Batch Reactor: To find the Arrhenius form of temperature dependency of reaction
2. Studies in Mixed Flow Reactor (CSTR) : To find kinetics from reactor performance of CSTR
3. Studies in Tubular Reactor: To determine the rate constant and to verify the order of reaction
4. Mass Transfer with Chemical Reaction: (Liquid – Liquid Reaction System) To find out the mass transfer
coefficient in a stirred cell: With chemical reaction and without chemical reaction
5 Mass Transfer with Chemical Reaction: (solid – Liquid Reaction System) To find the mass transfer coefficient without chemical reaction and with chemical reaction.
6. R.T D Studies in Packed bed reactor: To determine the axial mixing (axial dispersion) in the packed column.
7. R T D Studies in Tubular Column To determine the variance of residence time distribution and the dispersion number in a tubular column.
8. Studies in Batch Reactor: With Equimolar Feed (M = 1) : To determine the rate constant and to verify the order of reaction by differential & integral methods of analysis.
9. Studies in Batch Adiabatic Reactor: to determine the kinetics of an exothermic reaction from the Temperature of the reaction system.
10. Studies in Mixed Flow Reactors in series: To compare the actual & ideal performances of a Reaction system.
11. Studies in Packed bed: To determine the rate constant and to verify the order of reaction from performance of the reactor.

Text Book

1. Octave Levenspiel, Chemical reaction Engineering, 3rd Ed, Wiley India Pvt.Ltd, New Delhi, 2006

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH C 20 **CHEMIAL ENGINEERING LAB II B**

(MASS TRANSFER OPERATIONS & THERMODYNAMICS)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

List of Experiments

Mass Transfer Operations

1. Estimation of diffusivity coefficient for the gaseous system (CCl_4 - Air)
2. Estimation of the mass - transfer coefficient k_G for Air- Water system and plotting the variation of k_G with Reynolds‟s number.
3. Determination of vapour - liquid equilibrium data for the given system.
4. Verification of the Rayleigh`s equation for the system of methanol and water
5. Determination of the capacity coefficient of the packed column under total reflux conditions and calculation of height equivalent to theoretical plate.
6. Developing the drying curve by using tray drier and estimation and composition of time required for drying the given solid.

Thermodynamics

1. Determine the PVT behaviour of pure fluids by using Equation of state Liquid- Liquid Equilibrium Equipment
2. Calculate the property change of mixing
3. To determine the relationship between vapour and liquid at different temperatures
4. To determine the solubility characteristics of given solution at different temperatures

Text Books

1. R.E.Treybal, Mass Transfer Operations, 3rd Edition, McGraw Hill, New Delhi, 1983
2. Introduction to Chemical Engineering Thermodynamics (in SI units) by J M Smith and H C Van Ness and M M Abbott, 7th edition, Mc-Graw Hill International Edition, 2005

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH C 21 **TRANSPORT PHENOMENA**

Instruction	3L + 1T Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	4

Course Objectives: This course introduces the students to

1. Fundamentals to solve flow problems involving transport of momentum, mass and energy using a unified approach
2. The analogy between momentum, mass and energy transport
3. The common mathematical structure of transport problems
4. The turbulent phenomena and the methods of characterizing the turbulent fluxes
5. Equations of change for isothermal and non-isothermal systems and multi-component mixtures

Course Outcomes: At the end of the course students will be able to

1. Develop expressions for velocity, temperature and concentration profiles using shell balances
2. Identify analogy between momentum, mass and energy transport
3. Formulate and solve one-dimensional transport problems by using the conservation equations
4. Apply equations of change to solve flow problems
5. Understand transport phenomena in turbulent flows

UNIT – I

Introduction - Mechanism of molecular transport of momentum, heat and Mass Transfer. Flux equations - Newton's, Fouriers' and Fick's laws - Similarities and differences

Non-Newtonian fluids, transport properties - estimation, temperature and pressure dependence, estimation of transport properties of binary gaseous mixtures

Velocity distributions in laminar flow - shell momentum balances - Flow of falling film - flow of fluids through circular tubes, annulus and Immiscible fluids between parallel plates.

UNIT – II

Temperature distributions in solids and in laminar flow – shell balances - Heat conduction with electrical, Nuclear, viscous and chemical heat source

Heat conduction through composite walls, and cooling fin; Forced convection and free convection

UNIT – III

Concentration distributions in solids and in laminar flow - shell mass balances, diffusion through a stagnant gas film, Diffusion with homogenous chemical reaction and heterogeneous chemical reaction. Diffusion into a falling liquid film-chemical reaction inside a porous catalyst

UNIT – IV

Equations of change for isothermal systems – Equation of continuity, Equation of Motion, Equations of change in curvilinear coordinates, use of equations of change to set up steady flow problems. Equations of change for non-isothermal systems – Equation of energy – use of equations of change to set up steady state flow problems. Equation of change for a binary mixture – Equation of continuity of a component in curvilinear coordinates

UNIT – V

Unsteady state problems in momentum, energy and Mass Transfer operations; Turbulence -Introduction to Time smoothing; Eddy properties - Intensity of turbulence Reynolds stresses; Semi empirical expressions for turbulent - momentum , energy and mass fluxes

Text Books:

1. R B Bird, W E Stewart, and E N Lightfoot , Transport Phenomena, John Wiley &Sons, 1960
2. R B Bird, W E Stewart, and E N Lightfoot, Transport Phenomena, Revised 2nd Edition, John Wiley & Sons Inc., 2007

HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Suggested Reading:

1. R S Broadkay, Introduction to Transport Phenomena, McGraw Hill Publications, 1980
2. J R Welty, C E Wicks and R E Wilson, Fundamentals of Momentum, Heat and Mass Transfer, 3rd Ed., 1984
3. Geankoplis, Transport Processes and Separation Processes Principles. 4th Edition, Prentice Hall, 2003

18CH C 22 **PROCESS TECHNOLOGY AND ECONOMICS**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course will help the students to understand about the

1. Manufacturing processes of various industry relevant inorganic chemicals
2. Understanding about raw materials, energy sources, consumption and operating conditions of petroleum processing
3. Applying knowledge of unit operations, unit processes to draw flow diagrams for the manufacturing various petrochemical products
4. Application of industry relevant fuels
5. Applying and analyzing profitability of projects

Course Outcomes: At the completion of this course students will be able to

1. Explain various sources and processes of manufacture of various industrially important chemicals
2. Apply unit operations to draw block diagrams/ process flow diagrams of the processes used for manufacture of industrially important chemicals
3. Find out energy sources, requirement of raw materials and operating conditions of petrochemicals
4. Outline the application of industry relevant fuels
5. Apply various economic equations to evaluate project viability

UNIT- I

Description, raw material and energy sources and consumptions, operating conditions, catalysts, basic block diagram and simplified process flow diagram for manufacture of Inorganic Chemicals, such as: inorganic acids Sulphuric Acid by contact process, Phosphoric Acid by sulphuric Acid digestion process, chloro-alkali chemicals (Soda ash by Solvay process, Caustic Soda) Ammonia, Fertilizers (Urea, MAP and DAP)

UNIT- II

Description, raw material and energy sources and consumptions, operating conditions, catalysts, basic block diagram and simplified process flow diagram for Petroleum processing: Constituents of petroleum, various unit operations and unit process of refining products of refining and cracking operations, syngas and hydrogen by steam reforming of hydrocarbons

UNIT- III

Description, raw material and energy sources and consumptions, operating conditions, catalysts, basic block diagram and simplified process flow diagram for manufacture of Petrochemicals: Chloromethanes, Ethanol amines, Acrylonitrile, Acetylene, phenol, toluene, xylene.

UNIT- IV

Industrially relevant fuels, coal, coal based chemicals and fuels Common utilities such as electricity, cooling water, steam, hot oil, refrigeration and chilled water

UNIT- V

Introduction to project cost and cost of production, Various components of cost of production and their estimation, Various components of project cost variable cost, fixed cost, breakeven point and their estimation. Estimation of Working Capital. Balance sheets, Project financing, concept of interest, (Present Worth, Future Worth) time value of money, depreciation. Profitability Analysis of Projects, Payout time and Rate of return

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Text Books:

1. Shreve's Chemical Process Industries, George T. Austin, McGraw-Hill International Editions Series, 1984
2. Plant Design and Economics for Chemical Engineers, Max Peters, Klaus Timmerhaus, Ronald West, McGraw Hill International Edition, 2013

Suggested Reading:

1. Chemical Process Technology, Moulijn, M. and van Dippen, Wiley, 2013
2. Dryden's Outlines of Chemical Technology, M. Gopala Rao, Marshall Sittig, East West Press, 1997
3. Chemical Project Economics, Mahajani V. V. and Mokashi S M., MacMillan India Ltd. 2005

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH C 23 **PROCESS INSTRUMENTATION**

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	20 Marks
Credits	2

Course Objectives: This course will help the students to understand the

1. Fundamental elements of industrial instruments and their characteristics
2. Different types of temperature measuring instruments and their industrial applications
3. Different types of pressure measuring instruments
4. Different types of flow meters and level measuring devices
5. Methods applied for composition analysis in process industries

Course Outcomes: At the completion of this course students will be able to

1. Identify instruments required in process industry based on their purpose and function
2. Compare the range of operation and working of different temperature measuring instruments
3. Interpret the different pressure measuring instruments based on their application
4. Select the required flow and level measuring instruments for process industry
5. Apply the different methods of composition analysis for industrial analysis

UNIT- I

Importance of industrial instrumentation: Need, significance, applications and classification. Functional units – elements of instruments and their functions as sensors, transducers, transmitters and receivers. Static and dynamic characteristics of instruments.

UNIT- II

Temperature measurement: Expansion thermometers – types, mercury in glass, bimetallic, pressure spring type, drawbacks for industrial applications. Industrial thermocouples – types and range of operation, lead wires, need of thermowells. Industrial resistance thermometers – types of sensors, Resistive Temperature Detectors [RTD], Thermistors. Infrared thermometry – pyrometers, radiation receiving elements, radiation pyrometer, optical pyrometer.

UNIT- III

Pressure measurement: Manometers types – U-tube, well type, enlarged leg, inclined leg, ring balance type. Elastic transducer elements– bourdon, bellow and diaphragm. Electrical pressure transducers – Linear variable differential transformer (LVDT) and strain gauge. Introduction to standard vacuum gauge – McLeod gauge and Pirani gauge.

UNIT- IV

Flow and Level measurement: Flow meters – head type, area type, mass flow meter, electromagnetic flow meters. Level measurement – hydrostatic head, float type, RF capacitance, Radar type.

UNIT- V

Analytical Techniques: Spectroscopic analysis, absorption type – infrared, UV, X-ray and NMR. Emission and Mass spectroscopy Analysis of moisture in gases (humidity) by psychrometer, hygrometer, dew point methods. Introduction to chromatography – types, uses, Gas Liquid Chromatography, Thin layer Chromatography.

Text Books:

1. D Patranabis, Principles of industrial instrumentation, 2nd ed., Tata McGraw Hill Edu. (India) Pvt. Ltd., New Delhi, 2013
2. Donald P Eckman, Industrial Instrumentation, CBS pub and distr. Pvt. Ltd., New Delhi, 2004

Suggested Reading:

1. N V S Raju, Instrumentation Operation, Measurement, Scope and Application, B S Pub., Hyd., 2016
2. Arun K Ghosh, Introduction to Measurements and Instruments, PHI learning Pvt. Ltd., New Delhi, 2013

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH E 13 **MINERAL PROCESSING TECHNOLOGY**

(Core Elective V)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course will help the students to understand

1. Various unit operations involved in mineral processing technology and the mineral concentration processes
2. Importance and principles of materials handling in the mineral processing plant with special emphasis on feeding and conveying of bulk material
3. Opportunities to acquire practical skills in concentrates handling, grade
4. Heavy media separations and separation vessels
5. Recovery and loss calculation and participatory laboratory experiments

Course Outcomes: At the completion of this course the students able to

1. Explain the principles governing a range of processes applied in the mineral industry
2. Identify typical unit processes and flow-sheets for production of a number of metals
3. Apply basic engineering principles to the design of mineral processes
4. Develop conceptual designs for simple extraction processes
5. Summarize the operation of beneficiation units for coal and mineral

UNIT- I

Introduction to Mineral Processing, Objectives, Scope and importance. Properties and Types of Minerals
Ore handling: removal of harmful materials - sampling of ores: moisture sampling, assay sampling, sampling Techniques, sample division methods.

UNIT- II

Mineral liberation: Degree of liberation, concentration, measures of assessing metallurgical performance viz., Recovery, Ratio of Concentration, Grade, Enrichment ratio and Recovery vs Grade
Laboratory sizing: Particle size and shape, Sieve analysis, Sub sieve techniques, centrifugal methods (warmancyclosizer), microscopic sizing, online particle size analysis.

UNIT- III

Classification: Principle of Classification, Types of Classifiers
Gravity concentration: Principle, Jigs, Basic Construction of Jig, Types of Jigs viz., Harz Jig, circular and radial jigs, coal jigs (Baum and Batac jigs)
Gravity concentration in streaming currents: Pinched sluice, cones, spirals, shaking table.

UNIT- IV

Heavy medial separation: Principle, liquids and suspension for heavy media separation.
Separation vessels: Gravitational vessels (Wemco Cone separator, Drum separator)
Centrifugal separators: (Vorsyl separator, LARCODEMS, Dyna whirlpool separator) DMS cyclone , DMS circuits.

UNIT- V

Flotation – History and theory: Flotation practice: ore and pulp preparation, contact angle, work of adhesion; Flotation Reagents: collectors, frothers, regulators; and their action –reagents and conditioning- Flotation Machines: pneumatic (Davcra cell, flotation column, Jameson cell, froth separators) and mechanical (Denver cell, Wemco cell) electro flotation, skin flotation,
Case studies: i) Advanced Beneficiation processes. ii) Different methods for fine particles collection (Copper, Iron, Gold).

Text Books:

1. B.A.Wills – "Mineral Processing Technology", 7th edition Maxwell International Edition - 1987
2. Introduction to Mineral Processing (Kelly and Spottiswood)
3. Principles of Mineral Dressing (A. M. Gaudin)
4. Coal Preparation (J. W. Leonard)
5. The Coal Handbook: Towards Cleaner Production (D. Osborne)

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Suggested Reading:

1. Ashoka Gupta & Denis Yen, Mineral Processing Design and Operations, 1st Edition, Elsevier Publishers
2. S.K.Jain,Ore Processing, Oxford and TBHY Publishing Co. (P) Ltd., India , 1986
3. S. K. Jain, Ore Processing, Oxford- IBH Publishing Company, 2005

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH E 14 **CORROSION ENGINEERING**

(Core Elective V)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course will help the students to understand the

1. Definition and classification of corrosion.
2. Principles of corrosion, common corrosion forms
3. Different corrosion testing methods.
4. Corrosion control methods and material selection for cost reduction.
5. Modern theories to explain corrosion

Course Outcomes: At the completion of this course students will be able to

1. Explain and predict various corrosion mechanism based on the corrosion theories
2. Distinguish and identify various types of corrosion
3. Explain and apply corrosion testing methods
4. Identify and apply various corrosion prevention techniques
5. Apply modern theories and techniques to predict and prevent corrosion

UNIT- I

Introduction: Corrosion principles, Types of Corrosion, Acid Theory, Dry chemical corrosion, Wet theory or Electrochemical Theory, Electro- chemical aspects of Corrosion, environmental effects, Pilling-Bedworth Rule, Metallurgical aspects, corrosion rate expressions, methods of estimation of corrosion rates, Passivity.

UNIT- II

Types of corrosion: Forms of corrosion, uniform attack, galvanic corrosion, Examples of galvanic corrosion, Factors affecting galvanic corrosion, Crevice corrosion, Types of Crevice corrosion, pitting Corrosion: Principle and Theory, inter-granular corrosion, Knife line attack, selective leaching: Dezincification and Graphitization, Cavitation damage, Fretting Corrosion.

UNIT- III

Erosion-corrosion and some case studies, Factors affecting erosion- corrosion, stress corrosion cracking and Factors affecting stress corrosion.

Corrosion testing procedures: Introduction, Purpose of Testing, Steps involved in Corrosion testing, Standard expression for corrosion rate, NACE test, Slow stain rate test, Linear Polarization, Paint test, Seawater test, In vivo corrosion test (Field test).

UNIT- IV

Corrosion prevention methods:

Protection against Corrosion: Material selection, alteration of environment, Use of inhibitors, Protection by proper Designing, Modification of the properties of the metal, Cathodic Protection and Anodic Protection Units, Use of protective coatings -organic and inorganic coatings, Methods of application of metallic coatings, cladding.

UNIT- V

Advanced techniques:

Modern Theory: Principle, Thermodynamics: Free energy, Cell Potential, SHE and EMF series, Application of Thermodynamics to corrosion, Pourbaix Diagram. Electrode Kinetics: Exchange current density, Activation Polarization, Concentration Polarization, Combined Polarization, Mixed electrodes, Passivity with modern aspects.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Predicting corrosion behaviour: Effect of oxidisers, Velocity effects, Galvanic coupling, Alloy evaluation. Corrosion prevention: Anodic Protection and Noble-Metal Alloying.

Text Books:

1. Corrosion Engineering, 3rd ed., M G Fontana, Tata McGrawHill,2005

Suggested Reading:

1. Corrosion and Corrosion Control, H HUhlig, Wiley, 3rd edition,2011
2. Handbook of Corrosion Engineering, Pierre Roberge, McGraw- Hill, New York,2000

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH E 15 **SCALE-UP METHODS**

(Core Elective V)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course helps the students to

1. Understand prototypes, models, principle of similarity Understand physical, static, dynamic, thermal and chemical similarity understand the scale-up principles of mixing and heat transfer equipment
2. Develop scale-up techniques for chemical reactors
3. Develop scale-up techniques for both batch and continuous separation process

Course Outcomes: At the end of the course students will be able to

1. Explain principles of scale-up
2. Apply dimensional analysis technique for scale up problems
3. Deduce the scale up of mixers and heat exchangers
4. Outline the scale up of chemical reactors
5. Design the distillation columns and packed towers scale up process.

UNIT- I

Principals of Similarity, Pilot Plants & Models: Introduction to scale-up methods, pilot plants, models and principles of similarity, Industrial applications.

UNIT- II

Dimensional Analysis and Scale-Up Criterion: Dimensional analysis, regime concept, similarity criterion and scale up methods used in chemical engineering, experimental techniques for scale-up.

UNIT- III

Scale-Up of Mixing and Heat Transfer Equipment: Typical problems in scale up of mixing equipment and heat transfer equipment.

UNIT- IV

Scale-Up of Chemical Reactors: Kinetics, reactor development & scale-up techniques for chemical reactors

UNIT- V

Scale-Up of Distillation Column and Packed Towers: Scale-up of distillation columns and packed towers for continuous and batch processes.

Text Books:

1. Marko Zlokamik, Scale-up in Chemical Engineering, Wiley-VCH, 2ndEdition, 2006
2. Johnstone, Thring, Pilot Plants Models and Scale-up methods in Chemical Engineering, McGraw Hill, NewYork, 1962

Suggested Reading:

1. Hoyle W, Pilot Plants and Scale-Up, Royal Society of Chemistry, 1999
2. Bruce Nauman E, Chemical Reactor Design, Optimization and Scale-up, McGraw Hill Handbooks, New York, 2002

HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18ME O 11 **MODERN MANUFACTURING PROCESSES**
(Open Elective II)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Understand the opportunities and challenges brought about by Industry4.0.
2. Familiarize with the basic concept and process of digital manufacturing.
3. Understand real-life scenarios and recommend the appropriate use of 3D printing technology.
4. Acquire the knowledge of non-traditional machining processes.
5. Learn the procedure for the fabrication of micro-electronic devices.

Course Outcomes: At the end of the course, the students are able to

1. Understand the opportunities, challenges brought about by Industry 4.0 and how organizations and individuals should prepare to reap the benefits.
2. Apply the concept, architecture and process of digital manufacturing.
3. Evaluate real-life scenarios and recommend the appropriate use of 3Dprintingtechnoloy
4. Compare various non-traditional machining processes.
5. Demonstrate the procedure for the fabrication of micro-Electronic devices.

UNIT –I

Introduction to industry 4.0: The various industrial revolutions, digitalization and its impact, comparison of industry 4.0 factory and today's factory. business issues in industry 4.0, internet of things (IoT) & industrial internet of things (IIoT) & internet of services, smart manufacturing, cyber physical systems, trends of industrial big data, cloud computing, robotic automation and collaborative robots, cyber security.

UNIT –II

Digital manufacturing process : Introduction to digital manufacturing and design, concepts , research and development status of digital manufacturing, definition, features and development of digital manufacturing, transition to digital manufacturing and design, advantages of digital manufacturing and design. digital thread, information sharing in the digital thread, data procurement standards, manufacturing supply chains, integrated information systems in the product lifecycle.

UNIT –III

Additive manufacturing processes: Introduction to 3D printing, evolution, distinction between 3D printing & CNC machining.

Processes and principles: Photo polymerization, powder bed fusion, binder jetting, material jetting, sheet metal lamination, material extrusion, direct energy deposition. Application in aerospace industry, automotive industry, jewelry industry, medical and bioengineering applications, planning and simulation of complex surgery, forensic science.

UNIT–IV

Nontraditional machining processes: Requirement, process description of ultrasonic machining, abrasive jet machining, water jet machining, water abrasive jet machining, electro discharge machining, electrochemical machining, chemical machining, ion beam etching, plasma arc machining, laser beam machining and electron beam machining.

UNIT-V

Fabrication of micro- electronic devices: Introduction, semiconductors and silicon, fabrication of integrated circuits and silicon wafers, film deposition, lithography, etching, diffusion and ion implantation, metallization and testing, bonding and packaging, printed circuit boards.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Text Books:

1. Mikell P. Grover, “Fundamentals of Modern Manufacturing Materials, Processes and Systems”, 4/e, John wiley& sons, inc,2009.
2. Zude Zhou, Shane (Shengquan) Xie and DejunChen, “Fundamentals of Digital Manufacturing Science”, Springer-Verlag London Limited,2012.
3. Brent Stucker, David Rosen, and Ian Gibson, “Additive Manufacturing Technologies” Springer,2010.

Suggested Reading:

1. Serope Kalpak Jain, Steven R.Schmid, “Manufacturing Engineering and Technology”, 4/e, Pearson Education India, 2006
2. Amitabh Ghosh and Mallick, “Manufacturing Science”, Assoc. East West Press Pvt. Ltd., 4/e,2011.

18EE O 02 **ENERGY MANAGEMENT SYSTEMS**
(Open Elective II)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course objectives:
1. To know the concept of Energy management
2. To understand the formulation of efficiency for various engineering systems
3. To explore the different ways to design various technologies for efficient engineering systems.

Course Outcomes: After completion of this course, students will able to:
1. Know the current energy scenario and importance of energy conservation.
2. Understand the concepts of energy management.
3. Evaluate the performance of existing engineering systems
4. Explore the methods of improving energy efficiency in different engineering systems
5. Design different energy efficient devices.

UNIT-I
Basics of Energy and its Various Forms: Overview of engineering, elements Solar energy,electricity generation methods using solar energy, PV cell, elements of wind energy, electricity generation using wind energy, elements of bio energy, bio mass energy conservation, elements of geothermal energy, sources of geothermal energy, sources of chemical energy, fuel cells, Energy Scenario in India

UNIT-II
Energy Management - I: Defining Energy management, need for energy management, energy managementtechniques, importance of energy management, managing the energy consumption, energy crisis, environmental aspects

UNIT-III
Energy Management-II: Energy management approach, understanding energy costs, bench marking, energyperformance, matching energy use to requirement, optimizing the input, energy requirements, energy audit instruments, material and energy balance diagrams, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, restructuring of the energy supply sector, energy strategy for the future

UNIT-IV
Energy Efficient Technologies-I: Importance of energy efficiency for engineers, Energy efficient technology in mechanical engineering: Heating, ventilation and air-conditioning, boiler and steam distribution systems Energy efficient technology in civil engineering: future of roads, harnessing road and transport infrastructure;

UNIT-V
Energy Efficient Technologies-II: Energy efficient technology in electrical engineering: Electricity billing,electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors; Energy efficient technology in chemical engineering: green chemistry, low carbon cements, recycling paper

Text Books:

1. Umesh Rathore, 'energy management', Kataria publications, 2nd ediiton, 2014.
2. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects
3. Hargroves, K., Gockowiak, K., Wilson, K., Lawry, N., and Desha, C. (2014) An Overview of Energy

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Efficiency Opportunities in Mechanical/civil/electrical/chemical Engineering, The University of Adelaide and Queensland University of Technology.

Suggested Reading:

1. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)

2. K V Shama, P Venkataseshaiah, "Energy management and conservation", I. K. International Publishing agency pvt ltd., 2011, ISBN: 978-93-81141-29-8

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18ME O 03 **RESEARCH METHODOLOGIES**

(Open Elective II)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To make the students to formulate the research problem.
2. To identify various sources for literature review and data collection.
3. To prepare the research design.
4. To equip the students with good methods to analyze the collected data.
5. To explain how to interpret the results and report writing.

Course Outcomes: At the end of the course, the students are able to

1. Define research problem.
2. Review and assess the quality of literature from various sources.
3. Understand and develop various research designs.
4. Analyze problem by statistical techniques: ANOVA, F-test, Chi-square.
5. Improve the style and format of writing a report for technical paper/Journal report.

UNIT – I

Research methodology: Objectives and motivation of research, types of research- descriptive vs. analytical, applied vs. fundamental, quantitative vs. qualitative, conceptual vs. empirical, research approaches, significance of research, research methods vs. methodology, research process, criteria of good research, problems encountered by researchers in India, technique involved in defining a problem.

UNIT–II

Literature survey: Importance of literature survey, sources of information-primary, secondary, tertiary, assessment of quality of journals and articles, information through internet.

UNIT – III

Research design: Meaning of research design, need of research design, feature of a good design important concepts related to research design, different research designs, basic principles of experimental design, steps in sample design.

UNIT – IV

Data collection: Collection of primary data, Secondary data, measures of central tendency-mean, mode, median, measures of dispersion- range, mean deviation, standard deviation, measures of asymmetry (skewness), important parametric tests -z, t, F, Chi-Square, ANOVA significance.

UNIT – V

Research report formulation and presentation: Synopsis, dissertation, technical paper and journal paper, writing research grant proposal, making presentation with the use of visual aids, writing a proposal for research grant.

Text Books*:*

1. C.R Kothari, “Research Methodology Methods & Technique”, New Age International Publishers,2004.
2. R. Ganesan, “Research Methodology for Engineers”, MJP Publishers, 2011.
3. Vijay Upagade and Aravind Shende, “Research Methodology”, S. Chand &Company Ltd., New Delhi, 2009.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Suggested Reading:

1. G. Nageswara Rao, "Research Methodology and Quantitative methods", BS Publications, Hyderabad, 2012.
2. Naval Bajjai, "Business Research Methods", Pearson Education, 2011.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CE O 02 **DISASTER MITIGATION AND MANAGEMENT**

(Open Elective-II)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course aims to,

1. Equip the students with the basic knowledge of hazards, disasters, risks and vulnerabilities.
2. Impart knowledge in students about the nature, causes, consequences and mitigation measures of the various Hydro-meteorological disasters.
3. Introduce the concepts of causes, consequences and mitigation measures of the various Geographical disasters.
4. Enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters.
5. Equip the students with the knowledge of the impacts of disaster, chronological phases in a disaster management cycle and to create awareness about the disaster management framework and legislations in the context of Central and State Level Authorities

Course Outcomes: Upon completion of this course, the student will be able to,

1. Identify and understand the fundamental terminologies in disaster management.
2. Distinguish between the Hydro-meteorological disasters and apply the concepts of structural and non-structural mitigation measures.
3. Categorize different Geographical Disasters and apply the knowledge in utilizing the early warning systems.
4. Analyze various mechanisms and consequences of human induced disasters.
5. Develop an awareness of disaster management phases and formulating effective disaster management plans, ability to understand various participatory roles of stakeholders- Central and State Government bodies at different levels.

UNIT- I:

Introduction: Basic definitions- Hazard, Disaster, Vulnerability, Risk, Resilience, Mitigation, Management; classification of types of disaster- Natural and manmade; Introduction to Disaster management cycle; International Decade for natural disaster reduction (IDNDR); International strategy for disaster reduction (ISDR), National disaster management authority (NDMA).

UNIT- II:

Natural Disasters:

Hydro meteorological disasters:

Causes, Early warning systems- monitoring and management, structural and non-structural measures for floods, drought and Tropical cyclones; Applications. Case studies related to various hydro-meteorological disasters.

UNIT- III:

Geographical based disasters: Causes, zoning, Early warning systems- monitoring and management, structural and non-structural mitigation measures for earthquakes, tsunami, landslides, avalanches and forest fires. Case studies related to various geographical based disasters.

UNIT- IV:

Human Induced Disasters: Chemical disaster- Causes, impacts and mitigation measures for chemical accidents, Risks and control measures in a chemical industry, chemical disaster management; Case studies related to various chemical industrial hazards eg: Bhopal gas leakage; Management of chemical terrorism disasters and biological disasters; Case studies related to power break downs, fire accidents, traffic accidents, oil spills and stampedes, building failure disasters.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

UNIT- V:

Concept of Disaster Impacts and Management:

Disaster impacts- environmental, physical, social, ecological, economical, political, etc.; health, psycho-social issues; demographic aspects, gender, age, special needs; hazard locations; global and national disaster trends; climate change and urban disasters.

Disaster management cycle and its phases, risk analysis, vulnerability and capacity assessment; Post-disaster environmental response water, sanitation, food safety, waste management, disease control; Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Text Books:

1. Pradeep Sahni, "Disaster Risk Reduction in South Asia", Prentice Hall, 2003.
2. B. K. Singh, "Handbook of Disaster Management: Techniques & Guidelines", Rajat Publication, 2008.

Suggested Reading:

1. Ministry of Home Affairs, Government of India, "National Disaster Management Plan, Part I and II",
2. K. K. Ghosh, "Disaster Management", APH Publishing Corporation, 2006.
3. http://www.indiaenvironmentportal.org.in/files/file\disaster_management_india1.pdf
4. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs)
5. Hazards, Disasters and your community: A booklet for students and the community, Ministry of Home Affairs.
6. Disaster Medical Systems Guidelines, Emergency Medical Services Authority, State of California, EMSA no.214, June 2003.
7. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings, Geneva: IASC.
8. http://ndma.gov.in/ (Home page of National Disaster Management Authority)

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CS O 10 **MACHINE LEARNING USING PYTHON**
(Open Elective II)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:
1. Get an idea of Machine Learning algorithms to solve real world problems.
2. Study various machine learning algorithms.
3. Analyze data using machine learning techniques.

Course Outcomes: Upon completion of this course, the student will be able to:
1. Define the basic concepts related to Python and Machine Learning.
2. Describe the feature engineering methods, regression techniques and classification methods.
3. Apply Python packages for data visualization. Text and time series data analysis using NLP toolkit.
4. Evaluate and interpret the results of the various machine learning techniques.
5. Solve real world problems using deep learning framework

UNIT - I
Introduction to Machine Learning: Introduction, Machine Learning process. Introduction to Python: Features, sources and installation of Python, IDEs, Basics of Python, Data Structures and loops.

UNIT - II
Feature Engineering: Introduction to Features and need of feature Engineering, Feature extraction and selection, Feature Engineering Methods, Feature Engineering with Python. Data Visualization: Various charts, histograms, plots.

UNIT - III
Regression: Simple and multiple regressions, Model assessment, various types of errors, errors, ridge regression, Lasso regression, non-parameter regression. Classification: Linear classification, logistic regression, Decision Trees, Random Forest, Naïve Bayes.

UNIT - IV
Unsupervised Learning: Clustering, K-Means clustering, Hierarchical clustering. Text Analysis: Basic text analysis with Python, regular expressions, NLP, text classification. Time Series Analysis: Date and time handling, window functions, correlation, time series forecasting.

UNIT - V
Neural Network and Deep Learning: Neural network- gradient descent, activation functions, parameter initialization, optimizer, loss function, deep learning, deep learning architecture, memory, deep learning framework. Recommender System: Recommendation engines, collaborative filtering.

Text Books:

1. Abhishek Vijavargia “Machine Learning using Python”, BPB Publications, 1st Edition, 2018
2. Tom Mitchel “Machine Learning”, Tata McGraWHill, 2017
3. Reema Thareja “Python Programming”, Oxford Press, 2017.

Suggested Reading:

1. Yuxi Liu, “Python Machine Learning by Example”, 2nd Edition, PACT, 2017

Online Resources:
1. https://www.guru99.com/machine-learning-tutorial.html
2. https://www.tutorialspoint.com/machine_learning_with_python/index.htm
3. https://www.tutorialspoint.com/python/
4. https://docs.python.org/3/tutorial/
5. https://www.geeksforgeeks.org/machine-learning/

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH C 24 **PROCESS INSTRUMENTATION AND CONTROL LAB**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	25 Marks
Credits	1.5

Course Outcomes: At the end of the course, students will be able to

1. **Evaluate** the performance of a U-tube manometer
2. **Assess** the discharge efficiency of an orifice meter
3. **Analyze** step response of simple feedback control systems
4. **Determine** frequency response of control systems
5. **Analyze** the behavior of a control system using different modes of control when subjected to a permanent disturbance
6. **Apply** closed loop and open loop techniques to tune process controllers

List of Experiments

Part I: Process Instrumentation

1. Introduction to basics of control system components, signals and standards
2. Pressure measuring instruments/sensors
3. Level measurement
4. Flow measuring instruments
5. Temperature measuring devices
6. Humidity, density, viscosity and pH measuring devices
7. Pressure controllers: regulators, safety valves
8. Flow control actuators: different types of valves
9. Electrical and pneumatic signal conditioning and transmission
10. Computer process control, PLC, DCS,SCADA

Part II: Process Control

1. Control Valves
2. Flow-level cascade control Trainer
3. Viscosity Measuring Device
4. Level and Flow Measuring Devices
5. Temperature and Pressure Measuring Device
6. Temperature, level, and pressure control trainers
7. Open loop systems: lagged thermometer
8. Transmitters and transducers

Text Books:

1. Donald R Coughanowr , Steven E LeBlanc ,Process Systems Analysis and Control, 3rd edition, McGraw Hill Education (India) Edition2013
2. D Patranabis, Principles of Industrial Instrumentation, , 2nd ed., Tata McGraw Hill Edu. (India) Pvt. Ltd., New Delhi,2013

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH C 25 **PROCESS MODELING AND SIMULATION LAB**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	25 Marks
Credits	1.5

Course Outcomes: At the end of the course, students will be able to

1. **Develop** chemical engineering process models based on fundamental laws of mass and energy transfer
2. Dynamically simulate and **interpret** two heated tanks, using MATLAB
3. Dynamically simulate and **analyze** continuous reactors in Series using MATLAB
4. **Adapt** ASPEN software to perform steady state simulation of valves
5. **Apply** ASPEN software for simulation of batch Distillation
6. **Utilize** ASPEN software to design Plug flow reactor

List of Experiments

Part I

1. Introduction to Software Packages. Understanding the basic concepts and steps involved for developing process flow sheet.

Part II

i. Setting up models for simulation

Part III: Dynamic simulation using MATLAB

1. Two-heated Tanks in series
2. Three CSTRs in series at isothermal, constant holdup condition
3. Batch Reactor
4. Vapor Liquid Equilibrium
5. Ideal Binary distillation
6. Gas-Phase Pressurized CSTR

Part IV: Steady State simulation using ASPEN

1. Simulation of reactor systems
2. Simulation of simple units like valves, pumps, flash columns, Heat exchangers
3. Simulation of Distillation columns
4. Flow-sheeting of chemical process.

Text Books:

1. Manjeet KaurBedi, Prof. Vikram Singh, A Textbook Of Simulation And Modeling, Laxmi Publications, 2011

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH C 26 **PROJECT: PART I**

Instruction	4 Hours per week
CIE	50 Marks
Credits	2

Course Outcomes: At the end of the course, the student will be able to:

1. Summarize the literature review to identify and formulate engineering problems
2. Design the experiments/ process /mathematical model by selecting the engineering tools/components for solving the identified problem
3. Develop skills of problem solving, interpreting analysis and evaluation
4. Illustrate written and oral communication skills through project report and presentation
5. Demonstrate the knowledge, skills, attitude and ethics of a professional engineering graduate
6. Adapt to the working environment of Industry/Institute by working as a team

The objective of Project Part -1 is to enable the student take up investigative study in the broad field of Engineering / Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) towards R&D. The work shall include:

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminary Analysis/Modeling/Simulation/Experiment/Design/Feasibility;
4. Preparing a Written Report on the Study conducted for Presentation to the Department;
5. Final Seminar, as oral Presentation before a departmental Committee.

Guidelines for the award of Marks:
Max. Marks: 50

Evaluation by	Max.Marks	Evaluation Criteria / Parameter
Supervisor	20	Project Status / Review
	5	Report
Department Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Preparation

i/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH E 16 **CHEMICAL PROCESS SAFETY**

(Core Elective VI)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course will help the students to understand the

1. Importance of safety culture in process industry.
2. Disregard for ethical decision making based on numerous case studies.
3. Interaction and implementation of trade-offs concept in chemical plant operation.
4. Examples of problems that can occur with inadequate process design, improper process modification.
5. Different case studies related to industrial processes

Course outcomes: At the completion of this course, students will be able to

1. Evaluate effect of chemical hazards and risks of toxicants.
2. Analyze chemical incidents and possible consequences to plant facilities, workers, and the general public.
3. Analyze fire and explosion hazards.
4. Integrate safety concepts into chemical plant design.
5. Apply ethics during process plant operation

UNIT – I

Introduction: Process industrial safety –definition, importance. Safety awareness – Safety aspects of site selection, plant planning and layout, check list, inline arrangement of tower drums, exchangers, pumps and main pipelines.

Case studies of major disasters due to safety violations: Chernobyl disaster, Bhopal disaster, recent oil spills. Chemical hazards and workers safety, industrial process case studies.

UNIT – II

Organized labor interest in safety: Involvement of unions in accident prevention, recommendation of occupational health committees. Work Policy of MCA in accident prevention at process industries. Risk assessment procedures (HAZOP) and typical operational practices. Necessary precautionary measures (OSHA). Hazards: Identification and operability studies. Involvement of chemical criminals in process industries and their prevention. DOW Fire and explosion index, calculation of the DOW Fire and EI. Chemical safety data sheets and guides.

UNIT – III

Safety education and training: Training of personnel, on- the- job and job instructed training, meeting and instructional presentations. Effects of toxic Agents, chemicals and smoke on skin, eyes, respiratory tract, digestive tract. Primary protection equipment (PPE) – types, significance and applications. Measuring safety effectiveness: criteria for effective measurement, disabling (Lost-time) injuries, frequency rate, severity rate. Problem related safe-t-score. Involvement of inspector of factories in accident prevention. The technique of safe process design, separation sections, materials handling, storage sections, flow sheet review.

UNIT – IV

Fires and explosions: Definition of fire, fire triangle, Classification of fires as Class-A, B, C and D. Reaction of fires. Fire extinguishers: Portable fire extinguishers applications and their uses, Construction and working of water, Mechanical foam, CO_2, stored powder, ABC powder. Automatic multiple CO_2 extinguishers in chemical process industries.

UNIT – V

Emergency preparation and accident investigation: On-site and off-site emergency plan and infrastructure, learning from accidents, layered investigation, equipments aiding in diagnosis. Safety audit: Introduction,

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

essentials, requirements, programs and procedures

Text Books

1. D. A. Crowl and J.F. Louvar, "Chemical Process Safety", Prentice Hall, New Delhi, 2011.
2. Howard H. Fawcett and W. S. Wood, "Safety & Accident prevention in chemical operations", 2nd Ed., John Wiley and Sons Inc, 1982.

Suggested Reading:

1. Coulson and Richadson, "Chemical Engineering Design", 3rd ed., Vol 6, TMH, 1999.
2. Fulekar M.H, "Industrial Hygiene and Chemical Safety", I.K. International Publisher, 2006.
3. Sanders R.E., "Chemical Process Safety: Learning from case Histories", Butterworth-Heinemann (Elsevier) pub, 2005.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH E 17 **FERTILIZER TECHNOLOGY**
(Core Elective VI)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course will help the students to understand the

1. Use of fertilizers in improving soil productivity and crop yield.
2. Different types of the nitrogenous, phosphatic and potash fertilizers.
3. Various fertilizer application methods.
4. Different organic fertilizer production methods.
5. Environmental impact of fertilizer plants

Course outcomes: At the completion of this course, students will be able to

1. Identify the different nutrients and significance of feed stocks for the production of various nitrogenous fertilizers.
2. Apply different manufacture methods for various phosphorous fertilizers.
3. Explain production methods for potassium and mixed complex fertilizers
4. Explain the need, application techniques and uses of new variety of fertilizers.
5. Summarize effluent treatment methods and impact of fertilizers on environment.

UNIT – I:

Introduction: Fertilizer Technology, Plant Nutrients, Role of essential elements for plant growth. Availability of feed stocks. Nitrogen Fertilizers.

Feed stocks for the production of Ammonia, Ammonia synthesis by Haber and Kellogg processes. By-product ammonia recovery by direct and indirect methods.

UNIT –II

Manufacture of Urea: Manufacture of urea and other nitrogenous fertilizers such as ammonium sulphate, ammonium nitrate, calcium ammonium nitrate, ammonium chloride. Manufacture of nitric acid.

UNIT – III

Phosphorous fertilizers: manufacture of single and triple super phosphate. Production of Mono ammonium phosphate, Di ammonium phosphate and nitro phosphates, Manufacture of phosphoric acid by wet process and thermal process.

UNIT –IV

Introduction to new variety of fertilizers: Potassium fertilizers, mixed and NPK fertilizers. Liquid fertilizers. Bio fertilizers – Introduction, advantages over chemical fertilizers, types and uses.

UNIT –V

Fertilizer application techniques: different soil controlled release fertilizers. Effluent treatment methods for various fertilizer plants. Environmental impact of fertilizer plants on Ecosystem. Indian Fertilizer industry – production Economics and future plans.

Text Books

1. Brahma Mishra, “Fertilizer Technology and Management”, IK International Publishing House Pvt. Ltd., New Delhi, 2012.
2. Dr. ShaliniSuri, “Bio Fertilizers and Bio pesticides”, 1st Ed., APH publishing Corporation, New Delhi, 2011.

Suggested Reading:

1. Fertilizer Association of India, “Fertilizer Handbook”, 2nd Ed., Scientific Publisher, New Delhi, 2009.
2. UNIDO, “Fertilizer Manual”, 3rd edition, Kluwer Academic Publishers, New Delhi,1998.

18CH E 18 **CHEMICAL PROCESS SYNTHESIS**

(Core Elective VI)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course objectives: This course helps the students to
1. Understand chemical process flow sheet and equipment synthesis
2. Understand heuristics for process synthesis
3. Learn optimization of process flow sheet for a given product
4. Learn to design and evaluate project profitability
5. Understand trouble-shooting analysis of equipment

Course Outcomes: At the end of the course, student will be able to
1. Analyze alternative processes and equipment
2. Synthesize a chemical process flow sheet that would approximate the real process
3. Design best process flow sheet for a given product
4. Perform economic analysis related to process design
5. Evaluate project profitability

UNIT – I
Synthesis of steady state flow sheet: Introduction, Flow sheets, General semantic equation of equipment, Generalization of the method of synthesis of process flow sheet, Recycle structure of the flow sheet, separation systems.

UNIT – II
Heuristics for process synthesis: Raw materials and Chemical reactions, Distribution of chemicals, Separations, Heat exchangers and furnaces, pumping pressure reduction and conveying of solids, Reactor design.

UNIT – III
Optimization of flow sheet with respect to heat exchanger: Introduction, Network of heat exchanger, Some necessary conditions for the existence of an optimal heat exchanger network, Maximum heat transfer in a single exchanger, Hot and cold utilities.

UNIT- IV
Safety in Chemical plant design: Introduction, Reliability of equipment, prevention of accidents, Flammability of chemicals, Safety considerations in plant layout, Classification of chemicals and handling problem, Safety consideration in reactor design, Design of safety valves

UNIT- V
Trouble-shooting analysis of equipment and chemical plants, Fault tree analysis of accidents. Reliability consideration in maintenance policies of a chemical plant. Economic evaluation: Methods for Profitability evaluation, Discounted cash flow analysis.

Text Books:
1. Seider W. D., Seader J.D. and Lewin D. R., Product and Process Design Principles: Synthesis, Wiley, 2005.
2. Robin Smith, Chemical Process Design and Integration, John Wiley & Sons Ltd., 2005.

Suggested Reading:
1. Bieglar L.T, Grossman E.I and Westerberg A.W., Systematic Methods of Chemical Process Design, Prentice Hall Inc.,1997
2. Douglas J. M., Conceptual Design of Chemical Processes, McGraw Hill International, 1988.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18 PY O 01 **HISTORIES OF SCIENCE AND TECHNOLOGY**

(Open Elective III)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of the course is to make the student

1. Gains the knowledge about origin of science in the Stone Age and its progress during Antiquity period.
2. Familiar with scientific views in the Medieval period and during the Industrial revolution..
3. Aware of modern scientific developments from 19th century onwards.

Course Outcomes: After completion of the course, the students will be able to:

1. Demonstrate the process of beginning of science and civilization, knowledge acquisition and philosophical approach of science and its advancements in the Stone Ages and Antiquity period.
2. Illustrate the advancements in science and technology in the medieval period across Asia and Arab countries and decline and revival of science in Europe.
3. Explain the scientific approach and its advances of the Europeans and how the role of engineer during the industrial revolution and the major advancements.
4. Make use of the advancements in the field of science and technology by adopting new philosophies of 19th and first half of 20th century in finding ethical solutions to the societal problems.
5. Interpret the changes in specializations of science and the technology and build the relation between information and society from second half of 20th century onwards.

Unit-I

Science - The Beginning (through 599 BCE): The Stone Ages, Knowledge among hunter gatherers, Agricultural Revolution and other revolutions, Civilization, Major advances.

Science in Antiquity (600 BCE- 529 CE): Philosophy- a precursor to science, Hellenistic world and the Roman Empire, Other cultures of the period, Major advances.

Unit-II

Medieval Science (530 CE - 1452 CE): The decline of science in Europe, Science in China, Science and mathematics in India, Arab science, Revival of science in Europe, Technology revolution of the Middle ages, Major advances.

The Renaissance and the Scientific Revolution (1453 CE – 1659 CE): Renaissance, Scientific Revolution, Technology, Major advances.

Unit-III

Scientific Method: Measurement and Communication (1660 CE – 1734 CE): European domination, The scientific method, Major advances.

The Industrial Revolution (1735 CE – 1819 CE): Industrial Revolution, Rise of the engineer, Major Advances.

Unit-IV

Science and Technology in the 19th Century (1820 CE – 1894 CE): Philosophical basis of 19th-century science, Science and the public, Science and technology, Major advances.

Rise of Modern Science and Technology (1895 CE – 1945 CE): The growth of 20thcentury science, New philosophies, Quantum reality, Energy sources, Electricity: a revolution in technology, Major advances.

Unit-V

Big Science and the Post-Industrial Society (1946 CE – 1972 CE): Big science, Specialization and changing categories, Technology changes society, Major advances.

The Information Age (1973 CE – 2015 CE): Information and society, Globalization, The post-industrial society, Problems of the Information age, Major Advances

HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Text Books:

1. Bryan Bunch and Alexander Hellemans, “The History of Science and Technology”, Houghton Mifflin Company (New York), 2004
2. JD Bernal, “Science in History”, 4 Volumes, Eklavya Publishers, 2012

Suggested Reading:

1. “The 100 Most Influential Scientists of All Time”, Edited by Kara Rogers, Britannica Educational Publishing, 2010
2. Alberto Hernandez, “A Visual History of Science and Technology”, The Rosen Publishing Group, 2016

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18EG O 02 **GENDER SENSITIZATION**

(Open Elective III)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives This course will introduce the students to:
1. Sensibility regarding issues of gender in contemporary India.
2. A critical perspective on the socialization of men and women.
3. Popular debates on the politics and economics of work while helping them reflect critically on gender violence.

Course Outcomes After successful completion of the course the students will be able to**:**
1. Understand the difference between "Sex" and "Gender" and be able to explain socially constructed theories of identity.
2. Recognize shifting definitions of "Man" and "Women" in relation to evolving notions of "Masculinity" and "Femininity".
3. Appreciate women's contributions to society historically, culturally and politically.
4. Analyze the contemporary system of privilege and oppressions, with special attention to the ways gender intersects with race, class, sexuality, ethnicity, ability, religion, and nationality.
5. Demonstrate an understanding of personal life, the workplace, the community and active civic engagement through classroom learning.

UNIT – I
Understanding Gender:
Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1)
Socialization: Making Women, Making Men (*Towards a World of Equals*: Unit -2)
Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT – II
Gender And Biology:
Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4)
Declining Sex Ratio. Demographic Consequences.
Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10)
Two or Many? Struggles with Discrimination.

UNIT – III
Gender and Labour:
Housework: the Invisible Labour (*Towards a World of Equals*: Unit -3)
"My Mother doesn't Work." "Share the Load."
Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7)
Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT-IV
Issues Of Violence
Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)
Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading:"*Chupulu".*
Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)
Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading:
New Forums for Justice.
Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)
Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

UNIT – V

Gender: Co - Existence

Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12)
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers.
Additional Reading: Rosa Parks-The Brave Heart.

Textbook:

1. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote,VasudhaNagaraj, AsmaRasheed, GoguShyamala, DeepaSreenivas and Susie Tharu **"Towards a World of Equals: A Bilingual Textbook on Gender"** published by Telugu Akademi, Hyderabad, Telangana State, **2015**.

Suggested Reading:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. **"I Fought For My Life…and Won."**Available online at:
3. http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

Web Resources:

1. https://aifs.gov.au/publications/gender-equality-and-violence-against-women/introduction
2. https://theconversation.com/achieving-gender-equality-in-india

Note: Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18EG O 01 **TECHNICAL WRITING SKILLS**

(Open Elective III)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The course will introduce the students to:

1. Process of communication and channels of communication in general and technical writing.
2. Technical Writing and also contextual use of technology specific words.
3. Business letters and technical articles.
4. Technical reports and technical proposals.
5. Transferring data from verbal to graphic and vice versa and making technical presentations.

Course Outcomes: After successful completion of the course students will be able to:

1. Understand the channels of communication and define nature and aspects of Technical communication
2. Compare and contrast technical communication to that of general communication while constructing error free sentences applying features of technical writing.
3. Analyze data, draw inferences to write Journal articles and conference papers and to compose business letters.
4. Evaluate data to draft technical reports and technical proposals.
5. Design a technical presentation by understanding the nuances of presentation skills and also transfer data from verbal to graphic and vice versa

Unit I

Communication – Nature and process.

Channels of Communication – Downward, upward and horizontal and lateral communication. Barriers to communication.

Technical Communication – Definition; oral and written communication. Importance and need for Technical communication. Nature of Technical Communication. Aspects and forms of Technical communication. Technical communication Skills – Listening, Speaking, Reading & Writing.

Unit II

Technical Writing – Techniques of writing. Selection of words and phrases in technical writing. Differences between technical writing and general writing. Abstract and specific words. Sentence structure and requisites of sentence construction. Paragraph length and structure.

Unit III

Business correspondence – Sales letters, letters of Quotation, Claim and Adjustment letters.

Technical Articles: Nature significance and types of technical articles. Writing an abstract. Journal articles and Conference papers. Elements of technical articles.

Unit IV

Technical Reports: Types, significance, structure, style and writing of reports. Routine reports, Project reports.

Technical Proposals: Definition, types, characteristics, structure and significance.

Unit V

Information Transfer – Graphic to verbal (written) and verbal to graphic.

Technical Presentations: Important aspects of oral and visual presentations.

Text Books :

1. Meenakshi Raman & Sangeeta Sharma, **"Technical Communications-Principles and Practice",** Oxford University Press, Second Edition, 2012.

2. 1.M Ashraf Rizvi, **"Effective Technical Communication",** Tata McGraw Hill Education Pvt Ltd, 2012.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Suggested Reading:

1. Kavita Tyagi & Padma Misra, **"Basic Technical Communication",** PHI Learning Pvt Ltd, 2012.
2. R.C Sharma & Krishna Mohan, **"Business Correspondence and Report Writing",** Tata McGraw Hill, 2003

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc18_mg13/preview
2. https://www.technical-writing-training-and-certification.com/
3. https://academy.whatfix.com/technical-writing-skills

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CSO 03 **IoT AND APPLICATIONS**
(Open Elective III)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Programming Basics.

Course Objectives: The main objectives of this course are:
1. Impart necessary and practical knowledge of components in Internet of Things.
2. Understand working of IoT Systems.
3. Develop skills required to build IoT based systems in the field of biotechnology.

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand Internet of Things and its hardware and software components.
2. Interface I/O devices, sensors & communication module.
3. Remotely monitor data and control devices.
4. Hypothesizing real time IoT based projects.
5. Advance towards research based IoT in the field of biotechnology

UNIT – I
Introduction to IoT: Sensors, Types of sensors and Transducers, Actuators and Types of Actuators.

UNIT – II
Basics of Networking: Functional Components of IoT , IoT interdependencies, IoT Service oriented architecture, IoT categories, IoT gateways, IoT and associated technologies, Key technologies for IoT, IoT challenges.

UNIT – III
IoT Hardware Components: Computing (Arduino/ Raspberry Pi), Communication, Sensors, Actuators, I/0interfaces, Programming API's (for Arduino/Raspberry Pi).

UNIT – IV
IoT Application Development: Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, Authorization of devices

UNIT – V
IoT Systems and Applications: Smart Lighting, Weather Monitoring System, Weather Reporting Bot, Forest Fire Detection, Alcohol Detection System, Smart Parking Environment., Drip-irrigation, Biological water treatment system, Work flow Automation in Industries, Smart Intrusion Detection System, monitoring space risks and hazardous conditions in industrial regions like underground tanks , trap door margins.

Text Books:

1. Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases",CRCPress,2017.
2. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi, 2018.
3. ArshdeepBahgaand Vijay Madisetti, "Internet of Things: A Hands- on Approach",Universities Press,2014.

Suggested Reading:

1. Dr. SRN Reddy, RachitTirnkraland Manasi Mishra, "Introduction to Internet of Things: A practical

i/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad–75.

Approach", ETILabs,2018.
2. Adrian Mc Ewen, "Designing the Internet of Things", Wiley, 2013.
3. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill, 2017.
4. CunoPfister,"GettingStartedwiththeInternetofThings",0Reilly Media,2011.
5. O.Vermesan, P. Friess, "Internet of Things– Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers, SeriesinCommunications,2013.

Online Resources / Weblinks / NPTEL Courses:

1. LiDaXu, WuHe, and ShancangLi, "Internet of Things in Industries: A Survey ", IEEE Transactions on Industrial Informatics, Vol.10,No. 4, Nov.2014.
2. Gotovtsev, Pavel M., and Andrey V. Dyakov. "Biotechnology and Internet of Things for green smart city application." 2016 IEEE 3rd World Forum on Internet of Things (WF-IoT). IEEE, 2016.
3. Yanjing, Sun,etal. "Research and design of agriculture informatization system based on IOT." Journal of Computer Research and Development 48(2011):316-331.
4. Somov, Andrey, etal."Bacteria to power the smart sensor applications: Yanjing, Sun, etal. "Research and design of agriculture informatization system based on IOT." Journal of Computer Research and Development 48(2011):316-331.
5. Han, Shuqing, etal. "Analysis of the frontier technology of agricultural IoT and its predication research. "IOP Conference Series: Materials Science and Engineering.Vol.231.No.1.IOP Publishing, 2017.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad–75.

18CSO 04 **BASICS OF DATA SCIENCE USING R**

(Open Elective III)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Probability and Statistics, basics of programming languages.

Course Objectives: The main objectives of this course are:

1. Understand R programming language.
2. Explore the programming skills needed to use R tool for statistical analysis of Biological data.
3. Analyze biological data.

Course Outcomes: On Successful completion of this course, student will be able to

1. Summarize the basics of R and in-built data visualization packages.
2. Describe the data analysis using Bayesian and stochastic modeling.
3. Relate Gibbs, Z- sampling distributions and compare the binomial, chi-square, wilcoxon and Fisher's exact tests in hypothesis testing.
4. Explore the ANOVA in Regression analysis and classify the multivariate data.
5. Experiment with the biological data using R tool and apply clustering algorithms to biological data.
6. Identify R commands for data manipulation and database technologies for datasets of bioinformatics

UNIT - I

Basics of R: Introduction, R features, setting up and exploring R environment, loading packages, types of data objects in R, working with R data objects, Controlling work space, importing files. Programming with R: Variables and assignment, operators, control structures, Functions-built-in, writing own functions, package creation.

UNIT - II

Data Analysis and Graphics: Data summary functions in R, Graphics technology in R, saving graphics, additional graphics packages. Bayesian Data Analysis: Need of Bayesian approach, Application of Bayes rule, Priors, Likelyhood functions, evaluating the posterior, Applications of Bayesial Statistics in Bioinformatics. Stochastic Modeling: Stochastic process and Markov Processes, Classification of Stochastic processes, modeling a DNA sequence with Markov Chain, Characteristics of Markov Chain.

UNIT - III

MCMC using Brugs: ABO blood type example. Gibbs sampling. Statistical Inference: Sampling distributions, Parameter estimation, interval estimation, bootstrapping, R packages for bootstrapping. Hypothesis Testing: Package ctest, Binomial test, comparing variances, Wilcoxon tests, Chi-Square test, Fisher's Exact tests, Likelihood Ratio tests.

UNIT - IV

ANOVA and Regression: ANOVA table, perforating ANOVA using R, graphical analysis of ANOVA comparison, Regression: Correlations, linear regression model, fitting and testing of regression model, generalization of the model. Working with Multivariate Data: Multivariate data, sample statistics, display of multivariate data, outliers and principal components. Classification of discriminate analysis- classification with two population and more than two populations, cross validation classification trees.

UNIT - V

Clustering methods: measures of dissimilarities, K-means clustering, K-Medoid clustering, Hierarchical clustering-Agglomerate and divisive. R Packages: Bio-conductor and Seqin R.

Data Technologies: R for Data manipulation, example, Database technologies, Bioinformatics resources on the WWW.

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Text Books:

1. Kim Seefeld, Ernest Linder, “Statistics using R with Biological examples”, 2007 (https://cran.r-project.org/doc/contrib/Seefeld_StatsRBio.pdf).
2. Robert Gentleman, “R Programming for Bioinformatics”, 1st Edition, CRC Press, 2008.

Suggested Reading:

1. ArvilCohhlan “A Little Book of R for Bioinformatics”, Release 1.0, CC ver 3.0

Online Resources:

1. https://epdf.tips/r-programming-for-bioinformatics.html
2. https://epdf.tips/r-programming-for-bioinformatics.htmlhttps://www.cyclismo.org/tutorial/R/object Oriented.html
3. https://www.w3schools.in/r/object-oriented/

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH C 27 **TECHNICAL SEMINAR**

Instruction	2 Hours per week
CIE	50 Marks
Credits	1

Course Outcomes: At the end of the course, the student will be able to:
1) Summarize the literature review in order to identify and formulate the engineering problem
2) Show preparedness to study independently and apply acquired technical skills to variety of real time problem scenarios
3) Develop the required critical thinking ability and analytical skills for evaluation of the selected problem
4) Illustrate the written and oral communication skills through a seminar report and presentation
5) Demonstrate the required knowledge, skills, attitude and ethics as a professional engineering graduate
6) Work in a team by adapting to the working environment

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state of the art topics in a broad area of his/her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

The seminar must be clearly structured and the power point presentation shall include following aspects:
1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Each student is required to:
1. Submit a one page synopsis of the seminar talk for display on the notice board.
2. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes in PowerPoint, followed by Question and Answers session for 10 minutes.
3. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by the department.

Seminars are to be scheduled from 3rd week to the last week of the semester and any change in schedule shall be discouraged.
For the award of sessional marks students are judged by three (3) faculty members and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation.

Note: Topic of the seminar shall be preferably from any peer reviewed recent journal publications.

Guidelines for awarding marks		
Sl No.	Description	Max Marks
1.	Contents and relevance	10
2.	Presentation skills	10
3.	Preparation of PPT slides	05
4.	Questions and answers	05
5.	Report in a prescribed format	20

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

18CH C 28 **PROJECT: PART II**

Instruction	20 Hours per week
CIE	100 Marks
SEE	100 Marks
Credits	10

Course Outcomes: At the end of the course, the student will be able to:

1. Summarize the literature review to identify and formulate engineering problems
2. Design the experiments/ process /mathematical model by selecting the engineering tools/components for solving the identified problem
3. Develop skills of problem solving, interpreting analysis and evaluation
4. Illustrate written and oral communication skills through project report and presentation
5. Demonstrate the knowledge, skills, attitude and ethics of a professional engineering graduate
6. Adapt to the working environment of Industry/Institute by working as a team

The object of 'Project: Part-2' is to enable the student extend further the investigative study taken up, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned;
2. Review and finalization of the Approach to the Problem relating to the assigned topic;
3. Preparing an Action Plan for conducting the investigation, including team work;
4. Detailed Analysis/Modeling/Simulation/Design/Problem Solving/Experiment as needed;
5. Final development of product/process, testing, results, conclusions and future directions;
6. Preparing a paper for Conference presentation/ Publication in Journals, if possible;
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar presentation before Departmental Committee

Guidelines for the award of marks in CIE: (Max. Marks: 100)

Evaluation	Max .Marks	Evaluation Criteria / Parameter
Department Review Committee	10	Review 1
	15	Review 2
	25	Submission
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	10	Quality of the work which may lead to publications
	10	Report Preparation
	10	Analytical / Programming / Experimental Skills

Guidelines for awarding marks in SEE: (Max. Marks: 100)

Evaluation	Max .Marks	Evaluation Criteria / Parameter
External and InternalExaminers together	20	Power Point Presentation
	40	Thesis Evaluation
	20	• Quality of the project • Innovations • Applications • Live Research Projects • Scope for future study • Application to society
	20	Viva-Voce

I/c HEAD
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

20MTC08

PARTIAL DIFFERENTIAL EQUATIONS AND STATISTICS

(For CIVIL/MECH/PROD/CHEM)

Instruction	3 L+1T Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives:

1. To learn Numerical solution of ODE and Engineering problems.
2. To form PDE and to find its solution.
3. To know the model of wave and heat equations.
4. Able to fit the hypothetical data using probability distribution.
5. To learn fitting of distribution and predicting the future values.

Course Outcomes: On successful completion of this course the students shall be able to

1. Find solution of initial value problems of ODE by Numerical Method.
2. Solve Linear and Non-Linear PDE's.
3. Solve One-Dimension Wave and Heat equations and Two Dimension Laplace equation.
4. Use the basic probability for fitting the Random phenomenon.
5. Analyze the random fluctuations of probability distribution and Principles of Least Squares approximations for the given data.

UNIT-I: Numerical Methods

Solution of Algebraic and transcendental equations by Bisection method, Regula-Falsi method Newton-Raphson method. Numerical Solutions of First Order Ordinary differential equations by Taylor's series method, Euler's method, Modified Euler's method and Runge-Kutta method of fourth order.

UNIT-II: Partial Differential Equations

Formation of Partial Differential Equations, Linear Equations of First Order (Lagrange's Linear Equations), Solution of First Order Non-linear Partial Differential Equation (Standard forms) and Charpits Method.

UNIT-III: Applications of Partial Differential Equations

Solution by Method of Separation of Variables, Solution of One dimensional Wave equation, Solution of One dimensional Heat equation, Solution of Two dimensional Laplace equation and its related problems.

UNIT-IV: Basic probability

Basic probability, Conditional probability, Baye's theorem. Random variable, Discrete probability distribution and Continuous probability distribution. Expectation, Addition and Multiplication theorem of expectation, properties of variance, Moments (Moments about the mean and moments about a point)

UNIT-V: Probability Distributions and Curve Fitting

Poisson distribution,MGF and Cumulants of the Poisson distribution, Normal distribution, characteristics of Normal distribution MGF and CGF of Normal distribution, Areas under normal curve. Correlation, Coefficient of Correlation and Lines of Regression. Curve fitting by the Method of Least Squares, Fitting of Straight lines, Second degree parabola, exponential and Growth curves.

Text Books:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2017.
2. S.C.Gupta, V.K.Kappoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.

Suggested Reading:

1. Erwin kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.
2. S. J. Farlow, "Partial Differential Equations for Scientists and Engineers", Dover Publications, 1993.
3. Sheldon Ross, "A First Course in Probability", 9th Edition, Pearson publications, 2014.

20CE C03

SURVEYING I

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: To enable the student

1. To understand basic concepts of surveying and use of chains for developing the map of a given area
2. To perform levelling operations and developing contour maps
3. To know the concepts and use of Tacheometry technique in surveying
4. To give exposure to the latest instruments like Total Station and GPS for solving the surveying problems
5. To understand the importance of trigonometric levelling and applying the same for finding the elevations of objects by various methods.

Course Outcomes:

At the end of the course the student should have learnt

1. To select basic surveying instruments such as chains, tapes etc., to measure areas.
2. To apply the principles of levelling and prepare contour maps to estimate volumes of earthwork using Simpsons and/or trapezoidal rules.
3. To apply the principles of tacheometry on the field.
4. To operate modern instruments like Total Station and GPS in the field
5. To make use of principles of trigonometric levelling for measuring elevations of required objects
6.

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1	1												
CO 2	2	1	2												
CO 3	2	1													
CO 4	2	1	1	1											
CO 5	2	1	1	1											

UNIT- I: INTRODUCTION AND BASIC PRINCIPLES OF SURVEYING

Concepts of surveying, principles of surveying, various classifications of surveying. Chain survey- Concepts of survey lines, offsets. Errors in chain survey. Measurement of area - Simpson's method, average ordinate, mid ordinate and trapezoidal rules. Basics of compass survey and plane table survey- accessories and methods.

UNIT – II: LEVELLING AND CONTOURS

Definition of levelling, terms used in levelling. Instruments of levelling, methods of booking levels, Height of Instrument and Rise and Fall methods. Concepts of balancing levels. Types of levelling, reciprocal levelling, profile levelling, precise levelling. Correction to refraction, errors in levelling. Definition of contours-Characteristics of contours, contour interval, methods of contouring-direct and indirect. Development and use of contour maps.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

UNIT – III: TACHEOMETRY

Tacheometry - Theory and use of stadia wires in levelling instruments and theodolite. Fixed hair tacheometers, and concepts and use of Tangential tacheometry. Concepts of Reduction Diagrams, tacheometric, tables, Principle and use of substance bar and concepts of Beaman's stadia arc.

UNIT – IV: MODERN SURVEYING INSTRUMENTS TOTAL STATION AND GPS

Modern Field Survey Systems: Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Total station-Parts of a Total Station – Accessories, Advantages and Applications, Field Procedure for total station survey, traversing by Total Station, Errors in Total Station Survey. Concepts of consecutive coordinates- Closing error adjustment and accuracy of a traverse – Gale's traverse table. Advantages of plotting traverse by co-ordinates, solutions to omitted measurements in traverse .Global Positioning: Systems- Segments, GPS measurements, errors and biases, surveying with GPS, co-ordinate transformation, accuracy considerations.

UNIT – V: TRIGONOMETRIC LEVELLING

Trigonometrical levelling Calculation of elevations and distances of accessible and inaccessible objects, numerical problems. Geodetic observations-refraction and curvature. Corrections, axis signal correction, determination of difference in elevation by single and reciprocal observations, numerical problems.

Text Books:

1. C. Venkataramaiah, "A Textbook of Surveying", Universities Press, Hyd, 2011.
2. R. Subramanian,''*Surveying and Levelling*", Oxford Higher Education, 2012.
3. B.C. Punmia & Ashok Jain, "Surveying", Vol II, 12th edition, Laxmi Publication, 2010.

References

1. AM. Chandra, "Plane Surveying", New Age International", 2007.
2. Arora, K.R," Surveying Vol II & III", Standard Book House & SBH Publishers & Distributors,1705, A Nai Sarak, New Delhi - 110 006, 12th edition, 2013.
3. S. K. Duggal, "Surveying", Tata McGraw-Hill Education Private Ltd, New Delhi India, 2013.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

20CE C04

SOLID MECHANICS

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: To enable the student
1. Understand the stress - strain behavior of different materials and temperature stresses, in compression and tension.
2. Analyze the statically determinate beams and sketch shear force and bending moment diagrams.
3. Understand the bending and shear stresses across various cross sections of beams.
4. Comprehend compound stresses, direct and bending stresses.
5. Analyze thin and thick cylinders for fluid pressures.

Course Outcomes: At the end of the course the students are able to
1. Evaluate the strength of various materials, against structural actions such as compression, tension.
2. To analyze statically determinate beams and sketch SFD and BMD.
3. Able to draw variation of shear and bending stresses.
4. Able to evaluate direct and bending stresses, compound stresses.
5. To design thin and thick cylinders for resisting internal and external pressures.

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	-	-	-	-	-	-	-	-	1	3	1	2
2	3	2	1	-	-	-	-	-	-	-	-	1	3	1	2
3	3	2	1	-	-	-	-	-	-	-	-	1	3	1	2
4	3	2	1	-	-	-	-	-	-	-	-	1	3	1	2
5	3	2	1	-	-	-	-	-	-	-	-	1	3	1	2

UNIT- I:
Simple Stresses and Strains: Various types of stresses and strains. Hooke's law, Modulus of Elasticity, Stress-Strain curve for ductile & brittle materials, Working stress and factor of safety. Deformation of bars of uniform, varying and tapering sections under axial loads, Elongation of bars due to self-weight, Compound bars and temperature stresses.
Elastic Constants: Poisson's ratio, volumetric strain and derivation of relationship between elastic constants.

UNIT- II:
Shear force and Bending moment: Different types of beams and loads, Shear force and bending moment diagrams for cantilever, and simply supported beams with and without over hangs subjected to different kinds of loads point loads, uniformly distributed loads, uniformly varying loads and couples- Relation between loading, shear force and bending moments.

UNIT- III:
Bending stresses in Beams: Assumptions in theory of simple bending- Derivation of bending equation, Moment of resistance -Calculation of stresses in statically determinate beams for different cross sections and types of loads.
Shear stresses in Beams: Equation of shear stress, shear stress distribution across rectangular, circular, triangular, I, T, and diamond sections.

UNIT- IV:
Direct and bending stresses: Basic concept, Eccentric loading, limit of eccentricity - core of sections-rectangular, circular, solid and hollow sections.
Compound Stresses and Strains: Stresses on oblique planes, principal plane and principal stresses. Mohr's circle of stress.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

UNIT- V:
Thin cylinders: Thin cylinders subjected to internal fluid pressure, volumetric change, Wire winding of thin cylinders.

Thick cylinders: Lame's equations, stresses under internal and external fluid pressures.

Text Books:
1. B. C. Punmia," *Mechanics of Materials Vol. I &II"*, Laxmi publishers, Delhi, 2017.
2. S. Ramamrutham, "*Strength of Materials*", Dhanpat Rai & Sons, Delhi, 2014.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

20CE C05

FLUID MECHANICS

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To understand fluid properties, fluid pressure and forces, basic concepts and continuity equation
2. To understand the fluid motion, energy equation, analyze the forces on various objects.
3. To know various measuring instruments in finding the fluid pressure, velocity, and discharge.
4. To understand and analyze different flow characteristics of laminar and turbulent flows
5. To understand water hammer effect in pipes and to understand dimensional analysis and models studies.

Course Outcomes:

At the end of the course, the student should have learnt

1. To evaluate the various properties of fluid, analyse fluid flow and forces.
2. To apply the various laws and principles governing fluid flow to practical problems.
3. To measure pressure, velocity and discharge of fluid flow in pipes, channels, and tanks.
4. To apply laws related to laminar and turbulent flow in pipes.
5. To evaluate water hammer effect in pipes and to apply dimensional and model laws to fluid flow applications.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1									1	2		
CO2	3	2	1									1	2		1
CO3	3	2	1									1	2		1
CO4	3	2	1									1	2		1
CO5	3	2	1									1	2		1

UNIT-I

Fluid Properties: Definition of fluid, Properties of fluids- Density, Specific Weight, Specific Volume, Specific Gravity, Bulk Modulus, Vapour Pressure, Viscosity, Capillarity and Surface tension, Newton's law of Viscosity.
Fluid Statics: Pascal's Law, Hydrostatic Law, Absolute and gauge pressure. Forces on immersed bodies: Total pressure, centre of pressure, pressure on curved surface.
Buoyancy: Buoyancy, Metacentre, stability of submerged and floating bodies**.**
Fluid Kinematics: Classification of fluid flow- steady unsteady, uniform, non-uniform-, one-, two- and three-dimensional flows. Concept of streamline, stream tube, path line and streak line.
Law of mass conservation – continuity equation from control volume and system analysis. Rotational and Irrotational flows, Stream function, Velocity potential function, flownet.

UNIT-II

Fluid Dynamics: Convective and local acceleration, body forces and surface forces, Euler's equation of motion from control volume and system analysis.
Law of Energy Conservation: Bernoulli's equation from integration of the Euler's equation. Signification of the Bernoulli's equation, its limitations, modifications and application to real fluid flows.
Impulse Momentum Equation: Momentum and energy Correction factor. Application of the impulse momentum equation to evaluate forces on nozzles and bends. Pressure on curved surface- vortex flow- forced and free vortex.

UNIT-III

Measurement of Pressure: Piezometer and Manometers - Bourdon Gauge.
Measurement of Velocity: Pitot tube and Current meter.
Measurement of Discharge in pipes and tanks: Venturi-meter, Orifice-meter, nozzle meter, elbow meter and rotameter. Flow through mouthpiece and orifice.
Measure of Discharge in Free surface flows: Notches and weir

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

UNIT-IV

Flow through Pressure Conduits: Reynold's Experiment and its significance. Upper and Lower Critical Reynold's numbers, Critical velocity. Hydraulic gradient. Laminar flow through circular pipes. Hagen Poiseuille equation. Turbulent flow characteristics. Head loss through pipes. Darcy-Weisbach equation. Friction factor. Moody's diagram. Minor loss, Pipes in Series and Pipes in parallel.

UNIT-V

Unsteady Flow in Pipes: Water hammer phenomenon, pressure rise due to gradual and sudden valve closure, critical period of the pipeline, power transmission through pipes.

Dimensional Analysis and Models Studies: Dimensional analysis - Rayleigh Method, Buckingham method, geometric, kinematic and dynamic similarity, similarity laws, significance of Reynolds and Froude model law, different types of models and their scale ratios, distorted and undistorted models, scale effect in models.

Text Books:

1. P.N. Modi and S.M. Seth, Hydraulics and Fluid Mechanics Including Hydraulic Machines, Standard Book House, Delhi, 22nd Edition, 2019.
2. A.K. Jain, Fluid Mechanics including Hydraulic Machines By A.K. Jain Khanna Publishers, Delhi, First Reprint, 2016.

Suggested Books:

1 K.L. Kumar, Engineering Fluid Mechanics, Eurasia Publishing House, 2008.
2 R.K. Rajput, Fluid Mechanics and Hydraulic Machines, S. Chand and Company, 2017.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

With effect from the Academic Year 2021-22

20CE C06

BUILDING CONSTRUCTION PRACTICE & CONCRETE TECHNOLOGY

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: To enable the student
1. To study about the traditional building materials, properties and their applications.
2. To learn the properties & conduct tests on various ingredients of concrete.
3. To understand various properties of fresh and hardened concrete.
4. To understand the concepts of building planning and various practices adopted and different types of roofs, doors, windows and stairs.
5. To understand different types of masonry, types of bonds used in construction of walls of buildings.

Course outcomes: At the end of the course the student is able
1. To identify the traditional building materials and select suitable type for given situation.
2. To determine the properties of the ingredients of concrete and adjudge their suitability.
3. To know various properties of fresh and hardened concrete.
4. To know the concepts of building planning and various practices adopted and different types of roofs, doors, windows and stairs.
5. To know different types of masonry, types of bonds used in construction of walls of buildings.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2				1						1	1	1	1
CO2		1			1							1		1	1
CO3		1			1							1	1	1	
CO4	1	1	2		1							1	1		1
CO5	1	1	2		1							1	1	1	1

UNIT- I:
Traditional Building Materials: Properties, Types, Applications and testing of traditional building materials - Stone, Timber, Brick, Paints, Varnishes and distempers.
Introduction to new materials/composites: Plastics, Tiles, AAC Blocks, CLC Blocks

UNIT- II:
Concrete Materials: Manufacturing process of cement, properties of cement, types and tests conducted on cement - Properties of aggregate (Fine & coarse) and tests on aggregate (Fine & coarse) – Properties and tests on cement mortar.
Production of concrete: batching, mixing, transportation, handling, placing and curing of concrete & methods of curing. Water cement ratio, Gel space ratio.

UNIT- III:
Influence of constituent materials on Fresh concrete: Segregation and bleeding of concrete - Workability, factors affecting workability, measurement of workability using slump cone and compaction factor tests.
Hardened concrete: Behaviour of concrete under compression - M
Concrete Mix Design: Basic considerations - Factor to be conside I.S. code method of mix design

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

UNIT- IV:
Concepts of Building Planning: Types of Buildings as per National Building Code, Functional needs and differences in their planning requirements – Principles of Planning - Building Byelaws – Planning of a building with byelaws - Plumbing services – HVAC services – Formwork & Shuttering – Plastering & Pointing - Types of roofs, doors, windows and staircases – Representation of Building materials and Plumbing services.

UNIT- V:
Masonry Construction: Introduction
Stone Masonry: Elevation, sectional plans and cross sections of walls of Ashlar, CRS I and II sort and RR stone masonry
Brick Masonry: Plan and isometric view of external main wall junctions, Stretcher Bond, Header Bond; English Bond& Flemish Bond – for half brick, one & one and a half brick wall.
Composite Masonry: Stone Composite Masonry, Brick Stone Composite Masonry, Cement Concrete Masonry, Hollow Clay tile Masonry, Reinforced Brick Masonry.

Text Books:
1. S.P. Arora & S. P. Bindra, "*A text book of Building Construction*", Dhanpat Rai Publications, 2010.
2. B.C Punmia, Ashok Kumar Jain &Arun Kumar Jain "*Building Construction*", Laxmi Publications (P) LTD, 2016.
3. A.M Neville., "Properties of Concrete", Pearson Education. 2012.
4. M.S. Shetty, and A. K. Jain, "Concrete Technology: Theory and Practice", S. Chand & Company, 2018.
5. R. Santhakumar, "Concrete Technology", Oxford University, Press 2018.

Suggested Reading:
1. P.C. Varghese, "*Building construction*" PHI, 2016.
2. CBRI Roorkee, "*Advances in Building Materials and construction*".
3. Sushil Kumar, "*Building Construction*", Standard Publishers, 1992.
4. National Building Code of India, 2006.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Code: 20EG M03

UNIVERSAL HUMAN VALUES-II: UNDERSTANDING HARMONY

(**B.E/B.Tech II/III Year** -Common to all Branches)

Instruction	3L Hours per Week
Duration of SEE	3 Hours
SEE	60Marks
CIE	40 Marks
Credits	3

Introduction

This course discusses the role of human values in one's family, in society and in nature. In the Induction Program, students would get an initial exposure to human values through Universal Human Values–I. This exposure is to be augmented by this compulsory full semester foundation course.

Course Objectives

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in human being, family, society and nature/existence.
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Outcomes

By the end of the course,

1. Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
3. They would have better critical ability.
4. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
5. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

The course has 28 lectures and 14 practice sessions:

Unit 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current Scenario
- Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Unit 2: Understanding Harmony in the Human Being - Harmony in Myself

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Unit 3: Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co -existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Unit 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment among the four orders of nature - recyclability and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all - pervasive space
- Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Unit 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order:
  a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
  b. At the level of society: as mutually enriching institutions and organizations

Include practice Exercises and Case Studies will be taken up in Pr To discuss the conduct as an engineer or scientist etc.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

With effect from the Academic Year 2021-22

Mode of Conduct (L-T-P-C 2-1-0-3)

- Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions.
- While analysing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.
- In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self- exploration.
- Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.
- Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practicals are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignments and/or activities are included.
- The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

Assessment:

This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self- assessment, peer assessment etc. will be used in evaluation.

Example:

Assessment by faculty mentor: 10 marks

Self-assessment/Assessment by peers: 10 M

Socially relevant project/Group Activities/Assignments: 20 marks

Semester End Examination: 60 marks

The overall pass percentage is 40%. In case the student fails, he/she must repeat the course.

Text Books

The Text Book

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1 The teacher's manual
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. A Nagaraj Jeevan Vidya: Ek Parichaya, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. Cecile Andrews, Slow is Beautiful
4. Gandhi - Romain Rolland (English)
5. Dharampal, "Rediscovering India"
6. E. FSchumacher. "Small is Beautiful"
7. J. C. Kumarappa "Economy of Permanence"
8. Pandit Sunderlal "Bharat Mein Angreji Raj"
9. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
10. 10.Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
11. Maulana Abdul Kalam Azad, India Wins Freedom -
12. Vivekananda - Romain Rolland (English)
13. The Story of Stuff (Book)

20CE C07

SOLID MECHANICS LAB

Instruction	2P Hours per week
Duration of Semester End Examination	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives: To know and understand the mechanical characteristics of various engineering materials by conducting different tests.

1. Mechanical properties of engineering materials under different structural actions like direct tension, compression, flexure and torsion.
2. Measurement of deflections and hence there by finding elastic properties.
3. To assess the behavior of steel rods under impact loads and shear.
4. To conduct torsion test and to conduct deflection test on helical spring and
5. To conduct compressive strength on brick and concrete cube

Course Outcomes: At the end of the course, the students will be able

1. To understand the stress strain behavior of mild steel bar under direct tension.
2. To compute the modulus of elasticity of given materials by conducting deflection tests on different types of beams.
3. To determine the impact/ shear strength of steel specimen.
4. To determine the rigidity modulus of a given material by conducting torsion test and deflection test on helical spring.
5. To determine the compressive strength of brick and concrete cube.

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	2	1	1	-	1	1	1	1	1	3	2	1
2	3	2	1	2	1	1	-	1	1	1	1	1	3	2	1
3	3	2	1	2	1	1	-	1	1	1	1	1	3	2	1
4	3	2	1	2	1	1	-	1	1	1	1	1	3	2	1
5	3	2	1	2	1	1	-	1	1	1	1	1	3	2	1

List of Experiments:

1. Direct tension test on mild steel bar.
2. Deflection test on Simply Supported beam.
3. Deflection test on Cantilever beam.
4. Deflection test on Propped cantilever beam.
5. Deflection test on Continuous beam.
6. Impact test.
7. Shear strength of a steel bar.
8. Torsion test.
9. Deflection test on helical spring.
10. Compression test on brick and concrete cube.

Suggested Reading:

1. William Kendrick Ha, "*Laboratory Manual of Testing M*

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

20CEC08 **FLUID MECHANICS LAB**

Instruction	2P Hours per week
Duration of Semester End Examination	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:
1. To enable the student understand the governing parameters for the discharge measurement for flows through various measuring devices.
2. To verify the flow and velocity measurements by conducting different tests.
3. To understand Bernoulli's principle by conducting experiment.
4. To understand Hydrostatic forces on flat and curved surfaces by conducting experiments.
5. To understand stability of floating bodies by conducting experiments.
6. To enable the student to understand viscosity.

Course Outcomes: At the end of the course, the student should have learnt
1. Ability to find the co-efficient of discharge for flows through various flow measuring devices.
2. To differentiate between laminar and turbulent flows and identify the governing parameters for both.
3. Applies the concept of Bernoulli's energy principle.
4. Applies the concept of hydrostatic forces on flat and curved surfaces.
5. Ability to find the stability and metacentre of floating body.
6. To differentiate between viscous and non-viscous flows and identify the governing parameters for both.

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1							1				1		1
CO2	3	1							1				1		1
CO3	3	1							1				1		1
CO4	3	1	1						1				1		1
CO5	3	1	1						1				1		1
CO6	3	1							1				1		1

LIST OF EXPERIMENTS

1. Determination of Cd, Cv, and Cc for circular Orifice (constant Head method).
2. Determination of Cd for mouthpiece (Falling Head method).
3. Determination of Cd for V notch.
4. Determination of minor losses and major loss in pipes.
5. Determination of Cd for venturi meter and orifice meter.
6. Determination of types of flow using Reynold's apparatus.
7. Verification of Bernoulli's principle.
8. Measurement of viscosity.
9. Stability of Floating Body.
10. Hydrostatics Force on Flat Surfaces/Curved Surfaces.

Text Books:

1. M.N. SheshaPrakash, "Experiments in Hydraulics and Hydraulic Machines – Theory and Procedures", PHI Learning Private Limited, 2011.
2. R.V.Raikar, "Laboratory Manual Hydraulics and Hydraulic Machines-PHI Learning Private Limited,2012.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

20CE C09

HYDRAULIC ENGINEERING

Instruction	3L Hours per week
Duration of Semester End Examination	3 hours
SEE	60Marks
CIE	40Marks
Credits	3

Course Objectives: The objective of this course is to

1. Understand and analyze the open channel flows, steady uniform flow and computation of friction and energy losses.
2. Understand and analyze the non-uniform flows and flow profile, energy dissipation
3. Exposure to the basic principles of aerodynamic forces, boundary layer formation and effects.
4. Understand the turbines; design the impulse turbine and its performance.
5. Familiarize with reaction turbines and its design, understand performance of reaction turbines and centrifugal pump

Course Outcomes: At the end of the course, the student will be able to

1. Apply the concepts of open channel flow and design the efficient channel cross section.
2. Apply the concepts of non-uniform open channel flow to the field problems.
3. Interpret the basics of computation of drag and lift forces in the field of aerodynamics, boundary layer effect.
4. Design the impulse turbines, run the turbines under efficient conditions.
5. Design the reaction turbines, draw characteristic curves of turbines and centrifugal pump

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO9	PO10	PO11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	1										2		
CO2	3	2	1										2		1
CO3	3	2	2										2		1
CO4	3	2	2										2		1
CO5	3	2	2										2		1

UNIT–I:

Uniform flow through open channels: Differences between pipe flow and channel flow, velocity and pressure distributions in channel cross-section, energy and momentum correction coefficients, uniform flow, Manning and Chezy formulae, most efficient channel cross-section, specific energy and specific force, concept of critical depth and its applications.

UNIT–II:

Non-uniform flow through open channels: Critical flow, Significance of Froude Number, dynamic equation of gradually varied flow, classification of gradually varied flow profiles and computation of flow profiles.

Hydraulic Jump- Momentum equation for a jump in horizontal rectangular channel, energy dissipation in hydraulic jump. Introduction to surges.

UNIT–III:

Boundary layer-Definition, laminar and turbulent boundary layers, boundary layer thickness, displacement thickness, momentum thickness and energy thickness, hydro dynamically smooth and rough boundaries, boundary layer separation and control.

Drag and lift: Fundamental concepts of drag and lift forces. Drag on sphere, cylinder, flat plate and aerofoil. Principles of streamlining, Magnus effect.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

UNIT-IV:

IMPACT OF JETS: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for Work done and efficiency-Angular momentum principle and torque.

HYDRAULIC TURBINES-I: Introduction, Classification, head and efficiencies, unit quantities, specific speed, power developed by turbine. Principles and design of Impulse turbine, velocity triangles, characteristic curves.

UNIT-V:

HYDRAULIC TURBINES-II: Reaction turbine - main components and working, work done and efficiencies, design of Francis turbine and Kaplan turbine, unit quantities, specific speed, characteristic curves, draft tube theory. Cavitation: causes, effects.

Centrifugal Pumps: Components, work done and efficiency, minimum starting speed, Euler head equation, specific speed and characteristic curves of centrifugal pumps, Pumps in series and parallel.

Text Books:

1. P.N.ModiandS.M.Seth,"*HydraulicandFluidMechanics*",StandardBookHouse,Delhi,2013.
2. K.Subramanya,"*FlowinOpenChannels*",TataMcGraw-HillEducation,2009.

Suggested Reading:

1. K. Subramanya, "*1000 Solved Problems in Fluid Mechanics*", TataMc-GrawHillPublications2005.
2. VenTeChow,"*Open-ChannelHydraulics",*McGraw-Hill,NewYork,1959.
3. A. K. Jain, "Fluid Mechanics: Including Hydraulic Machines", Khanna Publisher, 12th edition, 2016.
4. 4. R. L. Streeter, G. Z. Watters, and J. K. Vennerd, "Elementary Fluid Mechanics", John Wiley International Publications, 7th Edition, 1996

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

20CE C10

SURVEYING II

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: To enable the student
1. To understand the importance of various horizontal curves and the methods of setting
2. To understand the importance of transition curves and vertical curves and the methods of setting.
3. To understand the concepts of photogrammetric surveying
4. To know the simple concepts of Remote Sensing and image processing
5. To know the basics of adjustments of errors in survey and basics of LiDAR survey.

Course Outcomes: At the end of the course, student is able
1. To execute setting of simple and compound curves on the field by overcoming obstructions in curve ranging
2. To select suitable transition curves based on real world conditions and execute it on field
3. To apply the concepts of photogrammetry for solving problems in civil engineering
4. To choose appropriate remote sensing technique for data acquisition and image processing techniques for identification of ground features accurately
5. To be able to adjust the errors that are cropping while carrying surveying and adopt LiDAR survey for acquiring topographic data at high speed.

PO/ PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
20CEC09.1	2	2													
20CEC09.2	2	2													
20CEC09.3	2	2			1										
20CEC09.4	2	2			1										
20CEC09.5	1	1													

UNIT- I: CURVE SETTING

Curves: Introduction, Designation of curves, Elements of simple curves. Setting out simple curves by angular methods-Rankine's principle. Compound curves-Elements – solutions to different cases. Reverse curves-parallel straights and non-parallel straights.

UNIT – II: TRANSITION CURVES AND VERTICAL CURVES

Transition curves: Requirements-super elevation-equilibrium cant – cant deficiency-centrifugal ratio, length of transition curve-arbitrary gradient, the time rate, rate of change of Radial Acceleration. Ideal transition curve - Clothoid-cartesian coordinates-computations of Deflection angles. Modified ideal transition curves- The cubic Parabola, the cubic spiral, Characteristics of Transition curves and setting out of transition curves.

Vertical curves: Introduction, concepts of grade and change of grade-types of vertical curves, computations and setting of vertical curves-elevations by tangent correction, chord gradient-influence of sight distances.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

UNIT – III: PHOTOGRAMMETRIC SURVEYING

Photogrammetric Surveying: Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial Photogrammetric, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes

UNIT – IV: REMOTE SENSING AND VISUAL IMAGE INTERPRETATION

Remote sensing: Definition, Energy Principles, radiation principles, principles and Use of EMR spectrum, Energy interactions in atmosphere- Scattering, Absorption, Energy interactions with h surface features and concepts of spectral reflectance curve. Spectral reflectors, Diffuse reflectors, spectral reflectance on –vegetation, soils, water, pavement surface, spectral response pattern-atmospheric influences, characteristics of ideal remote sensing system and applications remote sensing to civil engineering problems.

Visual Image Interpretation: Introduction, fundamentals of visual image elements, image interpretation strategies and keys, wavelength of sensing, temporal aspects of image interpretation. Introduction to types of digital image processing.

UNIT – V: THEORY OF ERRORS AND LIDAR SURVEY

Theory of errors: Theory of errors and survey adjustments introduction, types of errors, laws of weights, Principles of Least squares, most probable value, method of displacements, Method of correlates, probable errors, distribution error.

LiDAR Survey: Introduction to LiDAR survey and fundamental concepts.

Text Books:

1. K. R. Arora, "*Surveying, Vol-I, II and III*", Standard Book House, 2015.
2. Gopi Satheesh and R.Sathikumar, "*Advanced Surveying: Total Station, GIS and Remote Sensing*", Pearson India, 2006.
3. T. Lillesand, R. W. Kiefer, "Remote Sensing and Image Interpretation", Jhon Willey & Sons, 2015.

Suggested Reading:

1. K. Manoj K. Arora and R. C. Badjatia*," Geomatics Engineering*", Nem Chand & Bros, 2011
2. A. M. Chandra, "*Higher Surveying",* Third Edition, New Age International (P) Limited, 2002.
3. M. Anji Reddy, "*Remote sensing and Geographical information system*", B.S. Publications, 2001.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

20CE C11

STRUCTURAL ANALYSIS-I

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: To enable the students
1. Comprehend the concept of determination of flexural deflections statically determinate beams using various methods.
2. Analyze the indeterminate beams.
3. Understand the behavior of circular shafts subjected to torsion and also to the combined effect of bending and torsion.
4. Compute the strain energy in bars subjected to the action of various types of loads and significance and analysis of types of springs.
5. To compute maximum load carrying capacity of various columns.

Course Outcomes: At the end of the course, the student will be able to
1. Compute slopes and deflections in determinate beams, under various types of static loads, using a suitable method.
2. Analyze the propped cantilevers and fixed beams subjected to various types of loads.
3. Analyze and design circular shafts subjected a given torque and bending.
4. To determine the strain energy in members under various loading situations, and to analyze various types of springs.
5. Analyze various types of columns with different end conditions.

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	-	-	-	-	-	-	-	-	1	3	1	2
2	3	2	1	-	-	-	-	-	-	-	-	1	3	1	2
3	3	2	1	-	-	-	-	-	-	-	-	1	3	1	2
4	3	2	1	-	-	-	-	-	-	-	-	1	3	1	2
5	3	2	1	-	-	-	-	-	-	-	-	1	3	1	2

UNIT-I:

Slopes and Deflections: Determination of Slope and deflections by double integration method and Macaulay's Method for cantilever, simple supported beams and overhanging beams carrying point loads, uniformly distributed loads, uniformly varying loads and couples. Application of Moment area method and Conjugate beam method for determination of Slope and deflections in simple cases.

UNIT - II:

Propped Cantilevers: Analysis of propped cantilever beams with elastic and rigid props for point loads and uniformly distributed loads, and determination of slope and deflections.

Fixed beams: Analysis of fixed beams subjected to point loads, uniformly distributed loads, uniformly varying loads. Slope and deflections in fixed beams with and without sinking of supports.

UNIT - III:

Torsion: Theory of pure torsion, Torsion equation, solid and hollow circular shafts, strength and stiffness of shafts, Transmission of power. Shafts in series and Shafts in parallel. Combined torsion and bending. Equivalent Bending and Torsional Moments.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

UNIT - IV:

Strain energy: Strain energy, proof resilience and modulus of resilience. Strain energy in bars subjected to gradually applied loads, suddenly applied and impact loads. Strain energy due to shear, bending and torsion.

Springs: Types of springs and significance, analysis of Closed and open coiled helical springs under axial load and twist.

UNIT- V:

Columns and Struts: classification of columns, Euler's theory for different end conditions of columns, effective length factors, radius of gyration and slenderness ratio, limitations of Euler's theory. Empirical formulae- Rankine's - Gordon's formula, Secant and Prof. Perry's formulae.

Text Books:

1. B .C. Punmia, "*Mechanics of Materials Vol. I &II* ", Laxmi publishers, Delhi, 2011.
2. S. Ramamrutham, "*Strength of* Materials", Dhanpat Rai & Sons, Delhi, 2012.

Suggested Reading:

1. S.B. Junnarkar*," Mechanics of structures (Vol-I &Vol-II)",* Charotar Publishing house, Anand, 2002.
2. D.S. Prakash Rao, "*Strength of Materials-A Practical Approach"*, Universities Press, 1999.
3. E.P. Popov, "*Engineering Mechanics of solids*", 1993.
4. G.H. Ryder, "*Strength of Materials",* 3 Edition in SI units, Macmillan India Ltd, Delhi, 2012.
5. A. Pytel and F. L. Singer, "*Strength of Materials",* Harper & Row, 4 Editions, New york.1999.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

20CE C12

REINFORCED CONCRETE DESIGN – I

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Outcomes: At the end of the course, student is able to

1. Use and suggest Reinforced concrete for various practical applications, interpret the clauses of IS:456 and apply the working stress method of design for rectangular beams.
2. Design RC beams of rectangular and flanged sections/ for flexure using limit state method and check for serviceability.
3. Design RC beams for shear, torsion and bond.
4. Analyse and design solid rectangular RC slabs of one way (cantilever, simply supported and continuous) and two way (simply supported and continuous).
5. Design RC short columns for axial loads and moments and axially loaded isolated footings.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	1								3	2	1
CO2	2	2	2	1	1								3	2	1
CO3	2	2	2	1	1								3	2	1
CO4	2	2	2	1	1								3	2	1
CO5	2	2	2	1	1								3	2	1

UNIT - I: Introduction to Reinforced Cement concrete: Concept of reinforced concrete - basic requirement of RC structures-Stresses, loads & combinations- Design Philosophies: Development of design philosophies – Introduction to working stress method and Limit state method - classification of limit states – characteristic loads - partial safety factors – Factors for material and load - design stress – stress and strain diagram of concrete and steel - Merit and demerits. Introduction to IS: 456- General design requirements and specifications. Working Stress method: Assumptions made in design of flexural members –Theory of bending in RC beams - Balanced, under and over reinforced sections. Analysis and design for flexure of singly reinforced rectangular beams-Analysis and design T-beams using WSM.

UNIT- II: Limit state method of design: Assumptions made in design of flexural members - Stress block parameters - Analysis and flexural design of singly reinforced, doubly reinforced rectangular beams and singly reinforced flanged beams. Limit state of serviceability: Short term, long term, total deflection - check for deflection - cracking - IS code provisions.

UNIT - III: Limit state of collapse in shear and torsion: Types of shear reinforcement – analysis and design for shear and torsion in beams - Bond - development length and curtailment of reinforcement in beams and detailing of bars: IS code provision.

UNIT - IV: Analysis and design of slabs as per IS 456: Solid rectangular slabs – one-way slabs (cantilever, simply supported and continuous), two-way slabs (simply supported and continuous slabs) subjected to uniformly distributed loads - Detailing of reinforcement and check for serviceability in slabs, Design of stairs - Design and detailing of dog legged slab type staircase.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

UNIT - V: Analysis and design of columns as per IS 456: Short and long columns - End conditions, effective length of columns - assumptions made in design - design and detailing of axially loaded rectangular and circular columns with lateral reinforcement - Design of axially loaded short columns subjected to uniaxial and bi-axial moments using interaction diagrams, Design of isolated footings as per IS 456: Design and detailing of axially loaded rectangular and circular footings.

Text Books:

1. N. Subramanian, "*Design of Reinforced Concrete Structures*" Oxford University Press. First Published in 2013, Second impression 2014.
2. S. Unni Krishnan Pillai and Devadas Menon, "Reinforced Concrete Design", Tata McGraw-Hill Publishing Co Ltd, (Third Edition), 2009.

Suggested Reading:

1. V. L. Shah and S. R. Karve, "Limit State Theory and Design of Reinforced Concrete", Structures Publications, 7th Edition,2014.
2. A.K. Jain, "Reinforced Concrete: Limit State Design", Nem Chand & Brothers-Roorkee; Seventh edition, paperback – 2012.
3. Sushil Kumar, "Treasure of RCC Designs", Standard Book House; Edition: 19th, Year-2014 edition (1 December 2009).
4. N. Krishna Raju, "Design of Reinforced Concrete Structures", CBS Publishers and Distributors, New Delhi, 4th edition, 2016.

With effect from the Academic Year 2021-22

PROFESSIONAL ELECTIVE-I

20CE E01

GREEN BUILDING TECHNOLOGIES

Instruction	3L Hours per week
Duration of Semester End Examination	3 hours
SEE	60Marks
CIE	40Marks
Credits	3

Course Objectives: To enable the student
1. To understand the basic principles of green building technologies and their significance.
2. To understand the judicial use of energy and its management.
3. To know about the Sun-earth relationship and its effect on climate.
4. To enhance awareness of end-use energy requirements in the society.
5. To know about the suitable technologies for energy management and audit procedures.

Course Outcomes: At the end of the course, the student should
1. Be able to identify the fundamentals of energy use and energy processes in building.
2. Be able to identify the energy requirement and its management.
3. Apply the knowledge about Sun-earth relationship vis-a-vis its effect on climate.
4. Be able to deal with the end-use energy requirements.
5. Be familiar with the audit procedures of energy.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1			1	2	1				1	2		2
CO2	1	1			1	1	2	1				1	2		2
CO3	1					1	2	1				1	1		1
CO4	2	2					2	1				1	1		1
CO5	1											1			

UNIT- I:
Overview of the significance of energy use and energy processes in building: Indoor activities and environmental control - Characteristics of energy use and its management - Macro aspect of energy use in dwellings and its implications.

UNIT- II:
Indoor environmental requirement and management: Thermal comfort – Ventilation and air quality – Visual perception – Illumination requirement - Auditory requirement.

UNIT- III:
Climate, solar radiation and their influences: Sun-earth relationship and the energy balance on the earth's surface - Climate, wind, solar radiation, and temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings.

UNIT- IV:
End-use, energy utilization and requirements: Lighting and day lighting - Heat gain and thermal performance of building envelope - Steady and non-steady heat transfer through the glazed window and the wall - Standards for thermal performance of building envelope - Evaluation of the overall thermal transfer

UNIT- V:
Energy management options: Energy audit and energy targeting r energy management. Certification- Study of the LEED and TERI (GRIHA) parameters a ldings

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Text Books:

1. Charles J. Kibert,"*Sustainable Construction - Green Building Design and Delivery*", John Wiley & Sons, New York, 2008
2. Norbert Lechner,"*Heating, Cooling, Lighting - Sustainable Design Methods for Architects*", Wiley, New York, 2015.
3. James Kachadorian, "*The Passive Solar House: Using Solar Design to Heat and Cool Your Home*", Chelsea Green Publishing Co., USA, 1997.

Suggested Reading:

1. Michael Bauer, Peter Mosel and Michael Schwarz, "Green*Building – Guidebook for Sustainable Architecture",* Springer, Heidelberg, Germany, 2010.
2. Mike Montoya,"*Green Building Fundamentals*", Pearson, USA, 2010.
3. Regina Leffers, *"Sustainable Construction and Design*", Pearson / Prentice Hall, USA, 2009.

With effect from the Academic Year 2021-22

20CE E02

PRINCIPLES OF GEOGRAPHICAL INFORMATION SYSTEM

Instruction	3L Hours per week
Duration of Semester End Examination	3 hours
SEE	60Marks
CIE	40Marks
Credits	3

Course objectives: To enable the student

1. Understand the basics and applications of GIS, and concepts of Maps , projections
2. Understands the basic difference between vector GIS and raster GIS.
3. Understand the various types of data, realize the importance of spatial data and also in a position to apply methods of data compression techniques. 4.Identify various types analysis functions used integrated analysis GIS data
5. Understand the basics of use of GIS softwares and apply the principles of cartographic modelling to watershed modeling, environmental modeling and watershed management.

Course Outcomes: At the end of the course, the student

1. Is able to apply the principles of GIS to various field problems and take decisions under uncertain conditions.
2. Is able to understand advantages and disadvantages of using vector GIS and raster GIS.
3. Is able to apply the methods of data Compression using GIS. 4. Can perform the data modeling and analysis using GIS.
5. Is able to apply the Cartographic modelling techniques for Watershed modeling, Environmental Modeling and for Watershed Management, visibility analysis..

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	2	2					2	2	2			
CO 2	2	2			2										
CO 3	2														
CO4	2	2	2	2	1				1	1	1	1			
CO5	2	2	2	2	1				1	1	1	1			

UNIT– I:

Introduction: Definition of GIS , History of development , Components of GIS-Data, Technology, System and Users, Map- introduction, scale, types of maps, mapping process-planning, data acquisition , cartographic production phase, product delivery, Plane coordinate system -rectangular, polar , Linear coordinate transformation system, Geographic coordinate system,

Map projections -Properties-area, shape, distance and direction, Classification -cylindrical, Conical, Azimuthal, Aspects of Projections-Normal, Transverse, oblique, View Points -Gnomonic, Orthographic and stereographic, Map projections for GIS, Datums-Geodetic and vertical , relationship between Coordinate system and map projections, UTM Projections

UNIT-II:

GIS Data: Nature of Geographic data-Geographic position, attributes, spatial relationship, time, Data types–spatial non spatial (attribute data)–data-structure, data format – point, line Polygon, Spatial data models - Raster data- data compression-point coding Run length coding, Quadtrees, Vector models- The spaghetti model, topological models, Triangulated irregular network model, Data files strucutre in comp :, Relational data base , object based data models Concepts of Geo referencing, Existing di abase. Digital elevation data

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

UNIT-III:
GIS Data analysis function : Introduction , organising Geographic data -data layers, coverage Classifications of analysis functions Spatial data analysis, data retrieval, query (SQL)–Organizing data for analysis, classification of GIS analysis function, maintenance and analysis of spatial data – transformation, conflation, Edge matching and Editing, Maintenance and analysis for non-spatial attribute data- Attribute editing and Attribute query functions.

UNIT-IV:
Integrated analysis functions: Retrieval and classification function: Overlay operations, neighborhood operations, connectivity function, output formatting – Map annotations ,text pattern and line styles, graphic symbols, cartographic modeling by GIS analysis procedure with an example.
Presentation of Geo-data Analysis: Types of output data–types of errors elimination and accuracies – sampling - components of data quality.

UNIT-V:
Software scenario – Functions: Introduction of Arc GIS, QGIS sfotwares,
Cartographic modelling - concepts, applications to Watershed modeling, Watershed Management, Environmental modeling – Visibility analysis. Vehicle tracking.

Text Books:
1. C.P.LO, Albert K.W. Yeung “ Concepts And Techniques of Geographic information systems” Prentice Hall of India Private Limited New Delhi,2016
2. P.A. Burrough, “*Principles of Geographical Information Systems for Land Resources Assessment (Monographs on Soil and Resources Survey)”,* Oxford University Press, 1986.
3. Lillesand and Kiefer, “*Remote Sensing and Image Interpretation*”, Wiley; Sixth edition, 2011.

Suggested Reading:
1. I. Heywood, S. Cornelius and Steve Carver, “*An Introduction to Geographical Information Systems*”, Pearson, 4th Edition, 2012. 2. B. Bhatta, “*Remote Sensing and GIS*”, Oxford, Second edition, 2011. 3. S. Kumar, “*Basics of Remote Sensing and GIS*”, Laxmi Publications, First edition, 2016.
2. S. Aronoff, “*Geographic Information Systems: A Management Perspective*”, WDL Publications Ottawa, 1991.
3. Michael N Demers ,”Fundamentals of Geographic system” Jhon Wiley sons, INC, 4th edition,2008

20CE E03

SOLID AND HAZARDOUS WASTE MANAGEMENT

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: To enable the student

1. Understand legislations on management of solid waste management.
2. Gain insight into the transfer, transport and energy recovery from municipal solidwaste.
3. Know the characteristics and handling of hazardous wastes.
4. Grasp the fundamentals of hazardous waste treatment techniques.
5. Know the regulations of site remediation and pollution prevention of hazardous wastes.

Course Outcomes: At the end of the course, student is able to

1. Characterize the solid waste according to thelegislations.
2. Apply the steps in waste reduction at source, collection techniques, resource recovery/recycling, transport and disposal options.
3. Characterize the hazardous waste and decide on transport methods of the same.
4. Select the site for disposal of hazardous waste and suggest remediation measures for disposal sites.
5. Applyvariouslegislationspertainingtohazardouswastemanagement according to the situations.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						1						1			
CO2	1	1	1	1		2	1	1			1	1	1		1
CO3	1	1	2	1		1	1	1			1	1	2		1
CO4	1	1	2	1		2	1	1		1	1	1	2		2
CO5	1	1				1		2				1			

UNIT- I:

Solid wastes: Solid waste generation in a technological society - sources and types of solid waste –legislations on management and handling of municipal solid wastes, monitoring responsibilities; Collection of Solid Waste: type of waste collection systems, analysis of collection system - alternative techniques for collection system.

UNIT-II:

Management of Solidwaste: Separationand Processingand Transformation of Solid Waste: unit operations used for separation and processing, Materials Recovery facilities, Waste transformation through combustion and anaerobic composting, anaerobic methods for materials recovery and treatment - Energy recovery - Incinerators. Transfer and Transport: need for transfer operation, transport means and methods. Disposal of Solid wastes- Land farming, deep well injections, Landfills: Site selection, drainage and leachate collection systems- requirements and technical solutions, integrated waste management facilities.

UNIT-III:

Hazardous waste : Definition and identification of hazardous wastes - sources and characteristics - hazardous wastes in Municipal Waste - Hazardous waste regulations -minimization of Hazardous Waste-compatibility, handling and storage of hazardous waste - collection and transport.

UNIT –IV:

Hazardous waste management: Treatment technologies –physical, ment, Hazardous waste landfills: Site selection, remediation of hazardous waste disposa essment, containment, remedial alternatives.

UNIT –V:

Environmental regulations: Environmental audit, Pollution Prevention, Facility Development and operation. Hazardous waste – legislations – RCRA process – superfund process – toxicological principles – dose response – toxic effects – toxic response

Text Books:

1. P. A. Vesilind, Worrell W and Reinhart, "*Solid Waste Engineering*", 2nd Edition (2016), Cengage Learning India Pvt. Ltd.
2. Tchobanoglous,"*Integrated Solid Waste Management"*, Mc-Graw Hill International 1st Edition, New York, 2014."
3. Charles A. Wentz; "*Hazardous Waste Management*", McGraw Hill Publication, 1995.

Suggested Reading:

1. CPHEEO, "*Manualon Municipal Solidwaste management"*, Central Public Health and Environmental Engineering Organisation, Government of India, New Delhi, 2000.
2. Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans, "*Hazardous waste Management*", Waveland Pr. Inc, 2010
3. C. A. Wentz, "*Hazardous Waste Management*", McGraw-Hill Publication, 1995.
4. A. D. Bhide and B. B. Sundaresan, "*Solid Waste Management, Collection, Processing and Disposal*", Nagpur.
5. S.C. Bhatia, "*Solid and Hazardous waste management*", Atlantic publishers, 2007.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

20CE E04

GROUND WATER ENGINEERING

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course objectives: The student should able to understand
1. Basics of groundwater hydrology, familiar with aquifer parameters.
2. Unsteady flow and its flow computation.
3. Exploring groundwater through surface and subsurface methods.
4. Artificial recharge and causes, methods of recharge.
5. Various models in groundwater, quality of groundwater, pollutant transport.

Course outcomes: The student should able to
1. Assess groundwater potential and head.
2. Estimate hydraulic conductivity and storage coefficient for time variant flow.
3. Investigate groundwater availability for a given area.
4. Plan and design artificial recharge.
5. Construct model and analyze groundwater flow.

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1										2		1
CO2	3	2	1										2		1
CO3	3	2	1			1	1						2		1
CO4	3	2	1			1	1						2		1
CO5	3	2	1										2		1

UNIT- I:
Introduction: Occurrence of groundwater, problems and perspectives regarding groundwater in India, groundwater basin, ground water in hydrologic cycle, vertical distribution of ground water, Hydrologic balance equation, types of aquifers. Darcy's law and limitations, aquifer parameters, specific yield, safe yield, three-dimensional groundwater flow equation, Steady radial flow to a well in unconfined and confined aquifers.

UNIT- II:
Unsteady radial flow to a well: Non equilibrium equation for pumping tests. This method of solution, Cooper Jacob method, Chow’s methods of solution. Law of times, well flow near aquifer boundaries, Image well theory, multiple well systems, well losses, pumping and recuperation tests.

UNIT- III:
Geophysical Exploration:
Surface investigations: Surface investigations of ground water – electrical resistivity method, seismic refraction method, gravity and magnetic methods, geologic methods, dowsing, remote sensing.
Subsurface Investigations: Test drilling, resistivity logging, temperature logging, caliper logging, Interpretation of logs and selecting the groundwater potential zones.

Unit- IV:
Artificial Recharge of groundwater: Methods of recharge, water spreading, sewage discharge, recharge through pits and shafts, recharge through well, induced recharge.
Sea water intrusion in coastal aquifers, occurrence, Ghyben – Herzberg relation, shape of fresh – salt water interface, Length of the intruded sea water wedge. Prevention and control of

Unit-V:
Modelling techniques: Introduction, ground water models, sand models, viscous fluid models, membrane models, thermal models, electric-Analog models. Numerical modelling, finite difference method.
Quality of groundwater: Groundwater Contamination, sources of groundwater contamination, groundwater quality criteria, advection process, diffusion and dispersion process, pollutant transport equation and modelling of pollutant transport.

Text Books:

1. D.K. Todd, "*Ground Water Hydrology*", John Wiley & Sons, Inc., USA, 2015
2. H.M. Raghunath, "*Ground Water*", Wiley Eastern Limited, New Delhi, 2007.

Suggested Reading:

1. Bouwer, "*Ground Water Hydrology*", Mc. Graw Hill, Newyork, 2013
2. A. K. Rastogi, "*Numerical Groundwater Hydrology*", Penram International Publishing, Mumbai, 2007.J. Bear, "*Hydraulics of Ground*

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

20CE C13 **Computer Aided Civil Engineering Drafting**

Instruction	1T+3P Hours per week
Duration of Semester End Examination	3 hours
SEE	50 Marks
CIE	50 Marks
Credits	2.5

Course Outcomes: At the end of the course, using the basic tools of Autocad - the student will be able to
1. Create basic 2D geometry shapes.
2. Draft elevation and sections of doors and windows.
3. Develop plan, section and elevations of buildings.
4. Draft plan and section of a staircase.
5. Draft RCC detailing of beams and footings.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1				1										
CO2	1				2							1	1		1
CO3	1				2							1	1		1
CO4	1				2							1	1		1
CO5	1				2							1	1		1

Introduction to Computer Aided Drafting - features and environment, initial settings. Coordinates - absolute, relative cartesian and polar coordinates. Snap, object snap, grid, ortho and polar modes. Draw tools and editing tools. Zoom and pan. Creating and managing – text and Dimensions. Managing object properties and hatching. Creating and inserting blocks, working in view ports and Layers.

List of Experiments:
1. Creating basic 2D geometry shapes.
2. Drafting elevation and sections of windows
3. Drafting elevation and sections of doors.
4. Developing plan, section and elevation of a single room house.
5. Developing plan, section and elevation of a single bedroom house.
6. Drafting the plan and section of a staircase (without reinforcement).
7. Detailing of RCC beam and footing.
8. Interpretation of Civil Engineering Drawings.
9. Guest lecture on – digitization of Industrial legacy drawings.

Text Books:

1. S.P Arora and S.P Bindra, ‘A text book of Building Construction’, Dhanpat Rai & sons, 2010.
2. George Omura, Brian C. Benton, ‘Mastering AutoCAD 2019 and AutoCAD LT 2019’, Wiley, 2018.

Suggested Reading:

1. K.Veenugopal, ‘Engineering Drawing and Graphics + Autocad’, New Age International Pvt.Ltd, 2010.
2. Balagopal A and Prabhu T. S, ‘Building Drawing and Detailing’, Spades publishers, Calicut, 1987.

20CEC14

HYDRAULIC ENGINEERING LAB

Instruction	2P Hours per week
Duration of Semester End Examination	3 hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives: To enable the student
1. Understand uniform and non-uniform flows and the importance of Froudenumber in open channel flows.
2. Determine super elevation in a curved channel.
3. Determine the force exerted by fluid jet on vane, determine efficiency and performance of turbines and centrifugal pumps.
4. To measure the discharge in a open channel.

Course Outcomes: At the end of the course, the student should have learnt
1. To compute the open channel rugosity coefficient in uniform flows and Froude number, energy losses in non-uniform flows.
2. To differentiate between uniform, non-uniform flows and flow in curved channel.
3. To determine work done by fluid jet on vane, compute work done and draw performance characteristic curves for turbines and centrifugal pumps.
4. To determine the coefficient of discharge of a venturi flume.

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1						1				1		1
CO2	3	1							1				1		1
CO3	3	1	1						1				1		1
CO4	3	1							1				1		1

List of experiments
1. Uniform flow in channels - Determination of Manning's Rugosity coefficient, Chezy's constant.
2. Curved Channel flow - Determination of super elevation
3. Hydraulic Jump - Determination of Froude number, loss of energy, type ofjump.
4. Venturiflume - determine coefficient of discharge in open channel.
5. Impact of Jets - Determination of force on flat vane and curved vane.
6. Unsteady flow in a hemi -spherical tank.
7. Pelton Wheel turbine-Determine the efficiency and construct performance characteristics of Pelton wheel turbine.
8. Francis Turbine- Determine the efficiency and construct performance characteristics of Francis turbine.
9. Kaplan Turbine- Determine the efficiency and construct performance characteristics of Kaplan turbine.
10. Centrifugal Pump- Determine the efficiency and construct operating characteristics curves for constant speed pump.

Text Books:

1. M.N. Shesha Prakash, "Experiments in Hydraulics and Hydraulic Machines – Theory and Procedures", PHI Learning Private Limited, 2011.
2. R.V.Raikar, "Laboratory Manual Hydraulics and Hydraulic Machines-PHI Learning Private Limited,2012

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

With effect from the Academic Year 2021-22

20CE C15

SURVEYING AND GEOMATICS LAB

Instruction	2P Hours per week
Duration of Semester End Examination	3 hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives: To enable the student

1. To know the use of simple survey instruments in the field.
2. To develop topo maps from the field data.
3. To get exposure to modern surveying instruments for solving the problems
4. To understand the concepts of automation in surveying.
5. To be in a position to set the curves by using various methods and identifying the data required to be computed for the same.

Course Outcomes: At the end of the course the student should have learnt

1. To use simple as well as modern surveying instruments.
2. To develop L.S and C.S for road works, Canal works, using Auto levels and to develop contour map of the given area.
3. To use Total Station for locating ground details and plotting.
4. To set simple curves using Total Station.
5. To locate ground features using GPS.

PO/ PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
20CEC14 .1	2	1	1						1						
20CEC14 .2	2	1	2						1			1			
20CEC14 .3	2	1	2						1						
20CEC14 .4	2	1	1	1					1						
20CEC14 .5	2	1							1						

LIST OF EXPERIMENTS:

1. Ranging, running perpendicular lines and types of offsets by using chain, tape, cross staff.
2. Use of prismatic compass for measuring the area of a given land by using compass traverse.
3. Introduction to plane table work. - Radiation and intersection methods.
4. Introduction to levelling - Fly levelling using Auto level.
5. Development of L.S. and C.S after obtaining levels by using Auto levels.
6. Developing contour maps.
7. Measurement of horizontal angles using theodolite.
8. Study of Total station operations.
9. Traversing by Total station.
10. Setting of simple curve with the help of Total Station.
11. Study of GPS operations.
12. Establishing control points using GPS.
13. Demonstration of Remote Sensing Data processing softwa

Suggested Reading:

1. B. C. Punmia and A. K. Jain," *Surveying and Levelling", Vol. I and II*, Laxmi Publications, 2016.
2. Subramanian, *"Surveying and Levelling*", Oxford Higher Education, 2012.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

20EGM01

INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES
(BE/BTech III/IV Semester - Common to all branches)

Instruction	2L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	0

Course Objectives
The course will introduce the students to:
1. History of Indian Constitution and how it reflects the social, political and economic perspectives of the Indian society.
2. Growth of Indian opinion regarding modern Indian intellectuals constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. Various Organs of Governance and Local Administration.

Course Outcomes
After successful completion of the course the students will be able to:
1. Understand the making of the Indian Constitution and its features.
2. Identify the difference among Right To equality, Right To freedom and Right to Liberty.
3. Analyze the structuring of the Indian Union and differentiate the powers between Union and States.
4. Distinguish between the functioning of Lok Sabha and Rajya Sabha while appreciating the importance of Judiciary.
5. Differentiate between the functions underlying Municipalities, Panchayats and Co-operative Societies.

Unit-I
Constitution of India: Constitutional history-Govt of India Act 1909, 1919 and 1935, Constitution making and salient features. Directive Principles of State Policy - Its importance and implementation.

Unit-II
Scheme of the Fundamental Rights & Duties: The Fundamental Rights **-** To Equality, to certain Freedom under Article 19, to Life and Personal Liberty Under Article 21. Fundamental Duties - the legal status.

Unit III
Union Government and its Administration - Structure of the Indian Union: Federalism, distribution of legislative and financial powers between the Union and the States.
Parliamentary form of government in India: Executive-President's role, power and position.

Unit IV
Legislature and Judiciary: Central Legislature-Powers and Functions of Lok Sabha and Rajya Sabha.
Judiciary: Supreme Court-Functions, Judicial Review and Judicial Activism

Unit V
Local Self Government - District's Administration Head (Collector): Role and Importance.
Municipalities: Introduction, Mayor and Role of Elected Representative, CEO of Municipal Corporation.
Panchayati Raj: Introduction, Zilla Panchayat, Elected Officials and their roles, CEO Zilla Panchayat: Position and Role. Block level: Organizational Hierarchy (Different departments). Village level: Role of Elected and Officials.

Text Books:
1. **Indian Government & Politics**, Ed Prof V Ravindra Sastry, Tel 2018.
2. **Indian Constitution at Work,** NCERT, First edition 2006, Rep

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Suggested Reading:

1. **The Constitution of India**, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, **Framing of Indian Constitution**, 1st Edition, 2015.
3. M. P. Jain, **Indian Constitution Law**, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu**, Introduction to the Constitution of India**, Lexis Nexis, 2015.

Online Resources:

1. http://www.nptel.ac.in/courses/103107084/Script.pdf

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

20EGM02

INDIAN TRADITIONAL KNOWELDGE

Instruction	2L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	0

Prerequisite: Knowledge on Indian Culture

Course Objectives:
1. To get a knowledge in Indian Culture
2. To Know Indian Languages and Literature and the fine arts in India
3. To explore the Science and Scientists of Medieval and Modern India

Course Outcomes: After completion of this course, students will be able to:
1. Understand philosophy of Indian culture
2. Distinguish the Indian languages and literature
3. Learn the philosophy of ancient, medieval and modern India
4. Acquire the information about the fine arts in India
5. Know the contribution of scientists of different eras.

UNIT-I
Culture and Civilization: Culture, civilization and heritage, general characteristics of culture, importance of culture in human life, Cultural diversity, Aesthetics, Women seers, Indus culture, Indian cuisine, Martial arts

UNIT-II
Education System: Education in ancient, medieval and modern India, aims of education, subjects, Languages, Science and Scientists of ancient, medieval and modern India

UNIT-III
Linguistic Wealth: Indian Languages and Literature: the role of Sanskrit, Paleography, Significance of scriptures to current society, Indian semantics and lexicography, Bhakti literature, Darsanas

UNIT-IV
Art, Technology & Engineering: Sculpture, Painting and Handicrafts, Indian Music, Dance Drama and Theatre, Introduction to Mayamatam, Iron and steel technology, Use of metals in medicinal preparations

UNIT-V
Science and Logic: Helio-centic system, Sulbasutras, Katapayadi, Hindu calendar, 6 pramanas in Indian logic, Scientific method applied to therapeutics, Fallacies, Tarka – Induction &Deduction, Ayurvedic biology, Definition of health

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Essential Readings:

1. Kapil Kapoor, **Text and Interpretation: The Indian Tradition,** ISBN: 81246033375, 2005
2. Samskrita Bharati, **Science in Samskrit**, ISBN-13: 978-8187276333, 2007
3. Satya Prakash, **Founders of sciences in Ancient Indi**a, Govindram Hasanand, ISBN-10: 8170770009, 1989
4. Brajendranath Seal, **The Positive Sciences of the Ancient Hindus**, Motilal Banarasidass, ISBN-10: 8120809254, 1915
5. Kancha Ilaiah, Turning the Pot, Tilling the Land: Dignity of Labour in Our Times

Suggested Readings:

- Swami Vivekananda, *Caste, Culture and Socialism*, Advaita Ashrama, Kolkata ISBN-9788175050280
- Swami Lokeswarananda, *Religion and Culture*, Advaita Ashrama, Kolkata ISBN-9788185843384
- Kapil Kapoor, *Language, Linguistics and Literature: The Indian Perspective*, ISBN-10: 8171880649, 1994.
- Karan Singh, *A Treasury of Indian Wisdom: An Anthology of Spiritual Learn*,ISBN: 978-0143426158, 2016
- Swami Vivekananda, *The East and the West*, Advaita Ashrama, Kolkata 9788185301860
- Srivastava R.N., *Studies in Languages and Linguistics*, Kalinga Publications ISBN-13: 978-8185163475
- Subhash Kak and T.R.N. Rao, Computation in Ancient India, Mount Meru Publishing ISBN-1988207126
- R.N Misra, *Outlines of Indian Arts Architecture, Painting, Sculpture, Dance and Drama,* IIAS, Shimla & Aryan Books International, ISBN 8173055149
- S. Narain, *Examinations in ancient India*, Arya Book Depot, 1993
- M. Hiriyanna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, ISBN-13: 978-8120810990, 2014
- Ravi Prakash Arya, Engineering and Technology in Ancient India, Indian Foundation for Vedic Science, ISBN-10: 1947593072020
- Shashi Tharoor, The Hindu Way
- Amartya Sen, Argumentative Indian

SWAYAM/Nptel:

History of Indian Science and Technology - https://onlinecourses.swayam2.ac.in/arp20_ap35/preview
Introduction to Ancient Indian Technology – https://onlinecourses.nptel.ac.in/noc19_ae07/preview
Indian Culture & Heritage - https://onlinecourses.swayam2.ac.in/nos21_sc11/preview
Language and Society - https://nptel.ac.in/courses/109/106/109106091/
Science, Technology & Society - https://nptel.ac.in/courses/109/103/109103024/
Introduction to Indian Philosophy - https://nptel.ac.in/courses/109/106/109106059/
Introduction to Indian Art - An appreciation - https://onlinecourses.nptel.ac.in/noc20_hs09/preview

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE C13

TRANSPORTATION ENGINEERING

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the student

1. To understand the design concepts of the highways, the quality of the materials required for the construction of highways and different techniques used in construction of flexible and rigid pavements.
2. To know how to collect the field data for the evaluation of traffic patterns.
3. To get an idea about the concepts of designing flexible and rigid pavements.
4. To know the construction techniques of pavements
5. To Know about pavement failures and maintenance of pavements

Course Outcomes: At the end of the course, the students will be able to

1. Understand the types of highways, patterns, master plans, alignment finalization and components of highway projects.
2. Apply various IRC Standards for the Geometric design of highways.
3. Organize collection of traffic related data and analysing the data for different applications
4. Apply the design concepts to flexible and rigid pavements as per IRC standards.
5. Understand precautions required for the execution of construction of pavements as per IRC standards, pavement distress, pavement maintenance, evaluation of pavement condition and recommend suitable remedial measures.

UNIT- I:

Highway alignment: Objectives and phases of highway engineering, history of highway engineering, factors to be considered for highway alignment, engineering surveys current road project in India and concepts of master plan road pattern highway project preparation, classification as per IRC.

UNIT- II:

Geometric Design: Highway standards (IRC)- carriageway, shoulders, medians, right of way, footpaths, cycle tracks, service roads, frontage roads, sight distance, stopping sight distance, overtaking sight distance. Camber, horizontal curves, super-elevation, transition curve, extra widening, gradient, grade compensation and design of vertical curves with numerical examples.

UNIT- III:

Traffic Engineering: Objectives of traffic studies, traffic characteristics, volume, speed, density, headways and relationship among them. Traffic volume studies, speed and delay studies, parking and accident studies. Intersection delay studies, highway capacity and level of service concept as per HCM 2000, origin and destination studies, intersection improvement studies at grade, and types of grade separated intersections, channelization, rotary planning and design, concept of signal design.

UNIT- IV:

Pavement Design: Various properties of highway materials, pavement types, factors to be considered for pavement design, structural difference between flexible and rigid pavement design. Flexible pavement design - concept of layer theory, design wheel load, ESWL, EALF. IRC cumulative standard axles method (IRC - 37: 2018).

Rigid pavement design (IRC 58-2015): Concepts -radius of relative stiffness, Modulus of subgrade reaction and other characteristics of concrete, wheel load stresses analysis by Westergaards, temperature stresses and critical combination of stresses. Longitudinal and transverse joints, contraction joints, expansion joints, construction joints, design of dowel bars and tie bars.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

UNIT- V:

Pavement Construction and Maintenance: Construction of WBM roads and WMM roads, types of bituminous construction- interface treatment, bituminous surface dressing, seal coat, penetration macadam, built up spray grout, pre-mix methods, bituminous macadam, bituminous pre-mix carpet, bituminous concrete, bituminous sheet asphalt, mastic asphalt. Construction procedures– surface dressing, penetration macadam, built- up spray grout, bituminous bound macadam and bituminous concrete. Construction of cement concrete pavements and construction of joints.Pavement distress, failures of flexible and rigid pavements, remedial measures including maintenance.

Text books:

1. S. K. Khanna, C. E. G. Justo, and A. Veeraraghavan, "*Highway Engineering*", revised 10^{th} Edition, Nem Chand & Bros., 2017.
2. L. R. Kadiyali, '*Traffic Engineering and transport planning'*, Khanna Publishers.2011.
3. S.K. Sharma, "principles, Practice and Design of Highway engineering", S. Chand Publishers, 2015.
4. R.Srinivas Kumar, "*Transportation Engineering*", Universities Press, 2020

Suggested Reading:

1. Fred L. Mannering and Scott S. Washburn, "*Principles of Highway Engineering and Traffic Analysis*", 4^{th} Edition, John Wiley, 2007
2. R. Srinivasa Kumar," *Pavement Evaluation, Maintenance and Management systems*", Universities Press, 2014.
3. L. A. Garber and N. J. Hoel, K. RamachandraRao, "*Traffic and Highway Engineering*, 5th Edition, 2017. Cengage learning India Pvt. Ltd., New Delhi
4. R. Srinivasa Kumar, "Textbook *of Highway Engineering*", Universities Press, 2011.
5. Dr. L.R. Kadiyali and Dr. N.B. Lal, "Principles and Practices of Highway Engineering", Khanna Publishers, 2018.
6. IRC 37:2018, "Flexible pavement design".
7. IRC 58:2015, "Rigid pavement design".

18CE C14

GEOTECHNICAL ENGINEERING

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the students

1. Understand the basic principles of soil mechanics, properties of soils and knowledge of identifying soil.
2. Understand the flow through soils and its behavior and gain a practical outlook of utilizing soil as construction materials.
3. Understand highly compressible soil settlements and estimate the strength of soil for different loading conditions.
4. Identify shear strength parameters of soil using different laboratory tests.
5. Interpret problem of earth pressures and slope stability under different field conditions.

Course Outcomes: At the end of the course, the student will be able to

1. identify various types of soils and determine their properties.
2. estimate coefficient of permeability, stresses in soils under various soil conditions and compute discharge in soil.
3. modify the properties of soil by using various compaction methods and compute the settlement of compressible soils.
4. estimate the shear strength of different soils under various loading conditions.
5. evaluate earth pressures and slope stability under different field conditions.

UNIT- I:

Physical and Index properties of soils: Introduction about origin and formation of soils, basic definitions from soil three phase diagram (weight ratios & volume ratio), Inter relationships of preliminary properties. Determination of laboratory tests for water content, field density, specific gravity by various methods, Index properties, sieve analysis, consistency limits, Indian soil classification IS-1498-1970.

UNIT- II:

Permeability of soils: Darcy's. law of seepage water through soils- Determination of co-efficient of permeability (constant head, variable head permeability tests) – Field tests (Pumping in and pumping out tests) – Equivalent permeability of stratified soils.

Stress in Soils: Total, effective and neutral stress for different soil conditions.

Seepage in Soil: Seepage flow, seepage pressure – Flow nets – Locating phreatic line in a homogeneous earthen dam using Kozeny's parabola – computation of seepage quantity.

Quick Sand Phenomena: Critical Hydraulic gradient.

UNIT- III:

Compaction: Compaction Mechanism, factors affecting compaction. Laboratory determination of compaction characteristics- standard and modified Proctor tests – IS Light and Heavy compaction tests; Field surface compaction: compaction equipment, procedure, quality control.

Consolidation: Spring Analogy, Laboratory consolidation test, calculation of void ratio, compression characters and settlement equation, differential equation for one dimensional consolidation, co-efficient of consolidation - square root & logarithm time fitting method.

UNIT- IV:

Shear strength: Significance of Shear strength of soils – Mohr-Coulomb equation – shear parameters – Laboratory tests for determination of shear strength – Direct shear test, Tri-axial compression tests. (UU, CU and CD), Un-confined compression test, Vane shear test. Factors affecting shear strength of cohesionless and cohesive soils.

UNIT- V:

Earth pressure: States of earth pressure – Active, Passive and at rest condition; Rankine's theory; computation of active and passive earth pressure in cohesionless (ø)& Cohesive (c) soils and c-ø soils; Coulomb's Wedge theory; Rebhann's graphical solution.

Slope stability: Definition and classification of slopes – types of slope failures- Factors of safety with respect to cohesion, angle of shearing resistance, Height – Analysis of stability of slope using Swedish slip circle method and Taylor's stability number.

Text Books:

1. K. R. Arora, "Soil Mechanics and Foundation Engineering", Standard Publisher Dist.; 7th Edition, 2009
2. B. C. Punmia, A. K Jain, and A. K. Jain "Soil Mechanics and Foundations", Laxmi Publications; Sixteenth edition, 2017.

Suggested Reading:

1. R. F. Scott, "Principles of Soil Mechanics", Wesley Educational Publishers Inc., 1st edition, 1963.
2. T. W. Lambe and R. V. Whitman, "Soil Mechanics", Wiley; 1 edition, 2012.
3. GopalRanjan, "Basic and Applied Soil Mechanics", New Age International Pvt Ltd; Third edition 2016.
4. C.Venkatramaiah, "Geotechnical Engineering", New Age Publications, revised Fifth edition, 2017.
5. B. M. Das and K. Sobhan, "Principles of Geotechnical Engineering", NPTEL study material.
6. IS 2720-11: Methods of test for soils, Part 11: Determination of the shear strength parameters of a specimen tested in unconsolidated undrainedtriaxial compression without the measurement of pore water pressure..

18CE C15

STRUCTURAL ANALYSIS – II

Instruction: 3L Hours per week
Duration of Semester End Examination: 3 Hours
Semester End Examination: 70 Marks CIE: 30 Marks
Credits: 3

Course Objectives: To enable the student

1. Understand the concept of drawing influence line diagrams (ILDs), for reactions, shear force and bending moment in determinate beams for various loads.
2. Grasp the procedure of constructing influence line diagrams for different truss girders under various types of loads and to find maximum forces in the members of trusses. Understand the concept of determining, deflections in determinate trusses and rigid jointed frames, by Castigliano's theorem –I and unit load method.
3. Gain the knowledge of analyzing three hinged arches for point loads and uniformly distributed loads. Know the concept and analysis of cables and suspension bridges with three hinged stiffening girder.
4. Know how to analyse continuous beams without and with sinking of supports by using slope displacement, moment distribution and Kani's method.
5. Know how to analyse rigid jointed plane frames without and with sway by using slope displacement, moment distribution and Kani's method.

Course Outcomes: At the end of the course, the student will be able to

1. develop the ILD's for reactions, shear force and bending moment at a section, determine the maximum SF and BM for various positions of the moving point loads and uniformly distributed loads.
2. construct the ILD's for forces in the members of trusses and evaluate the maximum forces for various positions of the moving point loads and uniformly distributed loads.
determine the deflections of determinate truss joints by Castigliano's theorem - I and unit load method.
3. analyze three hinged arches for point loads and uniformly distributed loads. analyze cables and suspension bridges with three hinged stiffened girder.
4. apply slope deflection, moment distribution, and Kani's methods for indeterminate beams with and without sinking of supports subjected to point loads and udl on the entire span.
5. analyze rigid jointed plane frames with and without lateral sway using slope deflection, moment distribution, and Kani's methods subjected to point loads and udl on the entire span.

UNIT– I:

Moving loads: Influence line diagrams for support reactions, shear force and bending moment for a simply supported beam/girder. Determination of maximum values of support reactions, shear force and bending moment at any section for various moving load systems on simply supported beam/ girder. Curves of maximum shear force and bending moment for simply supported girders traversed by (i) single point load, (ii) two point loads (iii) uniformly distributed load longer than the span, and (iv) uniformly distributed load shorter than the span. Focal length, enveloping parabola and EUDL

UNIT– II:

Moving loads on truss girders: Influence lines for forces in the members of statically determinate trusses like Warren truss, Pratt truss, and Curved flange trusses. Determination of maximum forces in truss members due to moving point loads and uniformly distributed loads. Counter bra

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Deflections of Determinate trusses: Deflections of truss joints using Castigliano's theorem –I and Unit load method.

UNIT– III:

Three hinged arches: Three hinged parabolic and segmental arches, determination of support reactions. Bending moment, normal thrust and radial shear at a section subjected to point loads and uniformly distributed loads. Influence line diagrams for horizontal thrust, bending moment, normal thrust and radial shear.

Cables and Suspension bridges: Stresses in suspended cables due to point loads and uniformly distributed loads, equation of the cable, length of cable and general cable theorem. Suspension bridge with 3-hinged stiffening girders for static loading, determination of maximum tension in the cable, bending moment and shear force in the girder.

UNIT- IV:

Indeterminate beams: Analysis of Indeterminate beams with and without sinking of supports using slope deflection, moment distribution, and Kani's methods. Loading on each span may be point load(s) and uniformly distributed load on whole span. Shear force and bending moment diagrams.

UNIT- V:

Indeterminate rigid jointed plane frames: Analysis of rigid jointed plane frames with and without lateral sway using slope deflection, moment distribution, and Kani's methods. Loading on each span may be point load(s) and uniformly distributed load on whole span. Shear force, axial force and bending moment diagrams.

Text Books:

1. B.C Punmia, and A. K. Jain, "SMTS - II Theory of Structures", Laxmi Publications, New Delhi, 2017.
2. S. Ramamrutham, "Theory of Structures", Khanna Publishers, New Delhi, 2018.

Suggested Reading:

1. H. J. Shah, S. B. Junnarkar, "Mechanics of Structures Vol. II [Theory and analysis of structures]", 24th Edition, Charotar Publishing House Pvt. Ltd., 2015.
2. T. S. ThandavaMoorthy, "Structural Analysis", 2nd edition, Oxford University Press, 2012.
3. C. S. Reddy, "Basic Structural Analysis", 3rd Ed., Tata McGraw Hill, New Delhi, 2017.
4. D. S. PrakashRao, "Structural Analysis" - A Unified Approach, University Press, 2012

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE E01

PRESTRESSED CONCRETE
(Core Elective –1)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the student to,

1. Understand the basic principles and structural behaviour of pre stressed concrete with reference to IS 1343 code
2. Equip the students with a thorough understanding of the behaviour and analysis of PSC beams.
3. Understand and apply the design principles of PSC beams in flexure and shear.
4. Understand the concepts of various stresses in anchorage zone.
5. Identify the advantages of continuous beams and can analyse for primary and secondary moments.

Course outcomes: At the end of the course, Students will be able to

1. understand the general mechanism of pre stressed concrete members, types of pre stressing
2. Analyze the behaviour of pre stressed concrete beams.
3. Identify and apply design concepts for the pre stressed concrete beams under flexure and shear.
4. analyze the stresses in anchorage zones and design the end anchorages.
5. understand the fundamental concepts of primary and secondary moments in continuous beams.

UNIT- I:General Principles of Pre Stressed Concrete:
Introduction: Basic concepts – Materials - Permissible stresses – Advantages – pre-tensing and post tensing – Pre Stressing by Straight Concentric, Eccentric bent and Parabolic Tendons – Different methods of Pre stressing – Hoyer System – Freyssinet system – Magnel-Blaton system – Lee Mecal system – Use of IS 1343 code, concepts of precast and post tensioned elements.

UNIT – II: Analysis, Losses and Deflection of PSC beams:
Analysis of sections for pre stress and flexure for Straight Concentric, Eccentric, Bent and Parabolic Tendons. Pressure Line – Cable Profile
Losses of Pre stress: Losses in P.S.C. members due to elastic shortening – Shrinkage – Creep in Concrete – Relaxation of Steel – Slip in anchorage – Frictional Loss – Computation of losses.
Deflections of P.S.C members: Importance of deflections - factors influencing deflections, short term and long term deflections – IS code requirements for Maximum deflections – Computation of short term deflections due to pre stressing force – Dead and Live loads.

UNIT – III:Design of Section for Flexure and Shear :
Allowable stresses – Elastic Design and Limit state method of Design of Rectangular – I Section beams for Flexure – Check for ultimate flexural strength as per – IS 1343 Codal Provisions. Design of Section for Shear: Shear and principal stresses – Cracked and uncracked sections – Codal provisions – Ultimate shear resistance – Design of shear reinforcement in beams.

UNIT – IV:Anchorage Zone stress in Post tensioned members:
Stress distribution in End block – Analysis by Magnel and Guyon'smethods – IS 1343 code provisions – Bursting Tensile force – Design of anchorage zone reinforcement.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

UNIT – V:Continuous beams:

Advantage and Disadvantages - Primary and Secondary moment – P and C- lines – Liner transformation , Concordant and Non concordant cable profile - Analysis of Continuous beams.

Text Books:

1. N. Krishna Raju ,"Prestressed Concrete" , Tata McGraw Hill,2018
2. G.S. Pandit and S.P. Gupta, "Prestressed Concrete", CBS Pub., 2009.

Suggested Reading:

1. Arthur H. Nilson, by"Design of Prestressed Concrete", John Wiley 1987.
2. T.Y Lin and Burn," Design of prestressedConcrete",Wiley India Private Limited, 2010. 52 53 18CE

18CE E02

GREEN BUILDING TECHNOLOGIES
(CoreElective –1)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Course Objectives: To enable the student
1. To understand the basic concepts of green building technologies and their significance.
2. To understand the judicial use of energy and its management.
3. To know about the Sun-earth relationship and its effect on climate.
4. To enhance awareness of end-use energy requirements in the society.
5. To know about the suitable technologies for energy management and audit procedures.

Course Outcomes: At the end of the course, the student will be able to
1. relate the fundamentals concepts of green buildings, identify the energy use & its management and recall some prominent green buildings in india.
2. understand the indoor environmental requirement and choose appropriate materials and finishes.
3. apply the knowledge about sun-earth relationship vis-a-vis its effect on climate and understand the energy impact on the shape and orientation of buildings.
4. estimate lighting and heat energy requirements and evaluate their end use.
5. understand the various concepts of energy audit, judge the buildings for green certifications and develop a green building as per the standards.

UNIT- I:
Introduction to green buildings- Barriers and benefits of Green Building- Characteristics of energy use, energy process and its management - Macro aspect of energy use in dwellings and its implications- Site and landscape planning for Green Building Construction- Prominent Green Buildings in India and their features.

UNIT- II:
Indoor environmental requirement and management: Thermal comfort– Ventilation and air quality– Air-conditioning requirement- Visual perception– Illumination requirement- Auditory requirement- Green Building materials and finishes- emittance levels.

UNIT- III:
Climate, solar radiation and their influences: Sun- Earth relationship and the energy balance on the earth's surface - Climate, wind, solar radiation, and temperature– Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings.

UNIT- IV:
Energy utilization and requirements: Lighting and day lighting– End use energy requirements- Status of energy use in buildings Estimation of energy use in a building- Heat gain and thermal performance of building envelope- Steady and non-steady heat transfer through the glazed window and the wall- Standards for thermal performance of building envelopes- Evaluation of the overall thermal transfer.

UNIT- V:
Energy management systems: Energy audit and energy targeting – Technological options for energy management.
Certification- Study of LEED and TERI (GRIHA) parameters and certification of Green Buildings.

Text Books:
1. Charles J. Kibert,"Sustainable Construction - Green Building Design and Delivery", John Wiley & Sons, New York, 2008

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

2. Norbert Lechner,"Heating, Cooling, Lighting - Sustainable Design Methods for Architects", Wiley, New York, 2015.
3. James Kachadorian, "The Passive Solar House: Using Solar Design to Heat and Cool Your Home", Chelsea Green Publishing Co., USA, 1997.

Suggested Reading:

1. Michael Bauer, Peter Mosel and Michael Schwarz, "Green Building– Guidebook for Sustainable Architecture", Springer, Heidelberg, Germany, 2010.
2. Mike Montoya,"Green Building Fundamentals", Pearson, USA, 2010.
3. Regina Leffers, "Sustainable Construction and Design", Pearson / Prentice Hall, USA, 2009.

18CE E03

PRINCIPLES OF GEOGRAPHICAL INFORMATION SYSTEMS
(Core Elective –1)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives: The student is able to

1. Know the basics of GIS and its application in decision making
2. Know about various data types used in GIS
3. Realize the importance of data quality and building of GIS data base
4. Carry analysis on GIS data
5. Develop maps based on queries using GIS software’s

Course outcomes: At the end of the course, the students will be able to

1. Understand the concepts and components of GIS.
2. Identify the data required to create data structure for implementation of GIS.
3. Apply the spatial and non-spatial functions for creating and editing of GIS data.
4. Choose an appropriate sequence of GIS functions for developing cartographic models.
5. Apply the knowledge of GIS in decision making by evaluation of data and find appropriate solutions to complex problems.

UNIT- I:

GIS-Introduction, definitions, components, software scenario, applications, Map- definition, elements, Projections-Definition, types, UTM, Datum - types, Coordinate system, coordinate transformations, Geoid and Ellipsoidal models.

UNIT- II:

Database management - introduction, records, fields and keys, data file and data access, database structure, database models-Hierarchical, Network, Relational database and object oriented models, Geographical data - spatial and non-spatial data, Spatial data models-Raster data-Run length coding, Block coding and Quadtree , Vector data- spaghetti data model, topological model, triangular irregular Network (TIN) data.

UNIT- III:

Development of GIS data - data input - keyboard, scanners, digitizers and images, existing data- source, concepts of Geo-referencing and selection of projections, data quality -components - positional accuracy, attribute accuracy, logical consistency, resolution, completeness, time , sources of errors- accuracy- definition, test and assumptions.

UNIT- IV:

GIS functions - organizing data for GIS analysis- Data Layers, Classification - Maintenance and analysis of spatial data-Format transformation, Geometric transformations, Geometric projections, Conflation, Edge matching, Editing and Line coordinate thinning. Maintenance and analysis of attribute- Editing and analysis functions.

UNIT- V:

Integrated analysis of Spatial and Non spatial data- Retrieval measurement and classification, Overlay, Neighborhood operations -search, Line in polygon, point in polygon, topographic functions, interpolation contour generation, Connectivity functions- contiguity, Proximity, Spread, Seek , indivisibility, Illumination, GIS output - Map Annotation, Text Labels, texture, and lines patterns. Cartographic modelling- watershed management, water resource management etc.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Text books:

1. Chor Pang Lo and Albert K.W. Yeung, "*Concepts and Techniques of Geographic Information systems*" Pearson, 2016.
2. Peter A. Burrough and Rachael A. McDowell, "*Principle of Geographical Information Systems*", Oxford University press, 1998.

Suggested Reading:

1. Michael N. Demers, "*Fundamentals of Geographic Information systems*", John Willey Publishers, 2012.
2. Stan Aronoff, "*Geographic information systems-A Management Perspective*" Environmental Systems Research Institute Inc.,U.S., 2005.
3. Kang-Tsung Chang "*Introduction to Geographic information systems*", Tata McGraw-Hill, 2015.
4. Ian Heywood, Sarah Cornelius, Steve carver, "*An introduction to Geographical information systems"*, Addison Wesley Longman, 2009.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE E04

MASONRY STRUCTURES
(Core Elective –1)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the student to understand the fundamental concepts of

1. Masonry materials and its mechanical properties.
2. Analysis and the behaviour of structural masonry
3. Shear and flexural behaviour of Reinforced and unreinforced masonry
4. Summarize construction practices, seismic behaviour, specifications ,for Design of masonry
5. Seismic evaluation and Retrofit of Masonry

Course Outcomes: At the end of the course, students will be able to

1. select an appropriate masonry unit and mortar mix for masonry construction.
2. distinguish in plane and out of plane loads and analyse for lateral forces.
3. analyse reinforced and unreinforced masonry structural elements for flexural and shear behaviour.
4. design masonry elements using working and ultimate strength design
5. understand the repairing techniques and strengthen the existing masonry structures for seismic loads

UNIT- I:

Introduction - Masonry construction - National and International perspective – Historical development, Modern masonry, Principles of masonry design, Masonry standards: IS 1905 and others.

Material Properties - Masonry units: clay and concrete blocks, Mortar, grout and reinforcement, Bonding patterns, Shrinkage and differential movements.

UNIT- II:

Masonry in Compression - Prism strength, Eccentric loading, Kern distance. Masonry under Lateral loads - In-plane and out-of-plane loads, Analysis of perforated shear walls, Lateral force distribution -flexible and rigid diaphragms.

UNIT- III:

Behaviour of Masonry - Shear and flexure - Combined bending and axial loads - Reinforced and unreinforced masonry - Cyclic loading and ductility of shear walls for seismic design – Infill masonry.

UNIT- IV:

Structural design of Masonry - Working and Ultimate strength design - In-plane and out-of-plane design criteria for load-bearing and in fills, connecting elements and ties - Consideration of seismic loads - Code provisions.

UNIT- V:

Seismic evaluation and Retrofit of Masonry - In-situ and non-destructive tests for masonry - properties - Repair and strengthening of existing masonry - structures for seismic loads.

Text Books:

1. P. Dayaratnam, "*Brick and Reinforced Brick Structures*", Oxford & IBH Publishing Co, 2017.
2. R. G. Drysdale, A. H. Hamid, and L. R. Baker, "*Masonry Structures: Behaviour& Design*", Prentice Hall Hendry, 1993.

Suggested Reading:

1. A.W. Hendry, B.P. Sinha and Davis, S. R, "*Design of Masonry Structures*", E & FN Spon, UK, 1997.
2. S. Sahlin, "*Structural Masonry*", Prentice Hall, Englewood Cliffs, NJ, 1971.
3. R.S. Schneider and W.L. Dickey, "*Reinforced Masonry Design*", Prentice Hall, 3rd edition, 1994.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE E05

SOLID AND HAZARDOUS WASTE MANAGEMENT
(Core Elective –2)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the student
1. Understand characteristics of solid waste and legislations of solid waste management.
2. Gain insight into the transfer, transport and energy recovery from municipal solid waste.
3. Understand characteristics, handling and storage of hazardous wastes.
4. Grasp the fundamentals of site selection, remediation measures for disposal sites; contrast between hazardous waste treatment techniques.
5. Understand the concepts of Environmental Audit, Hazardous waste management legislations and toxicology principles.

Course Outcomes: At the end of the course, student is able to
1. Identify characteristics of solid waste, collection systems as per legislations.
2. List out waste reduction methods, collection techniques, resource recovery/recycling, energy recovery, transport & disposal options and select appropriate waste management facility.
3. Identify sources of hazardous waste; assess handling & storage methods based on regulations.
4. Select the site for disposal of hazardous waste; suggest treatment technologies and remediation measures for disposal sites.
5. Understand the concepts of Environmental Audit, toxicology principles; apply legislations of hazardous waste management.

UNIT- I:
Solid wastes: Solid waste generation in a technological society, sources and types of solid waste, legislations on management and handling of municipal solid wastes, monitoring responsibilities; Collection of Solid Waste: type of waste collection systems, analysis of collection system, alternative techniques for collection system.

UNIT- II:
Management of Solid waste: Separation, Processing and Transformation of Solid Waste: unit operations used for separation and processing, materials recovery facilities, waste transformation through combustion and anaerobic composting, anaerobic methods for materials recovery and treatment; Energy recovery - Incinerators. Transfer and Transport: need for transfer operation, well injections; Landfills: Site selection, drainage and leachate collection systems, requirements and technical solutions, integrated waste management facilities.

UNIT- III:
Hazardous waste: Definition and identification of hazardous wastes, sources and characteristics, hazardous wastes in Municipal Waste, Hazardous waste regulations, minimization of Hazardous Waste, compatibility, handling and storage of hazardous waste, collection and transport.

UNIT –IV:
Hazardous waste management: Treatment technologies, physical, chemical and biological treatment, Hazardous waste landfills: Site selection, remediation of hazardous waste disposal sites, quantitative risk assessment, containment, remedial alternatives.

UNIT –V:
Environmental regulations: Environmental audit, pollution prevention, facility development and operation. Hazardous waste legislations, RCRA process, superfund process; [illegible]se response, toxic effects, toxic response.

Text books:

1. P. A. Vesilind, Worrell W and Reinhart, "*Solid Waste Engineering*", 2nd Edition (2016), Cengage Learning India Pvt. Ltd.
2. Tchobanoglous,"*Integrated Solid Waste Management"*, Mc-Graw Hill International 1st Edition, New York, 2014."
3. Charles A. Wentz; "*Hazardous Waste Management*", McGraw Hill Publication, 1995.

Suggested Reading:

1. CPHEEO, "*Manual on Municipal Solid waste management"*, Central Public Health and Environmental Engineering Organisation, Government of India, New Delhi, 2000.
2. Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans, "*Hazardous waste Management*", Waveland Pr. Inc, 2010
3. C. A. Wentz, "*Hazardous Waste Management*", McGraw-Hill Publication, 1995.
4. A. D. Bhide and B. B. Sundaresan, "*Solid Waste Management, Collection, Processing and Disposal*", Nagpur.
5. S.C. Bhatia, "*Solid and Hazardous waste management*", Atlantic publishers, 2007.

18CE E06

MECHANICS OF MATERIALS
(Core Elective –2)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the students

1. Understand the flexural behaviour of curved bars and determining the stresses in various cross sections.
2. Understand the behaviour of beams curved in plan, subjected to different types of loads.
3. Learn the determination of stresses in rotating discs & cylinders.
4. Realize the significance of experimental techniques in stress analysis & understand the stress analysis using brittle coating technique.
5. Comprehend the failure criteria of materials and corresponding theories of elastic failure.

Course Outcomes: At the end of the course, student will be able to

1. analyze curved bars of rectangular, circular and trapezoidal cross sections in crane hooks and chain links.
2. determine the stresses in beams curved in plan, for simply supported and fixed end conditions.
3. evaluate the stresses in rotating discs, rings and cylinders.
4. recall various brittle coating techniques, estimate the coating stresses and detect cracks.
5. apply an appropriate elastic theory of failure for the materials.

UNIT – I:

Bending of curved bars: Introduction, Bending of curved bars, stresses in curved bars with large curvature (Winkler-Bach Theory), calculation of stresses in curved bars of different sections-rectangular, circular and trapezoidal in crane hooks, and chain links.

UNIT-II:

Beams curved in plan: Introduction, circular beam loaded uniformly and symmetrically supported on columns, Semi-Circular beam simply supported on 3 equally spaced supports, cantilever quarter circular beam with a point load at free end, A fixed ended segmented curved beam.

UNIT-III:

Rotating Rings, Discs & Cylinder: Introduction, thin rotating ring or cylinder, rotating solid thin disc, rotating disc with a central hole, rotating disc of uniform strength, and rotating long cylinder.

UNIT-IV:

Stress analysis by brittle coating Technique: Introduction, Brittle Lacquers - Brittle coating techniques, Coating stresses, Theory of failure for Brittle coatings, crack patterns in brittle coating, crack detection, types of Brittle coating, Resin based brittle coating, equipment for Stress analysis by brittle coating method, specimen preparation, Testing & calibration of brittle coating .

UNIT-V:

Elastic theories of failure: Introduction - Failure by Yielding-Failure by Fracture - Yield and Fracture Criteria-Maximum Shearing Stress Theory-Maximum Distortion Energy Theory-Octahedral Shearing Stress Theory-Comparison of Yielding Theories-Maximum Principal Stress Theory- Mohr's Theory-Coulomb-Mohr Theory

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Text Books:

1. V. N. Vazirani and M. M Ratwani, “Analysis of Structures Vol. 1: Analysis, Design And Details Of Structures”, Khan Publications, 2003.
2. U.C. Jindal, “Advanced Topics of Strength of Materials (PART-II)”, Galgotia Publications Pvt..Ltd. 2001.

Suggested Reading:

1. Heinemann, “Mechanics of Materials” Butterworth, 3rd edition, 1997. 2. J. O. Seely and F. B. Smith, “Advanced Mechanics of Materials”, 1967.
3. R. Subramanian, “Strength of Materials”, Oxford University press, 2016. 4. U. C. Jindal, “Strength of Materials”, Pearson Education; 2nd edition, 2017.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE E07

REPAIR AND REHABILITATION OF STRUCTURES
(Core Elective –2)

Instruction	3L Hours per week
Duration of Semester End	Examination 3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the student to understand the fundamental concepts of
1. Maintenance and causes for distress.
2. Serviceability and durability limits.
3. Importance of structural audit and different NDT techniques.
4. Different repair materials & their suitability.
5. Various repair techniques and rehabilitation methods.

Course Outcomes: At the end of the course, the student will be able to
1. Understand the importance of maintenance & inspection and analyze the damage.
2. Find the causes of cracking & durability problems and examine the remedial measures.
3. Understand the principles of condition assessment and apply various techniques to evaluate them.
4. Choose a suitable material for a specific type of repair.
5. Identify a suitable technique for repair & rehabilitation of a structure and develop a practical solution for the problem.

UNIT – I:
Maintenance and inspection: Basic definitions of repair, retrofit, rehabilitation, strengthening and upgradation; Facets of maintenance; Planning for maintenance; Importance of maintenance, various aspects of inspection, introduction to structural auditing, NDT and NDE, structural stability and certification.
Introduction to damage mechanics: Causes of distress and damage assessment in concrete structures, Construction and design failures; Damage mechanics.

UNIT – II:
Serviceability and durability of concrete:
Deflections and deflection control, Cracks and cracks control in concrete structures, Vibrations in concrete structures. Thermal properties and cracking; Effects due to climate- Temperature, Chemical attack, Corrosion; Design and construction errors; Permeability; Effects of cover thickness and cracking.

UNIT – III:
Condition survey and NDT:
Definition and objective of condition survey, stages of conditions survey – planning, inspections and testing stages, possible defects in concrete structures; NDT techniques- rebound hammer, infra-red thermography, ground penetration technique, ultra-sonic pulse velocity test, half cell potential method and Windsor probe test, safety audit-principles and objectives, semi destructive testing– core cuttings methods.

UNIT – IV:
Materials for repair:
Special concretes and mortar- Concrete chemicals, Special elements for accelerated strength gain, Expansive cement, Polymer concrete, Sulphur infiltrated concrete, Ferro ce ete, Bacterial concrete,

Rust eliminators and polymers coating for rebars during repair, Foamed concrete, Mortar and dry pack, Vacuum concrete; Carbon composites.

UNIT – V:

Techniques for repair and rehabilitation:

Guniting, shotcreting; Epoxy injection, Mortar repair for cracks, Shoring and underpinning; Methods of corrosion protection, Corrosion inhibitors, Corrosion resistant steels, Coating and cathodic protection.

Techniques for column strengthening, beam strengthening, beam to column joint strengthening using concrete, steel, FRP and carbon fibre jacketing; Addition of infill walls, shear walls and steel braces**.**

Text Books:

1. Denison Campbell, Allen and Harold Roper, "Concrete Structures, Materials, Maintenance and Repair", Longman Scientific and Technical UK, 1991.
2. Allen R.T. & Edwards S.C, Repair of Concrete Structures, Blakie and Sons, UK, 1987.
3. B.L. Gupta and Amit Gupta, 'Maintenance and Repair of Civil Structures", Standard Publications, New Delhi, 2010.

Suggested Reading:

1. S. C. Millard and J. H. Bungey, "Testing of Concrete in Structures", Chapman and Hall, New York, 1989.
2. Barry A. Richardson, "Defects and Deterioration in Buildings", E & FN Spon Press, London, 1991.
3. A.R. Santhakumar, "Concrete Technology", Oxford University Press, New Delhi, 2006.
4. Peter H. Emmons, "Concrete Repair and Maintenance Illustrated", RS Means, John Wiley & Sons, New York, 1981.
5. W.H. Ransom, "Building Failures: Diagnosis and Avoidance", E & FN Spon Press, London, 1992.
6. P.K. Mehta and P.J.M. Monteiro, "Concrete- Microstructure, Properties and Materials", McGraw-Hill, New York, 2014.
7. N. Jackson and R.K, Dhir, "Civil Engineering Materials", Basingstoke, Macmillan, London, 1988.
8. Defects and Deterioration in Buildings, EF & N Spon, London.
9. Non-Destructive Evaluation of Concrete Structures by Bungey – Surrey University Press.
10. Concrete Repair and Maintenance Illustrated, RS Means Company Inc W.H. Ranso, (1981).
11. Ravishankar.K., Krishnamoorthy.T.S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.
12. CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE E08

CONCRETE TECHNOLOGY
(Core Elective –2)

Instruction 3L Hours per week Duration of Semester End
Examination 3 Hours Semester End Examination
70 Marks CIE
30 Marks Credits
3

Course objectives: To enable the students to
1. Learn the properties & conduct tests on various ingredients of concrete.
2. Understand the behavior of concrete in fresh and hardened states.
3. Understand the Mix design of concrete using various design methods.
4. To learn the durability of concrete & acquire knowledge on the properties and effective usage of various admixtures.
5. Gain knowledge of various special concretes and their applications.

Course outcomes: At the end of the course, the student will be able to
1. understand the properties of concrete making materials and production of concrete.
2. analyze the properties of fresh and hardened concretes.
3. design the concrete mix using various methods for a specified grade.
4. evaluate durability of concrete and apply suitable admixtures in concrete making.
5. evaluate and choose appropriate concrete for field application.

UNIT- I:
Concrete Materials & Production of Concrete: Manufacturing process of cement, Types of cements, Properties of cement and aggregate (fine & coarse), tests conducted on cement and aggregate (fine & coarse). Production of concrete – Various methods of batching, mixing, compaction and curing. Hot weather and cold weather concreting. Water cement ratio, gel space ratio, Segregation and bleeding of concrete.

UNIT- II:
Fresh concrete: Workability, factors affecting workability, measurement of workability using slump cone, compaction factor and Vee-Bee Consistometer tests.
Hardened concrete: Behavior of concrete under various types of loading - compression, Tension and flexure. Non -destructive testing methods. Time dependent behavior of concrete –Maturity, shrinkage & creep.Stress-Strain behavior of concrete.

UNIT- III:
Concrete Mix Design: Basic considerations, Factor to be considered in choice of mix design, Different mix design methods – I.S. code method, British and ACI methods. Quality control of Concrete.

UNIT- IV:
Durability of concrete: Durability –Factors affecting Durability, Cracking of Concrete - types of cracks, causes, remedies and tests on concrete cracks. Deterioration of concrete and its prevention.Behavior of concrete under various types of extreme environments, Freezing and Thawing, Acid attack on concrete, Efflorescence, fire resistance.
Concrete Admixtures: Classification of admixtures, Mineral an ence of various admixtures on properties of concrete.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

UNIT- V:

Special Concretes: Properties & applications of High Strength Concrete, High Performance Concrete, Polymer Concrete, High Density Concrete, Light Weight Concrete, and Ferro cement, Recycled Aggregate Concrete, Self Compacting Concrete (SCC) and Fly Ash Concrete. Ready Mix Concrete (RMC).

Fiber Reinforced Concrete(FRC): Mechanism, Types of fibers, Steel Fiber Reinforced Concrete – Properties & Applications, Geopolymer concrete – Constituent materials, properties and applications, Bacterial Concrete – principles of self healing, materials and applications

Text Books:

1. A.M Neville., "Properties of Concrete", Pearson Education. 2012.
2. M.S. Shetty, and A. K. Jain, "Concrete Technology: Theory and Practice", S. Chand & Company, 2018.
3. R. Santhakumar, "Concrete Technology", Oxford University, Press 2018.

Suggested Reading:

1. A.M. Neville and J.J. Brooks, "Concrete Technology", Dorling and Kindersley Publications, 2002.
2. P. K. Mehta, and J. M. M. Paulo, "Concrete- Microstructure – properties and Material", Mc. Graw Hill Publishers, 2017.
3. N. Krishnaraju, "Design of Concrete Mixes", CBS Publishers and Distributors, 2010.

18CE C16

TRANSPORTATION ENGINEERING LAB

Instruction	3P Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Objectives: To enable the student

1. Assess the quality of the material used in pavement construction and compare with IRC specifications.
2. Identify the field data required for assessing the traffic parameters.

Course Outcomes: The student will be able to

3. Conduct various tests on bitumen and aggregates, evaluate the quality of material to be used in pavements.
4. Organize various traffic studies and analyze the data by applying statistical tools.
5. Conduct the CBR test, Marshall Stability tests and interpret the results for design purpose.
6. Prepare representative samples for various tests on aggregates.
7. Develop skill of generating technical report based on the studies carried in the laboratory and field studies.

A) Tests on bitumen

1. Penetration test
2. Ductility test
3. Softening point test
4. Specific gravity test
5. Viscosity test
6. Flash and fire point test

B) Tests on road aggregates

7. Aggregate crushing value test
8. Los Angeles abrasion test
9. Aggregate impact value test
10. Aggregate shape test (flakiness & elongation)
11. Water Absorption
12. Soundness

C) Traffic Studies

13. Traffic volume study
14. Spot Speed study
15. O & D study concepts
16. Speed and delay studies

D) Miscellaneous Tests (demonstration only)

17. Determination of CBR.
18. Preparation of representative sample by coning and quartering.
19. Bitumen extraction test
20. Marshall stability concepts and tests.

Suggested Reading:

1. Khanna and Justo, “*Highway materials and Pavement Testing*”, Nem Chand & Bros. 2013.
2. R. Srinivasa Kumar, ”*Highway Engineering*”, Universities Press, 2011
3. IRC codes and specifications

18CE C17

GEOTECHNICAL ENGINEERING LAB

Instruction 3L Hours per week
Duration of Semester End Examination 3 Hours
Semester End Examination 35 Marks
CIE 15 Marks
Credits 1

Course Objectives: Students will able to
1. Identify physical and mechanical properties of soil in the field and laboratory.
2. Develop an understand the relationships between physical characteristics and mechanical properties of soils;
3. Understand techniques used in soil mechanics for Darcy's Law
4. Understand Mohr-Coulomb theory for shear strength behavior of soils.
5. Choose different tests for soils according to IS standards.

Course Outcomes: Upon successful completion of this course, students will be able to
1. Identify soils with reference to their characteristics.
2. Evaluate and classify soils according to IS classification.
3. Calculate seepage volume for different soils.
4. Examine methods to improve soil stability of soils.
5. Conduct tests according to IS laboratory standards and procedures.

List of Experiments:
1. Grain size distribution by Sieve Analysis.
2. Consistency limits - Liquid limit and Plastic limit using Casagrande's method.
3. Compaction test: Standard Proctor test.
4. Field Density using Sand Replacement method.
5. Field Density using Core Cutter method.
6. Specific gravity of soils.
7. Natural Moisture Content using Pycnometer method.
8. Direct Shear test.
9. Permeability test using Falling-head method.
10. Relative density

Demo Experiments:
1. Consolidation test
2. Triaxial test (UU)
3. Vane Shear test

Suggested Reading:
1. B. C. Punmia, "Soil Mechanics and Foundation Engg", (2005), 16th Edition Laxmi Publications Co. , New Delhi.
2. IS : 2720(part-3 1964) for specific gravity, (IS : 2720 (Part 17), 1966) for Sieve analysis IS : 2720 (Part-IV), 1965) for Grain size analysis, IS: 2720 (Part 1) - 1983 for shear strength tests and compaction.
3. T. W. Lambe," Soil Testing for Engineers"-., Wiley Eastern Ltd., New Delhi.
4. K. H. Head K.H."Manual of Soil Laboratory Testing"-., (1986)- Vol. I, II, III, Princeton Press, London.
5. J. E. Bowles J.E", Properties of Soil and Their Measurements",. (1988), - McGraw Hill Book Co. New York.
6. http://smfe-iiith.vlabs.ac.in/List%20of %20experiments.html?domain=Civil%20Engineering
7. http://home.iitk.ac.in/~madhav/geolab.html

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE C18

AUTO CAD LAB

Instruction	3P Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Outcomes: The student will be able to
1. Select and apply appropriate settings for coordinates, units and scale to the drawing.
2. Create 2D objects and use display commands.
3. Select and apply appropriate editing tools in the drawing and manage object properties.
4. Create text, blocks and insert them in the drawing.
5. Apply appropriate hatching and dimensioning to the drawing.

LIST OF EXPERIMENTS

1. Introduction to Computer Aided Drafting (AutoCAD) - features and environment.
2. Coordinates and Basic Drafting Tools: Exercises pertaining to basic building elements to illustrate use of absolute coordinates and relative Cartesian coordinates. Object tools, such as SNAP, GRID and initial settings of a drawing file.
3. Display commands: Drawing Scale & View magnification, zooming and panning Commands.
4. Creating 2D geometry: Creating LINE objects, creating CIRCLE, ARC, ELLIPSE, various POLYGONS and using POLYLINE.
5. Editing and construction techniques: Tools to assist drafting – Creating Offsets, Trimming and extending of lines, Filtering of corners, creating multiple objects through Mirroring and Array Generation.
6. Managing Object Properties: Concept and significance of Layers and its applications in building drawing - Use of different types of lines and line weights.
7. Creating Text and Defining Styles: Exercises in adding text to the drawing and management of text styles.
8. Introduction to Blocks: Significance of blocks in drawing – creating blocks of common building elements and their insertion.
9. Dimensions, Hatching and Plotting: Addition of dimensions to the drawing - Dimension style management - Hatching of sections - styles of hatch, Plotting.
10. Drawing 2-D Single story building plan with section and elevation.

Suggested Reading:

1. Shah M. G., Kale C. M and Patki S. Y, "*Building Drawing*", Tata McGraw-Hill Book Co., 2002.
2.George Omura , Brian C. Benton," *Mastering AutoCAD 2019 and AutoCAD LT 2019*", Wiley, 2018.
3. Balagopal A and Prabhu T. S., "*Building Drawing and Detailing"*, Spades publishers, Calicut, 1987.

18CE C19

DESIGN OF STEEL STRUCTURES - I

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Codes required: IS 800 – 2007, IS 875 Part II & Part III and Steel Tables.

Course Objectives: To enable the students

1. Learn and apply the design philosophies(working stress method andlimit state method) for various steel structural components and their connections, as per the relevant standard
2. To understand the behavior of compression members.
3. To understand the modes of failure of tension members.
4. To understand the behavior of flexural members in the industry
5. Learn the behavior of trusses and design of purlins.

Course Outcomes: At the end of the course, the student will be able to

1. understand the material properties, loads and design philosophies, design bolted and welded connections.
2. know, how yielding & buckling takes place, design simple and built-up compression members and column bases
3. understand the modes of failure of tension members ,design tension members using limit state method ,design tension and compression members using working stress method as per IS: 800-2007
4. classify structural steel sections, distinguish between laterally supported and laterally unsupported beams, design simple flexural members including secondary considerations
5. estimate the loads on roof trusses and design purlins and members of trusses

UNIT – I:

Materials and Specifications: Chemical composition of steel, types of Structural Steel, classification of Rolled Steel Sections.

Design Philosophies: Working Stress Method, Limit State Method, Loads and Load Combinations,Partial safety factors for materials and loads.

Bolted Connections (Limit State Method):

Bolted Joints -Modes of failure - Design of Bolted joints using ordinary Black Bolts - Lap & Butt joints - Concentric Connections and Eccentric Connections, Introduction to High Strength Friction Grip Bolted connections.

Welded Connections (Limit State Method): Types of Welds, Lap and Butt Joints- strength of welded joints -design of welded joints - Concentric Connections and Eccentric Connections.

UNIT – II

Design of Compression Members (Limit State Method): Introduction, yielding & Buckling phenomena, Sections used for compression Members. Effective Length of Compression Members, Design of Compression Members with single section and Built-up Sections, Lacing and Battening, Column Splices.

Design of Column Bases: Design of Slab and Gusset Bases.

UNIT – III

Design of tension members (Limit State Method): Introduction to tension members - Applications of tension members, Modes of Failure, Design of Tension Members –Staggered bolting ,Design of Lug Angles.

Working Stress Method as per IS 800-2007: Permissible Stresses, Slenderness Ratio, Design of tension members, Design of Simple Compression Members.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

UNIT – IV

Design of Beams (Limit State Method) : Introduction to Plastic Analysis –Plastic Hinge, Plastic moment, Shape factor; Classification of Cross Sections, Phenomenon of Lateral Torsional Buckling; Design of Laterally Supported beams and laterally Unsupported Beams, Secondary considerations - Check for Web crippling, web buckling & deflection.

UNIT – V

Design of Roof trusses (Limit State Method): Types of trusses, Estimation of loads- dead load, live load and wind load, Design of purlins, Analysis of roof trusses and design of its members with angle sections.

Text Books:

1. S. K. Duggal, "Limit State Design of Steel Structures", 3rd Edition, McGraw Hill HED, 2019.
2. N. Subramanian, "Design of Steel Structures, Limit States Method", 2ndEdition, Oxford University Press, 2016

Suggested Reading:

1. M.R. Shiyekar, "Design of Steel Structures, (Limit State Method", Second Edition, PHI Learning Pvt Ltd. 2013.
2. S. S. Bhavikatti, "Design of steel Structures", 3rd Edition, I.K.International Publishing House Pvt. Ltd. 2012.

18CE C20

ENVIRONMENTAL ENGINEERING

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the student
1. Understand methods of population forecasting, estimate water quantity to be supplied in towns and design water distribution network.
2. Understand and design various units of a water treatment plant.
3. Calculate sewage produced in residential areas and design conveyance components.
4. Learn about design components of waste water treatment plants, low cost treatment techniques and sludge digestion systems.
5. Address issues of air pollution and noise pollution with the aid of appropriate control methods.

Course Outcomes: At the end of the course, the student will be able to
1. identify an appropriate population forecasting method and estimate quantity of water to be supplied and plan & design conveyance components.
2. design water treatment units for a water treatment plant.
3. estimate quantity of sewage and storm water & characteristics of sewage, design sewers and plan sewer appurtenances.
4. design components of waste water treatment plant and sludge digestion systems.
5. understand and judge methods for control of particulate matter and gaseous pollutants in the atmosphere, outline noise pollution control methods.

UNIT – I:
Introduction: Protected water supply, population forecasting methods, design period, types of water demand, factors affecting, fluctuations, fire demand, drinking water standards; sources of water, comparison from quality and quantity and other considerations; intakes, infiltration galleries; Design of distribution systems, pipe appurtenances.

UNIT – II:
Water treatment: Sedimentation principles, design factors, coagulation, flocculation, clarifier design, coagulants, feeding arrangements. Filtration theory, working of slow and rapid gravity filters, multimedia filters, design of filters, troubles in operation, comparison of filters, disinfection, theory of chlorination, chlorine demand, other disinfection practices.

UNIT - III:
Characteristics of sewage: Waste water collection, estimation of waste water and storm water, decomposition of sewage, self purification of rivers, examination of sewage, B.O.D. Equation, C.O.D. Design of sewers, shapes and materials, sewer appurtenances, house drainage, plumbing requirements, sanitary fittings, traps, one pipe and two pipe systems of plumbing.

UNIT – IV:
Waste water treatment: Primary treatment: screens, grit chambers, skimming tanks, sedimentation tanks, principles of design, Biological treatment: Design of trickling filters, Activated Sludge Treatment and oxidation ponds. Sludge digestion: factors affecting, design of digestion tank, septic tanks: working principles and design, soak pits, ultimate disposal of sewage.

UNIT – V:
Air pollution: Meteorological parameters affecting air pollution, atmospheric stability, plume behaviour, control of particulates, gravity settlers, cyclone filters, Electrostatic precipitators; Control of gaseous pollutants.
Noise – Basic concept, measurement and various control method

Text Books:

1. B.C Punmia, Ashok.K.Jain, Arun K .Jain "*Environmental Engineering I",* Laxmi Publications; 2016.
2. B.C Punmia, Ashok.K.Jain, Arun K .Jain "*Environmental Engineering II*", Laxmi Publications; 2016.
3. Santosh Kumar Garg, "*Water Supply Engineering*", Khanna Publications, 2017.
4. Santosh Kumar Garg, "*Sewage Disposal and Air Pollution Engineering*", Khanna Publications, 2018.

Suggested Reading:

1. H.S Peavy, D. R. Rowe," *Environmental Engineering*", McGraw Hill Education (India) Pvt. Ltd, 2017.
2. Metcalf and Eddy, "*Waste Water engineering*", McGraw Hill, 2015.
3. Mark J Hammar and Mark J. HammarJr," *Water and Waste Water Technology*".Wiley, 2007.
4. "*Manual on Water Supply and Treatment*", Ministry of Urban Development, New Delhi.
5. "*Manual on Sewerage and Sewage Treatment Systems, Part A, B and C*", Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE C21

ENGINEERING GEOLOGY

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:-The Students Will able to
1. Describe the various properties of minerals, distinguishing features of rocks.
2. Describe the geological structures, processes of weathering and classification of soils.
3. Explain the process of ground water exploration
4. Illustrate the knowledge of geological studies for dams and reservoirs.
5. Illustrate the knowledge of geological studies for tunnels; list the causes and effects of earth quakes, tsunamis and landslides with their mitigation measures.

Course Outcomes: Upon the completion of course, students will be able to
1. identify different minerals and distinguish features exhibited by the rocks.
2. identify the geological structures like folds, faults, joints and unconformities present in rock and describe the processes of weathering.
3. assess the occurrence of ground water in various litho logical formations and location of bore wells.
4. evaluate the suitability of site for the dam construction.
5. evaluate the suitability of site for the tunnel construction; recognize the causes and effects of earthquakes, tsunamis and landslides in geological aspects.

UNIT- I:

Introduction: Branches of Geology useful to civil engineering scope of geological studies in various civil engineering projects.

Mineralogy: Definition of Mineral and crystal. Physical properties used in the identification of minerals. Physical properties of quartz, Orthoclase, Hornblende, Biotitic, Muscovite, Talc, Barite, Calcite, Kyanite and corundum.

Rocks:- Geological classification of Rocks, Textures and structures Geological description and Indian occurrence of granite, Basalt, Dolerite, Gabbro, Laterite, Sand stone, Shale, Limestone slate, Gneiss, Schist, Quartzite, Marble, and Khondalite.

UNIT- II:

Geological Structures: Classification mode of origin and engineering consideration of Folds, Faults, Joints and unconformities.

Rock Weathering: Definition of Rock weathering, classification of weathering Engineering consideration of Rock Weathering.

Geology of Soils: Formation of soil, Soil Profile important clay minerals, Geological classification of soils, Types of Indian Soils.

UNIT- III:

Hydro Geology: Hydrological cycle, Zones of Ground water Aquifers, Aquifuge, Aquiclude and Aquitards. Springs, ground water exploration, ground water provinces of India.

UNIT- IV:

DAMS: Terminology of Dam, types of dams, Geological investigation for selection of a good dam site. Analysis of Dam failures in the past .Engineering geology of major dam sites and Reservoirs of India.

UNIT-V:

Tunnels: Geological investigations of tunnels problems of tunneling, over break, logging of tunnels geology of some well known tunnels.

Geological Hazards: Geological aspects of earthquakes, tsunam

Text Books:
1. Parbinsingh, "*Engineering and general Geology*", S.K.Kataria& sons, New Delhi 2010.
2. Chennakesavulu, "*Text book of Engineering Geology*", Macmillan India Ltd, 2009.
3. D. Venkata Reddy, "*Engineering Geology*", Vikas Publishers House Pvt. Ltd 2010.

Suggested Reading:
1. F. G. Bell, "*Fundamentals of Engineering Geology*", Aditya Books Pvt. Ltd., New Delhi 2007
2. D. P. Krynine and W. R. Judd, "*Principles of Engineering Geology and Geotechnics",* CBS publishers Distribution First India Edition 1998.
3. SubinoyGangopadhyay, "*Engineering Geology*", Oxford University press 2013.
4. "*Seismo Tectonic Map of India*", Geological Survey of India 2005.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE E09

STRUCTURAL ANALYSIS -III
(Core Elective-3)

Instruction	3L Hours per week
Duration of Semester End Examination:	3 Hours
Semester End Examination:	70 Marks
CIE:	30 Marks
Credits:	3

Course Objectives: To enable the student to
1. Understand the concept of analyzing two hinged arches and the redundant trusses.
2. Use the approximate methods to analyze the multi-storey frames for gravity and lateral loads.
3. Apply the Flexibility method and to analyze the indeterminate beams, plane frames and trusses.
4. Comprehend the Stiffness method and analyze the indeterminate beams, plane frames and trusses.
5. Get exposed to basic concepts of finite element method and solve simple numerical problems.

Course Outcomes: At the end of the course, the student will be able to
1. determine the support reactions and bending moment, normal thrust and radial shear at a section for point loads and udl, apply Castigliano's theorem –II and Unit load method to determine the forces in the members of the redundant pin-jointed plane frames.
2. analyze the multi-story frames for gravity and lateral loads by using approximate methods
3. analyze the indeterminate beams, rigid jointed plane frames and trusses using flexibility matrix method for different load conditions.
4. apply Stiffness matrix method to analyze the indeterminate beams, rigid jointed plane frames and trusses, for different load conditions.
5. formulate stiffness matrix for bar, truss and beam element and apply to analyze axially loaded members, trusses and beams.

UNIT – I:
Two hinged arches: Parabolic and segmental arches, determination of horizontal thrust, bending moment, normal thrust and radial shear for static loading, temperature effects.
Redundant pin-jointed plane frames (trusses): Analysis of pin-jointed plane frames using Castiglione's theorem – II and Unit load method, with one degree of redundancy (internal / external), Assembly and temperature effects.

UNIT-II:
Approximate Methods of Analysis: Introduction – Analysis of multi-storey frames by Portal and Cantilever methods for lateral loads and Substitute Frame method for gravity loads.

UNIT– III:
Flexibility method of Analysis: Introduction, Analysis of continuous beams, and rigid jointed plane frames with static indeterminacy not exceeding three. Analysis pin jointed plane frames with static indeterminacy not exceeding two.

UNIT-IV:
Stiffness method of Analysis: Introduction, Analysis of continuous beams, and rigid jointed plane frames with kinematic indeterminacy not exceeding three. Analysis pin jointed plane frames with kinematic indeterminacy not exceeding two.

UNIT-V:
Basics of Finite Element Method: Introduction, Discretization of a structure, Types of Elements. Formulation of stiffness matrix for bar element, Truss element and Beam element. Numerical Problems with degree of freedom not exceeding three.

Text Books:

1. T. S. ThandavaMoorthy, "*Structural Analysis*", Oxford University Press, 2nd Edition, 2012.
2. C. S. Reddy, "*Basic Structural Analysis*", Tata McGraw Hill, 3rd Edition 2017.

Suggested Reading:

1. B.C. Punmia, and A. K. Jain, "*SMTS - II Theory of Structures*", Laxmi Publications, 2017.
2. S. Ramamrutham, "*Theory of Structures*", Khanna Publishers, 2018.
3. D. S. PrakashRao, "*Structural Analysis" - A Unified Approach"*, University Press, 2012.
4. W. Weaver, JR. and J. M. Gere., "*Matrix Analysis of Framed Structures*", CBS Publishers, 2nd edition, 2004

18CE E10

FOUNDATION ENGINEERING
(Core Elective-3)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives: To enable the students
1. Understand the stress distribution in the soils for different loading conditions
2. Understand the principle of bearing capacity and settlement analysis.
3. Understand the principles of single and group piles.
4. Select suitable methods for construction of coffer dams and caissons.
5. Understand the principles of site investigation techniques and timbering of excavations.

Course outcomes: At the end of the course the students will be able to
1. compute the stress distribution in the soil under different loading conditions.
2. estimate the bearing capacity and compute settlements for different soils in shallow foundation.
3. estimate the load carrying capacity of single and group of piles.
4. understand the construction techniques and performance of cofferdams and caissons.
5. identify suitable investigation techniques for soil exploration and compute the loads in timbering of excavations.

UNIT- I:
Stress distribution in Soils: Boussinesq's and Westergaards equations for point load. Application of point load formulae for uniformly distributed load on circular area, Line load, Strip Load, rectangular area. Use of Newmark's chart for different areas using Boussinesq's equation, Contact pressure distribution.

UNIT- II:
Bearing capacity of soils: Terzaghi's equation for bearing capacity in soils –for continuous, square, rectangular and circular footings, general and local shear failure conditions. Plate load test as per IS specification. Allowable bearing capacity.Standard penetration test and use of N values for estimating soil conditions and bearing capacity.

Settlement Analysis: Computation of pressures before loading and after loading. Estimation of settlement – ultimate settlementand after any given period.

UNIT- III:
Pile Foundations: Types of piles–Timber, steel, concrete, cast-in situ, precast piles, bearing piles, friction piles, compaction piles, large diameter piles. Pile capacity – Static formulae, dynamic formulae, pile load test, determination of point resistance and skin friction as per IS code. Bearing capacity of pile groups, negative skin friction.

UNIT- IV:
Coffer dams: General description and construction methodsEarth embankments, cantilever sheet piles, braced coffer dams. Double wall cofferdams, cellular coffer dams – circular, diaphragm type.

Caissons: types of caissons–Open caissons, pneumatic caissons, box caissons (floating caissons). General description and construction methods.Dewatering techniques: sumps, ditches. Well points, deep walls. Geotextile methods: Types and uses.

UNIT- V:
Site investigation: Principles of exploration, sampling methods, transportation and storage of samples, boring and drilling methods, log of bore holes, sampling tubes and samplers. Sampling records.
Timbering of excavation: Bracing for shallow and deep excavations. Computation of lateral earth pressure.Reaction of struts.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Text Books:

1. K. R. Arora, “Soil Mechanics and Foundation Engineering”, 7th Edition, Standard Publishers, 2009.
2. GopalRanjan, “Basic and Applied Soil Mechanics”, 3rd Edition, New Age International, 2016.

Suggested Reading:

1. B.C. Punmia and Ashok Kumar Jain and Arun Kumar Jain, “Soil Mechanics and Foundations”, Laxmi Publications, 16th Edition, 2017.
2. E. J. Bowles, “Foundation Analysis and Design”, Tata McGraw Hill, 2017.
3. IS: 2911 – (part-IV) – Codes of practice for design and Construction of Pile Foundations – Load test on piles.
4. IS 1888 - 1982: Method of load test on soils.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE E11

WATERSHED MANAGEMENT
(Core Elective-3)

Instruction	3LHoursperweek
DurationofSemesterEndExamination	3Hours
SemesterEndExamination	70Marks
CIE	30Marks
Credits	3

Course Objectives: To enable the student

1. Understandtheconceptsofwatershedmanagement,socioeconomic aspects related to watersheddevelopment.
2. Understandcharacteristicsofwatershed,soilerosionanditscontrol.
3. Familiarize with various water harvesting techniques and land use managementpractices.
4. Understand social aspects of watershedmanagement
5. Understand the concept of integrated watershed management and ecosystemmanagement.

Course outcomes: At the end of the course, the student will be able to

1. identify relevance and scope of watershed management.
2. identify causes of soil erosion and understand its control measures.
3. understand waterharvesting structures and land management practices.
4. understand the participation of stake holders in watershed management.
5. understand soil and agricultural ecosystem and identify integrated approach of watershed management.

UNIT – I:

Definition and concept of Watershed: Concept of watershed development, History of Watershed management and its relevance to India, objectives of watersheddevelopment,differentstakeholdersandtheirrelativeimportance,need for watershed development in India, selection of watershed, watershed policy issues, Integrated and multidisciplinary approach for watershedmanagement.

UNIT – II:

Characteristics of Watershed: Size, shape, physiographic, slope, climate, drainage,landuse,vegetation,geologyandsoils,hydrologyandhydrogeology, socioeconomiccharacteristics.
Principles of Erosion: Types of erosion, factors affecting erosion, effects of erosiononlandfertilityandlandcapability,estimationofsoillossduetoerosion. **Measures to Control Erosion**: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rock fill dams, brushwood dam, Gabion.

UNIT – III:

Water Harvesting: Rainwater harvesting, catchment harvesting, harvesting structures& Design of harvesting structures,soilmoistureconservation,checkdams,artificialrecharge,farmponds and percolation tanks. Roof top waterharvesting.
LandManagement:Landuseandlandcapabilityclassification,managementof forest,agricultural,grassland andwildland,reclamationofsalineandalkaline soils.

UNIT – IV:

SocialAspectsofWatershedManagement:PlanningofWatershedmanagement activities, community participation, Private sector participation, Institutional issues, Socio-economy, Integrated development, Water legislation and implementations, Casestudies.

UNIT – V:

Integrated Watershed Management: Introduction to integrate resources management, conjunctive use of water resources.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

EcosystemManagement:RoleofEcosystem,crophusbandry,soilenrichment, inter mixed and strip cropping, cropping pattern, sustainable agriculture, bio- mass management, dry land agriculture, horticulture, social forestry and a forestation.

Text Books:

1. Murthy,J.V.S.,"*WatershedManagement*",NewAgeInternational(P), Ltd., NewDelhi,1988.
2. Majumdar,D.K.,"*IrrigationandWaterManagement*",PrenticeHall, NewDelhi, 2000.

Suggested Reading:

1. Mohan Das, M. and Das Saikia, "*Watershed Management*." PHI Learning(P).,Ltd.,NewDelhi,2013.
2. Goswami, M.D.,"*Watershed Management: Theroy and Practices*." RitwikandGargee(P).,Guwahati,Assam,2004.
3. Haan, C.T., Johnson, C.T., AND Brakensiek, D.L,.*"Hydrologic ModelingofSmallWatersheds*."ASAE,Michigan,1982.
4. SrinivasaRajuK.andNageshKumarD,"*MulticriterionAnalysisin EngineeringandManagement*",PrenticeHallofIndia(PHI)Learning Pvt.Ltd,NewDelhi,2014.

18CE E12

URBAN TRANSPORTATION PLANNING
(Core Elective-3)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives:

1. To understand the importance and the steps involved of transportation planning.
2. To identify the data required for creating and improving transportation infrastructure
3. To get knowledge about the traffic data acquisition process and analysing for understanding traffic growth pattern.
4. To understand the concepts of modelling techniques applied in transportation planning.
5. To know the ways to apply economic evaluation criteria to transportation project.

Course outcomes: At the end of the course, the student will be able to

1. apply the fundamental knowledge for forecasting and creating the transportation infrastructure facilities scientifically and ethically by collecting the appropriate sample data.
2. identify the procedures for collecting the traffic related data for generating and validating transport demand models.
3. apply four stage transportation demand modelling by creating mathematical models to understand the travel pattern and behavior of road users.
4. apply the mathematical knowledge in solving the transportation planning related problems by analyzing transportation data.
5. evaluate highway projects by using different economic methods and understand the role of computer applications in transportation planning.

UNIT - I:
Introduction of concepts of Transportation planning process, Interdependence of the land use and traffic, systems approach to transportation planning, stages in transportation planning, survey and analysis of existing conditions, forecast analysis of future conditions and plan synthesis, evaluation, program adoption and implementation.

UNIT - II:
Transportation Surveys – Introduction, definition of the study area, zoning, types of surveys, home interview, commercial vehicle, taxis, roadside interview, postcard questionnaire, registration number of vehicle plate, tags on vehicles, mass transport, analyzing the data from samples.

UNIT - III:
Trip Generation – Introduction and definition, trip purpose, factors governing trip production and attraction rates, regression methods – multiple linear regression analysis. Trip Distribution – concepts of trip distribution, methods of trip distribution, uniform (constant) factor method, average factor method, Fratar method, Furness method, advantages and disadvantages of growth factor methods, the gravity model.

UNIT - IV:
Modal split – General considerations, factors affecting modal split, modal split in the transportation planning process. Traffic Assignment – purpose of traffic assignment, general principles, assignment techniques, all or nothing assignment, multiple route assignment, capacity restraint assignment, diversion curves.

UNIT - V:

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Economic evaluation of highway projects – need, basics principles, methods - benefit cost ratio, net present value, First year rate of return and internal rate of return - comparison. Computer applications in Transportation planning.

Text books:

1. B. G. Hutchinson, "*Principles of Urban Transport Systems Planning*", McGraw –Hill, Newyork, 1974.
2. C. S. PapacostasandP. D. Prevedouros, "*Transportation Engineering and Planning*", Pearson education India, 2015.

Suggested Reading:

1. L.R. Kadiyali "*Traffic Engineering and Transportation Planning*" Khanna Publishers, 2011.
2. Sarkar, Pradip Kumar, Maitri, Vinay, Joshi, G.J. "*Transport Planning: Principles, Practice and Policies*" PHI Learning, 2017.

18CE E13

FINITE ELEMENT METHODS
(Core Elective-4)

Instruction:	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination:	70 Marks
CIE:	30 Marks
Credits:	3

Course Objectives: To enable the student
1. Learn the fundamentals of Finite element method (FEM) and derive elasticity matrices for 2-D, 3-D and axisymmetric elasticity problems.
2. Understand basic principles of minimum potential energy methods, Principle of virtual work and various coordinate systems
3. Understand the FEM formulation for bar, truss elements and analyze simple problems with kinematic indeterminacy not greater than three.
4. Understand the FEM formulation for beam element and rigid jointed plane frame element and analyze simple problems with kinematic indeterminacy not exceeding than three.
5. Get familiarized with displacement models, Iso-parametric elements, 2D CST elements and rectangular elements and know the formulation of global stiffness matrices and load matrices and Gauss Quadrature rule

Course Outcomes: At the end of the course, student will be able to
1. apply the fundamentals of FEM, elements of theory of elasticity for 2D, 3D and axisymmetric problems.
2. apply Principle of minimum potential energy and Principle of Virtual work; analyze simple problems using Rayleigh Ritz Method and Galerkin's method.
3. formulate the local and global stiffness matrix, load matrix for 1D bar elements and 2D truss elements and analyse simple problems.
4. develop the stiffness matrix for beams and rigid jointed plane frames and solve problems with degree of freedom not exceeding three.
5. select displacement functions, formulate the stiffness matrix, load matrix for CST elements. Use Iso-parametric elements and quadrilateral elements, and evaluate definite integral by Gauss Quadrature.

UNIT- I:
Introduction to FEM: General description of the method, brief history of the method, applications of the method, advantages of the finite element method, steps in the finite element method. Types of elements, Types of forces, and Boundary conditions. Strain displacement, and stress- strain relations for 2-D, 3-D problems & Axisymmetric elements. Equations of equilibrium and compatibility conditions for 2-D and 3-D problems. Plane stress and plane strain situations and derivation of elasticity matrices.

UNIT- II:
Finite Element Formulation: Principle of minimum potential energy, Principle of virtual displacement, Raleigh Ritz method, Weighted Residual method- Galerkin's method. Coordinate system - Global coordinate, local coordinate and natural coordinate system.

UNIT- III:
Bar Elements: Shape functions, stiffness matrix for a 2- noded bar element, axial bar subjected to point loads, surface forces and body forces - constant cross section and varying cross section bar.
Truss Elements: Transformation matrix, Stiffness matrix of truss member in local and global coordinate, analysis of trusses with kinematic indeterminacy not exceeding three.

UNIT- IV:

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Beam Elements: Shape functions, beam element stiffness matrix, element load vector, and analysis of continuous beams with kinematic indeterminacy not exceeding three.
Plane Frame elements: Element stiffness matrix in local coordinates,
Transformation or Rotation matrix, and stiffness matrix and load vector in global coordinates.

UNIT-V:
Displacement models: Selection of displacement models, geometric invariance, conforming and non-conforming elements.
2-D Triangular Elements (CST) and Rectangular Elements: Determination of strain-displacement matrix, shape functions, determination of element stiffness and load matrices, assembling global stiffness and load matrices.
Iso-parametric elements: Iso-parametric concept, Iso-parametric, Sub parametric and Super parametric elements. Gauss Quadrature of numerical integration.

Text Books:
1. David V. Hutton, "*Fundamentals of Finite Element Analysis*", McGraw Hill Education (India) Private Limited, Delhi, 2014.
2. P. N. Godbole," *Introduction to Finite Element Method*", I. K. International Publishing House Pvt. Ltd. New Delhi, 2013.
3. P. Seshu, "*Finite Element Analysis*", Prentice Hall of India Private Limited, New Delhi, 2010.

Suggested Reading:
1. T. R. Chandrupatla and A. D Belegundu, "*Introduction to Finite Elements in Engineering*", Prentice –Hall of India Private Limited, New Delhi, 2009
2. Daryl L, Logan, "*A first course in the Finite Element Method*", Third Edition, Thomson Brook, Canada Limited, 2007.
3. R. D. Cook, "*Concepts and Applications of Finite Element Analysis"*, John Wiley and sons, 1981.
4. O. C. Zienkiewicz and R. Taylor, "*The Finite Element Method"*, Vol.1, McGraw Hill Company Limited, London, 1989.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE E14

REINFORCED CONCRETE DESIGN-II
(Core Elective-4)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The student shall be able to
1. Comprehend the concepts of design and detailing of combined rectangular and trapezoidal footings.
2. Understand the design and detailing of cantilever and counterfort type of retaining walls.
3. Learn the concepts of design and detailing of various water tanks.
4. Grasp the knowledge from relevant IRC codes, design and detailing of RC solid slab bridge.
5. Know the procedures for design and detailing of T-beam bridges.

Course Outcomes: At the end of the course the student will be able to
1. develop the plan layout, design and detail rectangular & trapezoidal combined footings and beam-slab type raft footing.
2. analyse for stability, design, the various components and detail cantilever and counterfort type retaining walls.
3. interpret the specifications from relevant codes, determine the design forces, design various components and detail rectangular and circular water tanks including Intze tanks.
4. understand the clauses from relevant IRC codes, design and detail the various components of Solid slab bridge.
5. analyse the slab panels using effective width method/ Pigeaud's curves, girders using Courbon's method and design & detail the various components of T-Beam bridges.

UNIT – I:
Combined Footings: Limit state design & detailing of combined rectangular and trapezoidal footings – Design of raft footings (Beam Slab type up to 3 x 2 grid)
UNIT – II:
Retaining walls: Limit state design and detailing of cantilever and counterfort type of retaining walls under various conditions of backfill.
UNIT – III:
Water tanks: Elastic Design & Detailing of circular and rectangular ground level and over-head tanks, Design principles of Intze tank - Design of staging for wind loads.
UNIT – IV:
Bridges: Basic components- Types of bridges -Loads on bridges- IRC standards; Elastic design and detailing of two lanes, simply supported RC Solid Slab Bridge including Kerb.
UNIT- V:
T-beam bridges: Components of a T-beam bridge- Elastic design and detailing of two lane, Simply Supported, Three girder T-beam bridge- Use of effective width method- Pigeaud's curves and Courbon's method.

Text Books:
1. N. Krishna Raju, "*Advanced Reinforced Concrete Design (IS: 456-2000)* ", CBS Publications 2nd Edition,2010.
2. Vazirani and Ratwani," *Design Of Concrete Bridges*", Khanna Publishers, 1998.

Suggested Reading:
1. D. S. PrakashRao, "*Design Principles and Detailing of Concrete Structures*", Tata McGraw-Hill Publishing Co. Ltd., 1998.
2. D. Johnson Victor, "*Essentials of Bridge Engineering"*, paperl ing Co., New Delhi, 6th Edition, 2015.

3. S. Ponnuswamy, "*Bridge Engineering*", Tata McGraw Hill, Third Edition, 2017.4. N. Krishna Raju, "Design of Bridges", Oxford &IBHPubs Company New Delhi, Fourth Edition, 2008.

18CE E15

RAILWAY ENGINEERING
(Core Elective-4)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the student

1. To understand about permanent way and its components and their functions
2. To know about the geometric standards of railway track.
3. To know the role and the construction of Points and constructions
4. To know the importance of maintenance of railway track
5. To know the role of signals and their components and the requirements of drainage system

Course Outcomes: At the end of the course, the students will be able to

1. understand the role played by various components of permanent way.
2. apply engineering knowledge to geometric design of a railway track as per the standards.
3. understand the importance and components of points and crossings.
4. create facilities for railway passengers and goods, identify procedures to be followed for maintenance of track.
5. understand various types of railway signals and their functions, need and requirements of drainage system in railway tracks.

UNIT- I:
Introduction to Railway Engineering: History of development of railway engineering, brief introduction of railway zones, classification of Indian railway, Permanent way- rail gauges- types, uni-gauge policy, ideal requirements, Rails, types of rails, rail fastenings, rail joints, creep - causes, measurement, remedial measures for rectification of creep, Adzing of rails, Sleepers- function of sleepers, requirements of sleepers, sleeper density, types of sleepers, Ballast- functions of ballasts, requirements of ballasts, screening of ballasts, size and quantity of rail ballasts.

UNIT– II:
Geometric Design of Track: Curvature of track, designation of curves, types of curves, design of transition curves, cant concept, cant deficiency, cant excess, speeds of trains on curves, types of gradients, and grade compensation.

UNIT– III:
Points and Crossings: Introduction of right and left hand turn outs, terms used in points and crossings, components, length of stock rail, tongue rail, heel clearance, Crossings- types of crossings- ordinary and double crossings, theoretical and actual nose of crossing, crossing angle, types of leads calculations, Design and maintenance of points and crossings.

UNIT– IV:
Track Maintenance, Stations and Yards: Necessity for maintenance of track, maintenance of track proper, maintenance of railway bridges, maintenance of rolling stock, signaling during maintenance, tools required during maintenance, rail inspection, track inspection, modern methods of track maintenance. Definition of station, selection of site for railway station, features of railway station, types of railway stations definition platform types, Dimensions of platform, definition of a yard, types of yard,

UNIT– V:

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Signals and Track Drainage Systems: Objectives of signaling, types of signals, classification based on function, classification based on location, and special signals, typical layouts, control of movement of trains, Interlocking – principles of interlocking and methods of interlocking. Drainage system - significance of drainage system, requirements of drainage system.

Text Books:

1. S.P.Arora, Prof. S.C. Saxena," *Railway Engineering*", DhanpatRai Publications Pvt. Ltd., New Delhi, 2010.
2. S.C. Rangwala , "*Railway Engineering* " , Charotar Publishing House Pvt. Ltd. (2017)

Suggested Reading:

1. Satish Chandra, M. M. Agarwal," *Railway Engineering*", Oxford, second edition, 2013.
2. K. P. Subramanian, "*Highway, Railway, Airport and Harbour Engineering*", 2015. Scitech Publications (India) Pvt. Ltd.,

   R. Srinivasa Kumar, "*Airport, Railway, Docks &Harbors*", Universities Press, 2014.

18CE E16

GROUND WATERENGINEERING
(Core Elective –4)

Instruction	3LHoursperweek
DurationofSemesterEndExamination	3Hours
SemesterEndExamination	70Marks
CIE	30Marks
Credits	3

Course objectives: The student should able to understand,

1. Basicsofgroundwaterhydrology,familiarwithaquiferparameters.
2. Unsteady flow and its flowcomputation.
3. Exploring groundwater through surface and subsurface methods.
4. Artificial recharge and causes, methods ofrecharge.
5. Various models in groundwater, quality of groundwater, pollutant transport.

Course outcomes: At the end of the course, students will be able to

1. understand the concepts of groundwater flow and basic equations.
2. distinguish between steady and unsteady flow and solve the relevant problems.
3. explore and estimate groundwater potential.
4. understand the artificial recharge, sea water intrusion and control measures.
5. identify and define groundwater contamination and construct groundwater models.

UNIT- I:

Introduction: Occurrenceofgroundwater,problemsandperspectivesregarding groundwaterinIndia,rockpropertieseffectinggroundwater,groundwaterbasin, ground water in hydrologic cycle, vertical distribution of ground water, Hydrologicbalanceequation,typesofaquifers,unconfined,confinedandleaky aquifers. Darcy's law and limitations, compressibility of aquifer, aquifer parameters, specific yield, safe yield, general equation of ground water flow, steadyunidirectionalflow.Steadyradialflowtoawellinunconfinedandconfined aquifers.Steadyflowwithuniformrecharge.

UNIT-II:

Unsteadyradialflowtoawell: Nonequilibriumequationforpumpingtests.Theismethodofsolution,CooperJacobmethod,Chow'smethodsofsolution.Lawof times,wellflownearaquiferboundaries,Imagewelltheory,multiplewell systems, well losses, pumping and recuperationtests.

UNIT-III:

Geophysical Exploration:

Surface investigations: Surface investigations of ground water – electrical resistivity method, seismic refraction method, gravity and magnetic methods, geologic methods, dowsing, remote sensing.

SubsurfaceInvestigations: Testdrilling,resistivitylogging,temperaturelogging, caliper logging, Interpretation of logs and selecting the groundwater potential zones.

Unit- IV:

Artificial Recharge of groundwater: Methods of recharge, water spreading, sewage discharge, recharge through pits and shafts, recharge through well, induced recharge.

Seawaterintrusionincoastalaquifers,occurrence,Ghyben–Herzbergrelation, shape of fresh – salt water interface, Length of the intruded sea water wedge. Prevention and control

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Unit-V:

Modeling Techniques: Introduction, ground water models, sand models, viscous fluid models, membrane models, thermal models, electric - analog models.Numerical modeling, finite difference method.

Qualityofgroundwater: GroundwaterContamination,sourcesofgroundwater contamination, groundwater quality criteria, advection process, diffusionand dispersion process, pollutant transport equation and modeling of pollutant transport.

Text Books:

1. D.K. Todd, "*Ground Water Hydrology*", John Wiley & Sons, Inc., USA,2015
2. H.M.Raghunath,"*GroundWater*",WileyEasternLimited,NewDelhi, 2007.

Suggested Reading:

1. Bouwer,"*GroundWaterHydrology*",Mc.GrawHill,Newyork,2013
2. A. K. Rastogi, "*Numerical Groundwater Hydrology*", PenramInternational Publishing, Mumbai,2007.
3. J.Bear,"*HydraulicsofGroundWater*",Mc-GrawHill,Newyork,2013.

18CE E17

APPLICATION OF ARTIFICIAL INTELLIGENCE IN CIVIL ENGINEERING
(Core Elective 4)

Instruction	3LHoursperweek
DurationofSemesterEndExamination	3Hours
SemesterEndExamination	70Marks
CIE	30Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. Provide a strong foundation of fundamental concepts in Artificial Intelligence.
2. Learn various types of neural networks and study the applications of neural networks
3. Learn the concepts of Fuzzy systems and applications in civil engineering
4. Study the applications of support vector machines in civil engineering
5. Study the different types of regression analysis techniques and applications in civil engineering

Course Outcomes: On Successful completion of this course, student will be able to

1. recall fundamental knowledge on artificial intelligence.
2. understand neural networks and their types and apply neural networks in the domain of civil engineering.
3. understand and apply fuzzy controllers to solve real-world civil engineering problems.
4. explain basic concepts of support vector machines and choose appropriate techniques relevant to civil engineering.
5. develop a regression models for civil engineering problems.

UNIT I:

Introduction: introduction, brief history, intelligent systems: ELIZA, categorization of intelligent systems, components of AI program. Foundations of AI, sub areas of AI, applications, current trends in AI.

UNIT II:

Artificial Neural Networks: introduction, artificial neural networks: neuron model, activation functions, neural network architecture. Single layer feed forward networks, multi-layer feed forward networks, radial basis function networks, design issues of artificial neural networks, recurrent networks.

Applications: construction technology evaluation, predicting carbonation depth in concrete structures, optimal calibration of water distribution systems, traffic control system for isolated intersections, classification of pavement surface distress, back calculation of flexible pavement moduli from falling weight deflectometer data, back calculation of pavement profiles from the Spectral analysis of surface waves test

UNIT III:

Fuzzy sets and fuzzy logic: introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules, fuzzy systems.

Applications: pipe networks, real time reservoir operation, evaluation of existing reinforced concrete bridges, optimization of steel structures, diagnosing cracks in RC structures, construction scheduling, wastewater treatment systems, pavement cracking detection, road accident analysis

UNIT IV:

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Machine learning: introduction, machine learning systems, supervise and unsupervised learning, inductive and deductive learning, clustering, support vector machines

Applications: slope stability analysis, settlement of shallow foundations on cohesionlesssoils, evaporate losses in reservoirs, undrained shear strength of clay, prediction of compressive strength of self-compacting concrete, traffic signal coordination.

UNIT V:

Regression Analysis: Relationship between attributes using Covariance and Correlation, Relationship between multiple variables: Regression (Linear, Multivariate) in prediction. Residual Analysis, Hypothesis testing of Regression Model, R-square and goodness of fit, Multiple Linear Regression, Non-Linear Regression, logistic regression.

Applications: determination of uniaxial compressive strength and modulus of elasticity, prediction of fracture parameters of concrete, choose alternative route by optimization in transportation, capacity of signalized and unsignalized intersections, choose different mode by cost optimization.

Text Books:

1. PijushSamui, DwarkadasPralhaddas Kothari, Artificial intelligence in Civil Engineering: AI in Civil Engineering, 2012.
2. Ian Flood, Nabil Kartam, Artificial Neural Networks for Civil Engineers: advanced features and applications, 1998.

Suggested Reading:

1. S.M Yadav, Application of soft computing techniques in civil engineering, 2018.
2. SarojKaushik, "*Artificial Intelligence*", Cengage Learning India, 2012.
3. Nelson M. Mattos, "*An Approach to Knowledge Base Management*", Springer Berlin Heidelberg, 1991.

Online Resources:

1. http://nptel.ac.in/courses/106106126/
2. http://nptel.ac.in/courses/106105077/

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE C22

ENVIRONMENTAL ENGINEERING LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Objectives: The objectives of the course are to

1. Perform the experiments using different equipments
2. Determine water quality using standard test procedures
3. Understand the water & waste water sampling, their quality standards
4. Estimate air quality and classify the level of pollution
5. Estimate bacteriological quality of water.

Course outcomes: After the completion of the course student should be able to

1. Demonstrate skills to use equipments in conducting the test procedures.
2. Evaluate water quality and summarize the suitability in accordance with IS: 10500- 2012, Drinking Water specifications.
3. Evaluate characteristics of wastewater and summarize the suitability for disposal/reuse as per standards.
4. Measure air quality and classify the level of pollution based on standards set by Pollution Control Board.
5. Evaluate and analyse bacteriological quality of water**.**

Practical Work: List of Experiments

1. Determination of pH, turbidity
2. Determination of Electrical Conductivity
3. Determination of Total Solids (Organic and inorganic, volatile and fixed)
4. Determination of Alkalinity
5. Determination of Hardness (Total, Calcium and Magnesium Hardness)
6. Determination of Chlorides and sulphates
7. Determination of optimum coagulant Dosage
8. Determination of COD
9. Determination of DO and BOD
10. Determination of Breakpoint chlorination
11. Determination of MPN
12. Measurement of air quality

Suggested Reading:

1. Government of India & Government of The Netherlands –Hydrology Project Technical Assistance, “Standardanalytical procedures for water analysis”, May 1999

2. D. R. Khanna and R. Bhutiani, “Laboratory Manual of Water and Wastewater Analysis”, Daya Publishing House, 2008

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE C23

ENGINEERING GEOLOGY LAB

Instruction	3P Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	35 Marks
CIE	15Marks
Credits	1

Course Objectives: The students will:

1. Familiarize with the procedures for the identification of minerals rocks and
2. Describe different structural models.
3. Measure the attitude of beds and draw the sections for geological maps.
4. Operate electrical resistivity meter.
5. Describe the various types of maps.

Course Outcomes: Upon the Completion of this course students will be able to

1. identify the minerals, rocks and various
2. identify structural features like folds, faults and unconformities.
3. measure the electrical resistivity of rocks, soil etc.
4. interpret the topographic maps.
5. identify the geological and geotechnical features of given places.

LIST OF EXPERIMENTS:

1. Identification and description of physical properties of minerals.
2. Identification and description of Geotechnical characteristics of Rocks. IS 1123-1975
3. Study of structural models, folds, faults and unconformities.
4. Measurement of strike and dip of joints in granites using clinometers compass.
5. Measurement of electrical resistivity of rocks, soils and water.
6. Study of geological and Geotechnical map of Telangana, Andhra Pradesh and India.
7. Study of Topographic Maps of Srisailam and NagarunaSagar dams.
8. Study of maps and sections pertaining to the study of folds, faults and unconformities.

Suggested Reading:

1. IS 113-1975, "*Methodof Identification of natural Building stones*", Bureau of Indian Standards.
2. Parbinsingh, "*Engineering and general Geology*", S.K.Kataria& sons, New Delhi 2010.
3. F. G. Bell, "*Fundamentals of Engineering Geology*", Aditya Books Pvt. Ltd., New Delhi 2007
4. "*Seismo Tectonic Map of India*", Geological Survey of India 2005.
5. Kuzin M., Egorov N., "*Field Manual of Minerals*", Central Books Ltd., 1997.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

3. 18CS O01 – Basics of Artificial Intelligence
4. 18EE O04 – Energy Conservation

18CE C24

CONSTRUCTION ENGINEERING AND MANAGEMENT

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the students

1. Understand different types of construction, execution methods and basics of construction project management.
2. Develop knowledge in respect of project planning and application of different techniques for project planning and control.
3. Analyse the projects in respect of time and cost to result in resource optimization.
4. Understand the various construction safety measures and quality management systems applicable for construction projects.
5. Distinguish various construction equipment used and understand essential contracting systems adopted in construction industry.

Course Outcomes: After completion of the course, students will be able to

1. choose a suitable type of construction method and project delivery system for successful project completion.
2. plan the construction project and apply a suitable technique for the project under consideration.
3. optimize project time and cost with the exercise of proper monitoring and control in construction projects
4. recall construction safety and quality management systems to be implemented in construction projects.
5. select proper equipment for the execution of various operations in construction and recall various issues of contracting.

UNIT-I: Introduction to Construction and Construction Management: Construction and unique features of construction, construction projects-types and features, phases of a construction project, agencies involved and their methods of execution- Project Delivery Methods: BOT, SBOO, BOOT; Public Private Partnership (PPP); Significance of construction management, Construction Team. Organisation – principles and types.

UNIT-II:Construction project planning: Stages of project planning: pre-tender planning,pre-construction planning, detailed construction planning, Types of Project plans- Time plan, man power plan, material plan, construction equipment plan; Work break-down structure- Methodologies of WBS; estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts. Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT- Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion.

UNIT-III:Project Monitoring & Control: Introduction - Supervision, record keeping, periodic progress reports. Updating of plans: purpose, frequency and methods of updating- using bar charts, PERT/CPM, and Precedence network. Schedule/time progress control; Cost control- Classification of costs, time-cost trade-off in construction projects; Implement

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

UNIT-IV:Construction Safety and Quality Management Safety: Safety, Health and Environment on project sites: accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health; Quality control: construction quality, Quality control and Quality Assurance in construction projects, ISO Standards-Benefits of ISO 9000, Principles of quality management systems, ISO 9000 -2000 family of Standards.

UNIT-V:Construction Equipment and Contracts: Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials.
Contracts**:** Introduction, types of construction contracts and their advantages and disadvantages, conditions of contracts, Tender: Tender form, Tender Documents, Tender Notice, Work Order. Delays, penalties and liquid4.ated damages; Force Majeure, Suspension and Termination. Changes & variations, Dispute Resolution methods.

Text Books:

1. Varghese, P.C., “Building Construction”, Prentice Hall India, 2007.
2. National Building Code, Bureau of Indian Standards, New Delhi, 2017.
3. Chudley, R., Construction Technology, ELBS Publishers, 2007.

Reference Books:

1. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
2. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
3. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015.
4. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016..

18CE C25

HYDROLOGY AND WATER RESOURCES ENGINEERING

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the students to understand
1. Surface & sub-surface hydrology, rainfall and measurement of rainfall.
2. Runoff, runoff estimation and surface reservoir planning.
3. Groundwater and its occurrence, theory of subsurface flow, flow to wells and yield, and irrigation practices.
4. Canal system, design theories, and canal outlets.
5. Design of Gravity dams, earth dams and seepage analysis, spillways and energy dissipators.

Course Outcomes: On completion of the course, students will be able to
1. analyse the components of hydrologic cycle and determine rain gauge network.
2. interpret various methods to estimate runoff and understand reservoir planning.
3. identify aquifer types , understand the process of sustainable groundwater management and evaluate the performance of irrigation system.
4. understand canal systems and design canals using regime concept.
5. analyse the stability of dams and understand spillways.

UNIT- I:
Introduction: Hydrologic cycle, water-budget equation, world water balance, hydrology applications in engineering, surface water resources of India.
Precipitation: Forms of precipitation, characteristics of precipitation in India, measurement of precipitation, rain gauge network, mean precipitation over an area, depth-area-duration relationships, depth-duration-frequency relationship, Probable Maximum Precipitation (PMP).Infiltration, infiltration capacity, infiltration indices, evaporation, and evapotranspiration.

UNIT- II:
Runoff: Runoff, factors affecting runoff, flow-duration curve, flow-mass curve, hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph.
Reservoirs: Types, selection of suitable site, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation and life of reservoir.

UNIT- III:
Ground water: Types of aquifers, Aquifer parameters, steady radial flow into a confined and unconfined aquifer, Darcy's law, yield of an open well, well hydraulics, Safe yield, Water harvesting structures and augmentation of ground water, Sustainable Ground Water management.
Irrigation: Duty, delta and base period of crops, crop water requirements, methods of applying water to the fields, micro irrigation, irrigation efficiencies, soil-water relationship, depth of irrigation, frequency of irrigation, wilting point, water logging, consumptive use.

UNIT- IV:
Distribution systems : Canal systems, alignment of canals, balancing depth, canal losses, estimation of design discharge. Design of canals- rigid boundary channels, alluvial channels, Kennedy's and Lacey's theory of regime channels. Lining of canals, types of lining.
Types of Canal outlets, Introduction to diversion head works and [illegible]tion works.

UNIT- V:

Gravity dams: Types of dams, Forces on gravity dams, causes of failure, stress analysis, elementary and practical profile, and economical height of dam.

Earth dams: Classification, design considerations, control of seepage, slope protection.

Spillways: Types, components of spillways.

Text Books:

1. P. N. Modi, "Irrigation Water Resources & Water Power Engineering", Standard Publishers, 2014.
2. S. K. Garg, "Irrigation Engineering and Hydraulic Structures: Water Resources Engineering - Vol.II", Khanna Publishers, Delhi, 2017.

Suggested Reading:

1. Ch. S. N. Murthy, "Water Resources Engineering: Principles and Practice", New Age International Publishers, Delhi, 2002.
2. G. L. Asawa, "Irrigation and water Resources engineering", New Age International Publishers, Delhi, 2005.
3. VenTe Chow, "Handbook of Applied Hydrology", McGraw-Hill Book Company, New York, 1964.

18CE C26

ESTIMATION, SPECIFICATIONS AND COSTING

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives: To enable the students understand

1. The working of detailed estimates for different structures.
2. The working of steel quantities of R.C.C Framed works and preparation of BBS.
3. The rate Analysis for different items of works.
4. About TSDSS and Departmental procedures.
5. About Specifications and standard procedure for construction works.

Course outcomes: At the end of the course, the students will be able to

1. prepare approximate estimates, detailed estimates for simple and complex buildings.
2. understand the RCC drawings and estimate the steel qualities to prepare BBS of various items of the buildings – beams, columns, slabs, footings and other civil engineering structures.
3. apply engineering knowledge to estimate quantities of roads, culverts, canals and septic tanks.
4. understand the work force required for the quantities estimated, as per TSSDSR and apply rate analysis to compute unit cost for different items of works of buildings, concrete and bituminous road works.
5. understand general and detailed specifications of works and record details of measurements in the M-Book and work force details in muster roll.

UNIT – I:
Introduction to Estimation, objectives of estimation, factors influencing estimation, types of estimates, detailed estimates for Flat roof buildings - load bearing and RCC framed using long wall and short wall method, centre line method.

UNIT – II:
Estimation of steel quantities and preparation of bar bending schedule (BBS) for RCC framed works - slabs (one way and two way), beams and columns, footings, stair case and retaining walls.

UNIT – III:
Detailed estimate of WBM roads, CC roads and Bituminous roads (including earth work), single cell rectangular box culvert, Septic tank and earth work of irrigation canals.

UNIT – IV:
Preparation of analysis of rates and theoretical requirements of materials as per Telangana State Standard Data and Schedule of Rates (TSSDSR) for major items of works of a building, all items of Bituminous and concrete road works.

UNIT – V:
General and detailed specifications of various items of buildings and road works, M-Book and Muster Roll.

Text Books:

1. B. N. Dutta, “*Estimating and Costing in Civil Engineering – Theory and Practice*”, UBS, publishers’ distributors (p) ltd.-New Delhi 2012.
2. M.Chakraborti, “*Estimating, Costing, Specifications and Valu* Chakraborti 2006.

Suggested Reading:

1. Jagjit Singh, "*Estimating and Costing in Civil Engineering*", Galgotia Publications, New Delhi, 1996.
2. B. S. Patil," *Civil Engineering Contracts and Estimation*", Orient Black swan Private Ltd; Fourth edition 2015.
3. Telangana State Standard Schedule of Rates (TSSDSR).

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE E18

DESIGN OF STEEL STRUCTURES - II
(Core Elective 5)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Codes required: IS 800 – 2007, steel tables, Bridge rules, Bridge Code (RDSO), IS: 875 Part-2 & Part-3

Course Objectives: To enable the students

1. Gain exposure to a few basic types of steel structures (Plate Girders,Gantry girders, Trussed girders etc.) and their components, used in Highway bridges, Industrial workshops and Railway bridges .
2. Attain fundamental knowledge of design of plate girder, gantry girder,steel railway bridges (plate girder & truss girder type), rocker &rollerbearings and is able to interpret the specifications of relevant codes.
3. Acquire adequate conceptual knowledge and skills to extend the sameto investigate into critical issues , compare various options &choosebest solution for the problems in the areas of highway , industrial andrailway steel structures
4. Consider economy in the design of these structures without sufferingthe safety, in a given situation.
5. Understand the intricacies of detailing aspects of these structures and their connections

Course Outcomes: At the end of the course, the students will be able to

1. understand the phenomenon of shear buckling in beams with larger depths, design and detail welded plate girder for various structural actions.
2. estimate the loads on gantry girders, design and detail gantry girder including connections.
3. identify suitable bridge type, design roller & rocker bearings for railway bridges.
4. develop the layout of the bridge, design and detail deck type riveted plate girder bridge including wind effects.
5. choose the appropriate truss configuration, develop layout of the bridge, and design & detail truss girder bridges.

UNIT- I:

Design of Plate girders: Design of welded plate girder for static loads–Economical Depth, Design of Cross Section, Flange curtailment, intermediate and bearing stiffeners, connections- as per IS 800-2007.

UNIT- II:

Design of Gantry girders: Basic principles, Loads, Codal provisions, Detailed Design- Cross section and connections, Drawing- general layout and cross section;

UNIT- III:

Introduction to Railway Bridges and Design of bearings: Bridges: Deck and through type bridges – Economical span – Indian standard railway broad gauge train loadings – permissible stresses.

Bearings: Types and general description of various bearings, detailed Design of Rocker and roller bearings for railway bridges.

UNIT- IV:

Design of Deck type riveted plate girder railway bridges: Economical depth, detailed design of Cross section, connections, intermediate and bearing stiffeners, Wind effects-Design of Cross frames- Detailing; General layout, longitudinal and cross sections

UNIT- V:

Design of Through type riveted truss girder railway bridges: Truss configurations, Detailed design of stringer beams, Cross girders and Truss girders; Wind effects- Design of top lateral and bottom Lateral bracing, Portal and sway bracings; Drawing-General layout , generation of longitudi

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Text Books:

1. S. K. Duggal, “Limit State Design of Steel Structures”, 3rd Edition, McGraw Hill HED, 2019.
2. B.C. Punmia and Ashok Kumar Jain, “Comprehensive Design of Steel Structures”, Laxmi Publications, 2015.

Suggested Reading:

1. A.S. Arya and J.L Ajmani “Design of Steel Structures”, Nem Chand & Bros. 2014.
2. M.R. Shiyekar, “Design of Steel Structures, (Limit State Method”, Second Edition, PHI Learning Pvt Ltd. 2013
3. Ramachandra and VirendraGehlot, “Design of Steel Structures”,Volume – 2, Scientific Publishers, 2008.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE E19

AIRPORT ENGINEERING
(Core Elective –5)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: to enable the student

1. know the components of airports
2. know the factors effecting different airport component
3. know the site selection for airports
4. understand the design standards applicable in airport engineering
5. get an idea about air traffic management

Course Outcomes: At the end of the course**,** students will be able to

1. understand the structure of airport system.
2. understand the components of aircraft and airport.
3. apply engineering knowledge for selection of airport sites, plan airports and facilities as per international standards and also understand the corrections to be applied for runway.
4. design airports as per ICAO standards and develop the facilities required for passengers and aircrafts.
5. create the facilities required for the airport traffic management and understand the importance of the drainage system and its design in airports.

UNIT- I:

Introduction of Air Transport System: History of air transportation, roles and responsibilities of director of Civil Aviation and National Airport Authority, International Airport Authority of India, Airports Authority of India, ICAO, growth of air transport.

UNIT- II:

Aircraft Characteristics:

General introduction, relationship between aircraft and airport, effects of aircrafts on airports, aircraft characteristics, components of an aircraft.

UNIT- III:

Airport Planning: Airport master plan- FAA and ICAO recommendations, regional planning, airport site selection, airport location, typical layout of a terminal areas and airport incorporating airport components- terminal building, apron, hangar, Runway design- runway orientation, wind rose diagrams, basic runway length, connections to runway lengths, airport classifications and airport obstructions.

UNIT- IV:

Airport Capacity: Factors influencing runway capacity, methods for practical capacity determination, gateway, capacity, taxiway capacity, airport configuration – single runway, parallel runway, intersecting and non-intersecting runway, taxiway design, factors controlling taxiway layout and geometric design standards, exit taxiways.

UNIT- V:

Air Traffic Management: Visual aids-airport marking, airport lighting, air traffic control– need of air traffic control, concepts of air traffic control network, air communication, air traffic control aids, ILS and installations, landing aids, airport drainage system– special requirements of airport drainage system, design procedures for surface and sub– surface drainage systems.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Text Books:

1. Khanna. S. K. Arora, M. G. and Jain. S. S, "*Airport Planning and Design*" Fifth edition. Nem Chand & Bros, Roorkee, India, 1999.
2. K. P. Subramanian," *A text book on Highway, Railway, Airport and Harbour Engineering*", Scitech Publications (India) Pvt. Ltd., 2015.

Suggested Reading:

1. Subash C Saxena, " *Airport Engineering Planning and design*", CBS 1st edition, 2010.
2. Norman J.Ashford, Saleh A. Mumayiz and Paul H. Wright "*Airport Engineering Planning - Design and development and Planning- 21st century airports*", Wiley India Pvt. Ltd, 2012.
3. R. Srinivasa Kumar, "*Airport, Railway, Dock and Harbors*", Universities Press, 2014

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE E20

RIVER ENGINEERING
(Core Elective-5)

Instruction	3 Hours perweek
DurationofSemesterEndExamination	3Hours
SemesterEndExamination	70Marks
CIE	30Marks
Credits	3

Course Objectives: To enable the students to understand
1. The concepts of rivermorphology
2. The methods of stage measurement.
3. Hydraulicriver models.
4. Riverprotectionandtrainingworks
5. Designflood protection structures

Course Outcomes: At the end of the course, the students will be able to
1. define basic terms and understand the concepts of rivermorphology.
2. determine scour depth of hydraulic structure and identify methods of stage measurement.
3. understand hydraulic river models.
4. identify river training works and understand protective measures.
5. designflood protection structures.

UNIT- I:
Rivermorphology: Behaviourofriverflow,roleofsedimentsinrivers,changes in regimes. Sediment transport mechanics - bed forms, bed load transport, and transport of suspended sediment, critical shear stress, and sediment transport equations.

UNIT-II:
AggradationandDegradation: Localscouratbridgepiersandotherhydraulic structures, measurements in rivers - stage measurements, channel geometry, discharge, and sediment samplers and suspended and bed loadmeasurement.

UNIT-III:
Hydraulicmodellingofrivers: Hydraulicsimilitude,physicalrivermodels-fixed and movable bed models; sectional models, distorted models, mathematical models for aggradations, degradation and localscour.

UNIT- IV:
River Protection and Training Works: Introduction, classification of river training,typesoftrainingworks,protectionforrevetments,dikes,gabions,spurs, bank protective measures and bed controlstructures.

UNIT- V:
Design of river flood protection structures: Diversion and cofferdam, river regulations systems, dredging and disposal, river restoration.

Text Books:

1. P.Y.Julien,"*RiverMechanics*",CambridgeUniversityPress,March 2018
2. S.K.Garg,"*IrrigationEngineeringandHydraulicStructures",*
Khanna Publishers, 2017

Suggested Reading:

1. R.J. Gardeand K.G. RangaRaju, "*Mechanics of sediment transportationandAlluvialstreamproblems",*WileyEasternlimited, 1977
2. Central Board OfIrrigation ...ver, "*River BehaviourManagementandTraining(Vol.I&II)",*Nev...

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

3. U.S.ArmyCorpsofEngineers,“*RiverHydraulics*”,UniversityPress ofthePacific,2004.

18CE E21

WATER AND AIR QUALITY MODELING
(Core Elective –5)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the student
1. Understand various systems, models and their development.
2. Learn about the river water quality modelling and Benthal Oxygen Demand of sediments.
3. Get educated on the models for lakes and estuaries & transport mechanisms.
4. Learn about plume characteristics, air pollution modelling and its applications.
5. Understand plume behaviour using Gaussian plume equation for different atmospheric stability conditions.

Course Outcomes: At the end of the course the student will be able to

1. develop and validate mathematical models for stream water quality and perform cost benefit analysis.
2. assess water quality of rivers using models such as Streeter Phelps model and determine oxygenation coefficients, oxygen consumption by the sediments in rivers.
3. develop models for estuaries for their continuous quality monitoring and understand transport mechanisms.
4. apply knowledge of plume characteristics and diffusion of stack emissions in modelling.
5. derive models for air quality monitoring, Gaussian plume equation and compute stack height.

UNIT -I:
Introduction to Mathematical Models: Role of mathematical models; systems approach, systems and models, kinds of mathematical models, model development and validation effluent and stream standards; water quality model development, cost: benefit analysis using models, model requirements and limitations; Dissolved Oxygen model for streams sources and sinks of dissolved oxygen.

UNIT -II:
Surface Water Quality Modelling: Historical development of water quality models; rivers and streams water quality modelling, Streeter Phelps model, oxygen sag curve, determination of deoxygenation and re-aeration coefficient, Benthal oxygen demand.

UNIT -III:
Mass transport mechanisms: Models for Estuary and Lakes: Physical chemical and biological processes in estuaries; estuarine transport, net estuarine flow, estuary dispersion coefficient; Lakes and impoundments: Water quality response to inputs; water quality modelling process.

UNIT - IV:
Air pollution Modelling: Chemistry of air Pollutants, atmospheric reactions, sinks for air pollution, transport of air pollutants, meteorological settling for dispersal of air pollutants, vertical structure of temperature and stability, self cleaning of atmosphere, transport and diffusion of stack emissions, atmospheric characteristics significant to transport and diffusion of stack emission, stack plume characteristics.

UNIT - V:
Air quality models: Types of modelling techniques, multiple sources and area sources, fixed box models, Diffusion models, Gaussian plume derivation, modifications of Gaussian plume equation, stack height computation.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Text books:

1. Steven C. Chapra," *Surface Water Quality Modelling*", Tata McGraw Hill New York, 1997.
2. Alex De Visscher, "*Air dispersion modelling: Foundations and applications*", Wiley-Blackwell Publications, Nov 2013.
3. AbhishekTiwary, Ian Williams, "*Air Pollution: Measurement, Modelling and Mitigation*", CRC Press; 4 edition, 2018.

Suggested Readings:

1. R.W. Boubel, D.L. Fox, D.B. Turner & A.C. Stern, "*Fundamentals of Air Pollution*", Academic Press, New York, 2006.
2. P. Zannetti, "*Air pollution modelling*", WIT, Software edition 1990.

18CE E22

APPLICATION OF DATA ANALYTICS IN CIVIL ENGINEERING
(Core Elective –5)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. To identify the sources and characteristics of civil engineering data
2. To find the hidden patterns within the data by processing the raw data
3. To use the information obtained in order to make civil engineering project decisions
4. Study the applications of data analytics in civil engineering
5. To identify various open source tools and resources related to data analytics

Course Outcomes: On successful completion of this course, student will be able to

1. define the descriptive, predictive and prescriptive models and select suitable tools or techniques for application in civil engineering problems
2. identify the discrete and continuous random variables and select appropriate mathematical models which support decision making under uncertainty
3. design data collection process required for descriptive and exploratory models for problems in civil engineering
4. relate estimators and estimates to process of estimation and thus implement the various modeling techniques to uncover the patterns in the civil engineering related data
5. formulate hypothesis and their corresponding confidence intervals for various count data based and discrete choice models along with goodness of fit measures

UNIT I:

Introduction: Fundamentals and the context of data analytics, descriptive, predictive and prescriptive models of data analytics, evolution of data analytics solutions such as SQL analytics, visual analytics, big data analytics, and cognitive analytics. Data analytics tools and techniques used in civil engineering.

UNIT II:

Random variables: Sample, population, sample space, frequentist and Bayesian notations of probability, discrete and continuous random variables and their distributions.

Statistical Modelling: Overview, application, desirable features, issues and pitfalls of statistical models, framework for developing models, basic steps in model building and decision making under uncertainty.

UNIT III:

Experimental and observational study design: sample selection, recruitment, and data collection method selection. Descriptive and exploratory data analysis, including: measures of central tendency, histograms, density distributions, and box plots. Examples of descriptive and exploratory analysis [illegible] problems.

UNIT IV:

Estimation, estimators and estimates; criteria for assessing estimators, asymptotic properties. Estimation techniques: method of moments, ordinary least squares (OLS) regression, log likelihood estimation. OLS – assumptions of linear regression, linear relationship, and estimation of coefficients. Log likelihood estimation - definition of likelihood and log likelihood, parameter estimation using maximum likelihood estimation technique, desirable properties of maximum likelihood estimators.

UNIT V:

Statistical inference of models including tests, confidence intervals and hypothesis testing. Statistical models of independent data including simple and multiple linear regression.Count data and discrete choice models: Binary, multinomial logit models, and count data models with applications in travel choice and transport safety. Process of model selection, goodness of fit and sensitivity analysis.

Text Books:

1. MashrurChowdary, Amy Apon and KakanDey, Data Analytics for Intelligent Transportation Systems, 2012
2. SubhashishSamaddar and SatishNargundkar,Data Analytics: Effective methods for Presenting Results, CRC press, 2012.

Suggested Reading:

1. S.M Yadav, Application of soft computing techniques in civil engineering, 2018.
2. V.K.Jain, Data Science and Analytics, Khanna Publishing, 2018.
3. http://nptel.ac.in/courses/106106126/

18CE C27

CONCRETE TECHNOLOGY LAB

Instruction	3P Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Course Objectives:

1. Conduct tests on cement
2. Conduct tests on Fine Aggregate and Coarse Aggregate
3. Conduct tests on concrete in fresh and hardened states.

Course outcomes: At the end of the course, the student will be able to

1. determine the properties of given cement sample and assess its suitability for use in construction.
2. determine the properties of fine and coarse aggregate samples to assess their suitability for use in construction works.
3. measure the workability of concrete and recommend its suitability for structural works.
4. design a suitable concrete mix proportion as per the code provisions for the specified grade.
5. conduct destructive and non-destructive tests to evaluate the quality and strength of concrete.

List of Experiments:

1. Determination of the specific gravity of the given cement sample
2. Determination of the standard consistency of the given cement sample
3. Determination of the initial setting time of the given cement sample
4. Determination of the bulking of Fine Aggregate
5. Determination of the bulk density, void ratio, porosity and specific gravity of given Fine and coarse Aggregate
6. Determination of the fineness modulus of Fine Aggregate & Coarse Aggregate
7. Determination of the slump & compaction factor of concrete mix
8. Determination of the compressive strength of concrete cubes and split tensile strength of concrete cylinders
9. Mix design as per IS:10262-2019
10. Demo on Non-destructive testing of concrete specimen

Referencebooks:

1. M.S. Shetty, "Concrete Technology- Theory & Practice", S. Chand & Company Publishers.
2. IS 10262:2019,"Indian Standard Concrete Mix Proportioning – Guidelines".

18CE C28

COMPUTER APPLICATIONS LAB

Instruction	3 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives: Enable the students

1. Explore a few software packages used in various areas of Civil Engineering (Structural Analysis & Design, Soil Mechanics, Water Supply & Sanitary Engineering, and Surveying) and the applications of different software packages.
2. Attain the fundamental knowledge of navigation of software packages.
3. Acquire adequate conceptual knowledge and skills to use software packages in the field in order to provide solutions to civil engineering problems.
4. Provide accelerated/time bound solutions with help of software packages without effecting the accuracy of computations.
5. Understand the rectification of errors while using software packages.

Course Outcomes: At the end of the course the students will be able to

1. develop a model of framed structure and analyze using STAAD-Pro.
2. design the components of a framed structure including isolated footings using STAAD-Pro and STAAD Foundation.
3. evaluate stability of slope using Slip Circle method and design a cantilever retaining wall using GEO5.
4. analyze pipe networks using EPANET and sewer networks using SEWER Gems.
5. develop geo-referenced thematic maps and carry out overlay analysis using ArcGIS/QGIS

List of Exercises:

1. Modelling and analysis of plane frames using STAAD-Pro.
2. Modelling and analysis of space frames using STAAD-Pro.
3. Design structural components of a RC building using STAAD-Pro.
4. Design of isolated footing using STAAD Foundation.
5. Analysis of a slope for stability by Slip Circle method using GEO5 (Slope Stability module).
6. Design of cantilever retaining wall using GEO5 (Cantilever Wall module).
7. Steady state analysis of pipe networks (open/looped) using EPANET.
8. Analysis of sewer networks using SEWER Gems.
9. Digitization of topo-sheets and perform overlay analysis using ArcGIS.

Textbooks/References:-

1. STAAD.Pro V8i (SELECTseries 4) manual on staad exercises, July 2019.
2. EPANET 2 Users Manual Paperback – Import, 30 January 2013 by U S Environmental Protection Agency (Creator)
3. Instructional Guide for The ArcGIS Book 1st Edition, Kindle Edition by Kathryn Keranen (Author), Lyn Malone (Author), Esri Press; 1 edition (June 21, 2016)
4. Design of Sewer Network Using SewerGEMS Software Paperback – September 17, 2018 by HinalSopariya (Author)
5. https://www.finesoftware.eu/engineering-manuals/ for GEO5 execises.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE C29

PROJECT: PART-1

Instruction	Hours per week
Continuous Internal Evaluation	50 Marks
Credits	2

The objective of Project Part -1 is to enable the student take up investigative study in the broad field of Engineering / Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) towards R&D. The work shall include:

1. Survey and study of published literature on the assigned topic
2. Working out a preliminary Approach to the Problem relating to the assigned topic
3. Conducting preliminary Analysis/Modeling/Simulation/Experiment/ Design/Feasibility
4. Preparing a Written Report on the Study conducted for Presentation to the Department
5. Final Seminar, as oral Presentation before a departmental Committee.

Course Outcomes:

At the end of the course, the students will be able to

1. identify the domain of one's interest through critical review of literature.
2. define a problem in the domain of interest and understand its scope and also develop the skill of coordinating with the team in the form of discussions during the progress of finding the solution.
3. examine various approaches and build a preliminary approach to the problem on chosen topic.
4. defend their approach by healthy interactions with the participants and modify, if necessary and cultivate the culture of ethical practices.
5. develop the technical skill in preparing a well structured report and present.

Guidelines for the award of Marks:

Maximum Marks: 50

Evaluation by	Maximum Marks	Evaluation Criteria / Parameter
Supervisor	20	Project Status / Review
	5	Report
Departmental Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Preparation

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE E23

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES
(Core Elective-6)

Instruction 3L Hours per week
Duration of Semester End Examination 3 Hours Semester
End Examination 70 Marks CIE
30 Marks Credits
3

Course objectives: To enable the student

1. Understand the causes of earthquakes , their Magnitude & effects and various types of earthquake waves
2. Understand the concepts of damped and un damped vibrations and the response of single , two and multi-degree systems to thesevibrations , and concepts of Response spectrum
3. Review various case studies of past earthquakes, and performance of buildings during those earthquakes, understand the concepts of Seismic Design Philosophy and Earthquake Resistant Design of Masonry, RC and Steel structures. Evaluate the seismic loads on the structures using IS 1893 Part I codal provisions.
4. Gain knowledge of Seismic Performance of Engineered and NonEngineered Urban and Rural buildings
5. Understand the basic concepts of Seismic resistant construction, Base isolation techniques and other energy dissipation devices and Concepts of Seismic retrofitting

Course Outcomes: At the end of the course, the student will be able to
1. relate the fundamentals of engineering seismology, understand the characteristics and effects of strong motion earthquakes.
2. understand the concepts of damped and un-damped vibrations in single and multi-degrees of freedom systems.
3. estimate the seismic loads on structures and analyse using seismic coefficient and response spectrum methods.
4. examine the causes of damages of urban and rural buildings and interpret the design provisions from IS-1893 part - I (2016) and IS - 13920(2016).
5. know the use of various earthquake resistant devices, apply suitable construction techniques for retrofitting.

UNIT – I:

Engineering Seismology& Elements : Causes of Earthquakes–Geological faults,Tectonic Plate theory – Elastic Rebound theory –Focus - Epicentre – Hypocenter,Seismic waves –Primary and Secondary waves, Seismogram - Magnitude, Intensity and Energy release during earthquakes – Magnitude & Intensity Scales, Characteristics of strong earthquake ground motions – Effect of soil properties – Liquefaction of soils.

UNIT – II:

Theory of Vibrations: Introduction to Vibrating Systems – mass, stiffness and damping parameters – Concept of inertia, elastic restoring force and damping –types of damping, difference between static forces and dynamic excitation.
Single Degree of Freedom (SDOF) Systems – SDOF idealization - Formulation of Equation of motion(for mass as well as base excitation) and response for free, forced (harmonic loads only), damped &undamped vibrations, Logarithmic Decrement & Influence of gravitational force on the equation of motion, Natural Time period & Natural Frequency.
Multi Degree of Freedom (MDOF) Systems - Equation of Motion–Mass, stiffness and damping matrices, Modal Analysis -Natural frequencies - generation of modal frequencies and mode shapes, Concept of Response Spectrum – Response Spectrum Curve as per IS: 1893 Part I (2016).

UNIT – III:
Evaluation of Seismic Loads on Structures: Concepts of over ndancy –Determination of earthquake forces on structures – Seismic Co-efficient and Re

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

UNIT – IV:

Seismic Performance of Buildings: Case Studies of damages to urban and rural buildings during some past earthquakes – Damage Patterns in structural and non –structural elements – Soft storey effect, Design Provisions as per IS – 1893(2016), Ductile detailing as per IS – 13920(2016).

UNIT – V:

Earthquake Resistant Devices &Construction Techniques: Vibration Control Devices - Base isolators, Energy dissipating devices – Dampers, Lateral Displacement Control - Bracing Systems, Shear Walls.

Seismic Retrofitting: Repair, rehabilitation and retrofitting, retrofitting strategies – Importance of Re-analysis, Retrofitting Techniques for RCC, Masonry and rural buildings, IS – 13935(2009) codal provisions for Retrofitting.

Text Books:

1. PankajAgarwal and Manish Shrikhande, "Earthquake Resistant Design of Structures", Prentice Hall of India Pvt. Ltd, 2011.
2. S.K Duggal, "Earthquake Resistant Design of Structures", Oxford Higher Education, Second Edition, 2013.

Suggested Readings:

1. A.K. Chopra, "Dynamics of Structures", Pearson Education, Fifth Edition,2017.
2. Jai Krishna, A.R Chandrasekaran, Brijesh Chandra, "Elements of Earthquake Engineering", South Asian Publishers Pvt. Ltd, Second Edition,2014.
3. Steven L Kramer, "Geo-Technical Earthquake Engineering", Pearson Education Ltd, 2013.

18CE E24

GROUND IMPROVEMENT TECHNIQUES
(Core Elective-6)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To make the students able to
1. Understand the importance of ground improvement and learn about various types of ground improvement techniques suitable for given soil conditions.
2. Understand the concepts behind a range of ground improvement and soil remediation techniques by using chemical stabilization and grouting methods.
3. Understand the different concepts of vibration techniques for cohesionless soils stabilization.
4. Select suitable stabilization method for cohesive soils.
5. Understand the Types, functions and applications of Geo-textiles, geo-grid, tests on geo-textiles and Reinforced earth.

Course Outcomes: At the end of the course, the student will be able to
1. review the importance of ground improvement techniques and types, for different soils.
2. apply suitable chemical stabilization and grouting techniques to address the field problems.
3. modify the cohesionless soil properties to required degree by using suitable vibration techniques.
4. identify suitable ground improvement techniques for cohesive soils in a specific project.
5. explain different advanced stabilizing techniques for slopes.

UNIT- I:
Introduction: Need for ground improvement, applications, and factors affecting – different mechanical, chemical, static and dynamic techniques – mechanical stabilization – blending of aggregate – Rothfutch Testing. Concept of Soil confinement, Gabion Walls, Crib Walls and Sand Bags.

UNIT – II:
Chemical stabilization: Lime, Cement, Bitumen, Emulsions, Chemicals, factors influencing–Design approach, construction procedure, laboratory testing, additives. Suspension and solution grouts, Principles, method, equipment, applications, compaction grouting, jet grouting, field compaction control.

UNIT – III:
Stabilization of Cohesion less soils: In Situ densification, Vibro techniques– Mechanisms. Factors affecting, suitability number, compacting piles.Vibro replacement process, Vibro flotation process, Terra Probe Method, Dynamic Compaction.

UNIT- IV:
Stabilization of Cohesive soils: Expansive Soils- parameters of expansive soils and their classification- moisture changes in expansive soils- CNS technique. In Situ densification, Pre-loading–Dewatering– sand drains. Sand wicks, geo-drains, rope-drains, band-drains, stone columns, and lime piles, thermal and vacuum methods.

UNIT – V:
Ground treatment for Slopes: Different types of in-situ soil stabilization like soil nailing, anchoring, pre-stressed anchoring - design methods and construction techniques.
Geo-textiles: Woven and non-woven fabrics. Types, functions and applications– Geo-textiles, geo-grids, tests on geo-textiles, Reinforced earth – Principles and factors governing design.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Text Books:

1. P. Purushothama Raj, “Ground Improvement Techniques”, Laxmi publications 2016.
2. K.R Arora, “Soil Mechanics and Foundation Engineering”, 5th Edition, Standard Publishers, 2005.

Suggested Reading:

1. NiharRanjanPatra, “Ground Improvement Techniques”, Vikas publishing house Pvt. Ltd, 2012.
2. R. Hausmann., “Engineering Principles of Ground Modification”, McGraw Hill Publishing Co.,2013.
3. H. Fang,” Foundation Engineering Hand Book”, 2nd Edition, CBS Publication, New Delhi, 2004.
4. G. V. Rao and G. V. S. S. Raju, “Engineering with Geosynthetics”, McGraw Hill Education, 1998 5. IRC-SP 58 (2001): “Guidelines for use of fly ash in road embankments”.

18CE E25

DESIGN OF HYDRAULIC STRUCTURES
(Core Elective-6)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The student should be able to understand
1. Principles and design of surplus weir.
2. Functioning of sluice, design of various components.
3. Types of canal falls, basic principles of glacis type canal drop and its design.
4. Basic principles of design of cross regulator and its design.
5. Design of spillways.

Course Outcomes: On completion of the course, students will be able to
1. analyse and design surplus weir.
2. analyse and design direct sluice.
3. identify types of falls and design glacis type canal drop.
4. understand and design cross regulator.
5. identify types of spillways and design energy dissipators.

UNIT - I:
Surplus weir: Types of weirs, components of diversion head works, crest level of weir, afflux, design of surplus weir, design for surface flow and sub - surface flow, length, level and thickness of downstream apron, upstream and downstream cut-offs, protection works.

UNIT- II:
Direct Sluice: Hydraulic particulars of main canal and distributary, general arrangements of various components-Design of vent way, Sluice barrel, Head walls, Wing Walls and return walls.

UNIT- III:
Canal Falls: Definition, types of falls.
Glacis type Canal Drop: Design of Components, General arrangements, fluming ratio, fixing the crest level, length of weir, U/S and D/S glacis, Transitions - Protection works -Curtain wall, Energy dissipation arrangements .

UNIT- IV:
Cross Regulator: General design principles - General arrangements of various components - design of vent way by drowning ratio - arrangements of energy dissipation - U/S & D/S protection works.

UNIT- V:
Spillways: Spillways, Ogee spillway and design of its components. Design of Energy Dissipation structures, Bucket type and cistern type.

Text Books:
1.B.C. Punmia, "Irrigation & Water Power Engineering", Lakshmi Publications, Delhi, 2016.
2. Ch. S. N. Murthy, "Water Resources Engineering: Principles and Practice", New Age International Publishers, Delhi, 2002.

Suggested Reading:
1. R S Varshney, S C Gupta, R L Gupta, "Theory & Design of Irrigation Structures Vol. 1", Nem Chand & Brothers, 1992.
2. S. K. Garg, "Irrigation Engineering and Hydraulic Structures" ... elhi, 2017.
3.Sharma, S. K. Irrigation Engineering and Hydraulic Structures

18CE E26

RURAL WATER SUPPLY AND ONSITE SANITATION SYSTEM
(Core Elective-6)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the student
1. Identify the problems pertaining to rural water supply and sanitation.
2. Be conversant about water treatment and sanitation system for rural community.
3. Understand wastewater treatment collection and treatment units in rural areas.
4. Get educated on Industrial hygiene, sanitation and occupational hazards.
5. Design low cost waste management systems for rural areas, plan and design an effluent disposal mechanism.

Course Outcomes: At the end of the course, the student will be able to
1. solve the issues related to rural water supply and sanitation.
2. relate the needs for water treatment and develop different stages of water treatment and sanitation system for rural community.
3. plan wastewater collection system in rural areas and identify compact wastewater treatment units.
4. develop occupation related onsite sanitation and hygiene system and identify occupational hazards.
5. design an effluent disposal mechanism; develop solid waste management system in rural areas.

UNIT- I:
Rural Water Supply: Issues of rural water supply, various techniques for rural water supply- merits, National rural drinking water program, rural water quality monitoring and surveillance, operation and maintenance of rural water supplies, relationships between diseases and water quality, hygiene and sanitation.

UNIT- II:
Water Treatment: Need for water treatment, point of use water treatment systems, filters, bio-sand filters, disinfection systems for rural areas, chlorination, solar disinfection systems, removal of arsenic, fluoride and iron; hygiene and sanitation, epidemiological aspects of water quality methods for low cost water treatment - specific contaminant removal systems.

UNIT- III:
Rural Sanitation: Introduction to rural sanitation, community and sanitary latrines, planning of wastewater collection system in rural areas, treatment and disposal of wastewater, compact and simple wastewater treatment units and systems in rural areas.

UNIT- IV:
Onsite sanitation system: Nexus between water quality and sanitation, importance of hydrogeology on selection of onsite sanitation systems, Industrial hygiene and sanitation, occupational hazards in schools, public buildings and hospitals; Industrial plant sanitation.

UNIT- V:
Septic tanks: Design of septic tanks, single pit and double pit toilets, small bore systems, bio digesters, reed beds, constructed wetlands, sludge/seepage management systems, stabilization ponds; Solid Waste Management: Biogas plants, rural health, other specific issues and problems encountered in rural sanitation.

Text Books:
1. V. M. Eulersand E. W. Steel, "*Municipal and Rural Sanitation*", 6th Ed., McGraw Hill Book Company, 1965
2. F. B. Wright, "*Rural Water Supply and Sanitation*", 3rd Revised edition, McGraw-Hill Inc.,US, 1977
3. P. Juti, S. K.Tapio, and H. Vuorinen, "*Environmental History of Water: Global Views on Community Water Supply and Sanitation*", IWA Publishing (Intl Water Assoc), 200

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Suggested Reading:

1. Manual of water supply and treatment, 3rd edition, CPHEEO, GOI, New Delhi.
2. A handbook on "*Technological Options for On-site sanitation in rural areas",* Ministry of Drinking water & Sanitation, Govt. of India, June 2016
3. A Guide to the Development of on-site sanitation, WHO, 1992

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CEE27

APPLICATIONS OF BLOCKCHAIN TECHNOLOGY IN CIVIL ENGINEERING
(Core Elective-6)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives:

1. To get the terminologies and overview of Blockchain technology
2. To study the concepts and foundation of Blockchain technology
3. To understand the applications of Blockchain technology in civil engineering
4. To design use cases and architecture Blockchain technology
5. To study benefits, limitations and identify application area of Blockchain technology

Course outcomes: at the end of course, students would be able to:

1. Gain a clear understanding of the concepts that underlie Blockchain and Blockchain and types of Blockchain.
2. Understand key mechanisms like decentralization, transparency and trust, immutability.
3. Understand the importance of Blockchain in construction industry apply the concepts of smart contracts using Blockchain technology.
4. Understand and apply the project management systems using Blockchain technology.
5. Apply the concepts of building information modelling using Blockchain technology.

UNIT 1:Introduction to Blockchain: Introduction to centralized, decentralized and distributed system, History of Blockchain, Various technical definitions of Blockchain. **Generic elements of a blochchain:** Block, Transaction, Peer to peer network, Node, Smart contract, Why it's called blckchain. **Types of Blockchain:** Public Blockchains, Private Blockchains, Semi-private Blockchains, Sidechains, Permissioned ledger, Distributed ledger, shared ledger, Fully private and proprietary Blockchains, Tokenized Blockchains, Token less Blockchains, CAP theorem and Blockchain.

UNIT II: Concepts of Blockchain Technology: Cryptography, Hashing, Nonce, Distributed database, Consensus, Smart Contract, Component of block, and Structure of Blockchain. Applications of Blockchain technology, Tiers of Blockchain technology: Blockchain 0, Blockchain 1, Blockchain 2, Blockchain 3, generation of Blockchain X.

UNIT III:Applications of Blockchain technology in Civil Engineering: Importance of Blockchain in construction industry. Blockchain in operation, public and Private Blockchain types, Smart contracts on the Blockchain to enhance efficiency, Ideal solution for the construction industry.

UNIT IV:Payment and Project Management: Blockchain enabled project collaboration, Transparency in construction industry, Procurement and Supply Chain Management, Sustainable procurement in the construction industry enabled by Blockchain, Fostering enhanced and trust in the supply chain

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

UNIT V:Building Information Modelling (BIM) – BIM and Blockchain. Project delivery 'designed' to 'as built'.Smart Asset Management through BIM.Challenges and Implementation – Stages of Blockchain implementation in the industry.

Crypto currency: Bitcoin, Bitcoin definition, keys and addresses, public keys in Bitcoin, private keys in Bitcoin, Bitcoin currency units.

Textbooks:

1. Imran Bashir, "Mastering Blockchain", Packt Publishing Limited, 2nd edition 2018.
2. Narayan Prusty, "Building Blockchain Projects", Packt Publishing, 1st edition 2017.

References:

1. Blockchain For dummies, IBM Limited Edition, John Wiley & Sons, Inc.
2. Lemes, Samir, and LamijaLemes. Blockchain in Distributed CAD Environments". In International Conference "*New Technologies Development and Applications*", pp. 25-32. Springer, Cham, 2019.
3. Blockchain Technology in the Construction Industry-Digital Transformation for High Productivity, 2018.

18CE C30

TECHNICAL SEMINAR

Instruction	2 Hours per week
Continuous Internal Evaluation	50 Marks
Credits	1

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state of the art topics in a broad area of his/her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

Course Outcomes:

At the end of the course, the students will be able to

1. Identify their domain interest through critical review of literature.
2. Develop the technical skill in preparing a well structured report on the chosen topic of Civil Engineering by following ethical practices.
3. Develop the skill of presenting a structured seminar using Power Point presentation tools.
4. Improve communication skills.
5. Defend one's presentation by healthy interactions with the participants.

The seminar must be clearly structured and the power point presentation shall include following aspects:
1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Each student is required to:
1. Submit a one page synopsis of the seminar talk for display on the notice board.
2. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes in PowerPoint, followed by Question and Answers session for 10 minutes.
3. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by the department.

Seminars are to be scheduled from 3rd week to the last week of the semester and any change in schedule shall be discouraged.

For the award of sessional marks, students are judged by three (3) faculty members and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation.

Note: Topic of the seminar shall preferably be from any peer reviewed recent journal publications.

Guidelines for awarding marks		
Sl No.	Description	Maximum Marks
1.	Contents and relevance	10
2.	Presentation skills	10
3.	Preparation of PPT slides	05
4.	Questions and answers	05
5.	Report in a prescribed format	20

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE C31

PROJECT: PART-2

Instruction	10 Hours per week
Continuous Internal Evaluation	100 Marks
Semester End Examination	100 Marks
Credits	10

Course Outcomes:

At the end of the course, the students will be able to

1. Examine the chosen problem with a deeper insight and identify a path to problem solving while developing the skill of coordinating with the team.
2. Develop and demonstrate problem solving skills through detailed Analysis/ Modeling / Simulation/ Experimental works.
3. Evaluate the results based on deeper studies and draw conclusions along with scope for further studies to facilitate continuous learning.
4. Develop the art of technical report writing by following ethical practices.
5. Defend the work through a well structured presentation.

The object of 'Project: Part-2' is to enable the student extend further the investigative study taken up, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/ Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned.
2. Review and finalization of the Approach to the Problem relating to the assigned topic.
3. Preparing an Action Plan for conducting the investigation, including team work.
4. Detailed Analysis/Modeling/Simulation/Design/Problem Solving/ Experiment as needed.
5. Final development of product/process, testing, results, conclusions and future directions.
6. Preparing a paper for Conference presentation/ Publication in Journals, if possible.
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar presentation before Departmental Committee.

Guidelines for the award of marks in Continuous Internal Evaluation: (Max. Marks: 100)

Evaluation by	Maximum Marks	Evaluation Criteria / Parameter
Department Review Committee	10	Review 1
	15	Review 2
	25	Submission
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	10	Quality of the work which may lead to publications
	10	Report Preparation
	10	Analytical/ Programming/ Experimental Skills

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

Guidelines for awarding marks in Semester End Examination: (Maximum Marks: 100)

Evaluation by	Maximum Marks	Evaluation Criteria / Parameter
External and Internal Examiners together	20	Power Point Presentation
	40	Thesis Evaluation
	20	Quality of the project Innovations Applications Live Research Projects Scope for future study Application to society
	20	Viva-Voce

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

20CE C101

STRUCTURAL DYNAMICS

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: To enable the student

1. To make the student understand the importance of structural dynamics and appreciate its practical applications.
2. To make the student learn the process of formulation of equations of motion and generate their solutions.
3. To make the student well versed with modal analysis and make him to develop the response by mode superposition.
4. To make him learn the methods of practical vibration analysis and also generate response considering the system as continuous systems.
5. To make him conversant with the numerical solutions to find the response of dynamic systems.

Course Outcomes: At the end of the course, student is able to

1. The student gains expertise and confidence to tackle field dynamic problems, especially in the field of earthquake and wind engineering. 2. Gets the ability to model any dynamic system and get its response.
3. Can carry out modal analysis and can easily handle any software and can correctly interpret the results.
4. Can effectively use practical vibration analysis methods and obtain the dynamic parameters.
5. Gets the ability to apply numerical methods to get the dynamic response of the systems.

UNIT - I:

Introduction to structural Dynamics – Source of dynamic forces – Rotating machinery, wind and seismic forces, blast loads. **Methods of discretization**: Lumped mass Procedure and Consistent mass procedure.

Single Degree Freedom Systems – **Formulation of Equation of** D'Alemberts's Principle, Method of Virtual Work, Hamilton's Princi

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

Generalized SDOF systems and Rigid Body assemblage. Influence of Gravity Forces and Ground Motion on equation of motion.

UNIT - II:

Single Degree of Freedom System: Response to Free Vibration with and without Damping, Logarithmic decrement. Response to Harmonic loading and impulsive loading. Dynamic magnification factor, phase angle and band width. Response to General Dynamic loading using Duhamel's Integral - Fourier analysis for Periodic Loading.

UNIT - III:

Multiple Degree of Freedom System: Evaluation of structural property matrices – Formulation of MDOF equations of motion – Undamped free vibration – Solution of Eigen value problem for natural frequencies and mode shapesAnalysis of dynamic response- Normal coordinates – Orthogonal properties of normal modes -Uncoupled equations of motion –- Mode super position procedure.

UNIT - IV:

Practical Vibration Analysis: Stodola Method – Fundamental mode analysis, Analysis for second and higher modes. Holtzer Method – basic procedure. **Continuous Systems:** Flexural vibrations of beams- Elementary case - Derivation of governing differential equation of motion - Analysis of undamped free vibration of beams in flexure – Natural frequencies and mode shapes of simple beams with different end conditions.

UNIT - V:

Numerical Evaluation of Dynamic Response of linear (SDOF/MDOF) systems: Time stepping methods, Central difference method, Newmarks method and Wilson method.

References:

1. Anil. K. Chopra," *Dynamics of Structures",* Pearson Education India, 2007.
2. Ray W. Clough, Joseph Penzin," *Dynamics of Structures*", CBS Publishing, 2015.
3. Mario Paz,"*Structural Dynamics: Theory And Computation*", CBS Publishing, 2004.

4. PankajAgarwal and Manish Shrikhande*," Earthquake Resistant Design of Structures"*, PHI, 2006.
5. Biggs," *Introduction to Structural Dynamics*", Mc Graw Hill Education, 2013.

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

20CE C102

FINITE ELEMENT METHOD IN STRUCTURAL ENGINEERING

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: To enable the student

1. Learn the fundamentals of Finite element method (FEM) and derive elasticity matrices for 2-D and 3-D elasticity problems.
2. Understand basic principles of minimum potential energy methods and variational formulation of FEM know the stiffness matrix formulations using bar element and analyze simple problems.
3. Understand the FEM formulation using truss, beam, and plane frame elements and analyze simple problems with kinematic indeterminacy not greater than 3.
4. Get familiarized with displacement models, Isoparametric elements and quadrilateral elements and know the formulation of global stiffness matrices.
5. Know the formulation of stiffness matrices for Axi-Symmetric elements, Tetrahedron elements.

Course Outcomes: At the end of the course, student is able to 1. The fundamentals of FEM, elements of theory of elasticity.

2. Principle of minimum potential energy and variation formulation of FEM and analyze simple problems using bar elements.
3. The analysis of trusses beams and rigid jointed plane frames.
4. The formulation of Global stiffness matrix, load matrix and analysis structures using 1st order triangular elements, isoparametric elements, and quadrilateral elements.
5. Application of Axi-Symmetric and Tetra-Hedron elements.

UNIT - I:

Introduction to FEM: General description of the method, brief history of the method, applications of the method, advantages of the finite element

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

steps in the finite element method. Types of elements; Types of forces, and Boundary conditions.

Strain displacement, and stress- strain relations for 2-D and 3-D problems. Equations of equilibrium and compatibility conditions for 2-D and 3-D problems. Plane stress and plane strain situations and derivation of elasticity matrices (D).

UNIT - II:

Finite Element Formulation: Principle of minimum potential energy, Principle of virtual displacement, Global coordinate system, local coordinate system, Raleigh Ritz method, Weighted Residual method- Galerkin's method, Boundary value problems- with one element and two elements.

Bar Elements: Shape functions, stiffness matrix for a 2- noded bar element, axial bar subjected to point loads-constant cross section and varying cross section bar.

UNIT - III:

Truss Elements: Transformation matrix, Stiffness matrix of truss member in local and global axis, analysis of trusses with kinematic indeterminacy not exceeding three.

Beam Elements: Shape functions, beam element stiffness matrix, element load vector, and analysis of continuous beams with kinematic indeterminacy not exceeding three.

Plane Frame elements: Element stiffness matrix in local coordinates, Transformation or Rotation matrix, and stiffness matrix and load vector in global coordinates.

UNIT - IV:

Displacement models: Selection of displacement models, geometric invariance, conforming and non-conforming elements.

2-D Triangular Elements (CST) and Rectangular Elements: Determination of strain-displacement matrix, shape functions, determination of element stiffness and load matrices, assembling global stiffness and load matrices. Problems with kinematic indeterminacy not exceeding three.

Iso-parametric elements: Iso-parametric concept, Iso-parametric, Sub parametric and Super parametric elements. Gauss Quadrature of numerical integration. **Quadrilateral elements**: Construction of shape functions for 4 noded and 8 noded elements, determination of stiffness matrix, and nc matrices for 4noded quadrilateral element.

UNIT - V:

Axi-symmetric elements: Strain-displacement relationship, stress-strain relationship, determination of stiffness matrix for 3-noded ring element and load matrices for body force and surface traction.

Tetrahedron elements: Volume coordinates, Strain-displacement matrix, and stiffness matrix.

Computer Implementation of FEM procedure, Pre-Processing, Post-Processing.

Use of Commercial FEA software.

References:

1. David V. Hutton," *Fundamentals of Finite Element Analysis*", McGraw Hill Education (India) Private Limited, Delhi, 2014.
2. P. N. Godbole," *Introduction to Finite Element Method"*, I. K. International Publishing House Pvt. Ltd. New Delhi, 2013.
3. P. Seshu, "*Finite Element Analysis*", Prentice Hall of India Private Limited, New Delhi, 2010.
4. T. R. Chandrupatla and A. D. Belegundu," *Introduction to Finite Elements in Engineering*", Prentice –Hall of India Private Limited, New Delhi, 2009.
5. Daryl L, Logan, "*A first course in the Finite Element Method*", Third Edition, Thomson Brook, Canada Limited, 2007.
6. R. D. Cook, R.D" *Concepts and Applications of Finite Element Analysis*", John Wiley and sons, 1981.
7. O. C. Zienkiewicz. And R. L. Taylor, "*The Finite Element Method*", Vol.1, McGraw Hill Company Limited, London, 1989.

20CE E102

ADVANCED STRUCTURAL ANALYSIS
(ELECTIVE-I)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: To enable the student

1. Gain knowledge of using matrix methods of structural analysis stiffness and flexibility methods to analyse beams and trusses
2. Learns the basic concepts of analyse of frames and grids using flexibility methods.
3. Learns the basic concepts of analysis frames and slides using stiffness method
4. Understand the concepts of beams on elastic foundations with semi infinite and infinite lengths
5. Grasps the fundamentals of solving boundary value problems using approximate methods

Course Outcomes: At the end of the course, student will be able to

1. Analyse continuous beams and redundant trusses using force and displacement approaches (flexibility & stiffness approaches) of matrix methods
2. Analyse rigid jointed plane frames and grids by flexibility methods.
3. analyse rigid jointed plane frames and grids by stiffness methods.
4. Applies the concepts of (beams of semi-infinite and infinite lengths) an elastic foundation to field problems and analytical models.
5. Solve the boundary value problems using approximate methods.

UNIT- I:

Introduction to matrix methods of structural analysis: Static and kinematic indeterminacies, Matrix formulations by force and displacement r

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

Analysis of continuous beams and redundant trusses by force and displacement methods with degree redundancy and freedom not exceeding three.

UNIT- II:

Analysis of rigid jointed plane frames and grids: by Flexibility approach with degree of redundancy not exceeding three**.**

UNIT- III:

Analysis of rigid jointed plane frames and grids: by Stiffness approach with degree of freedom not exceeding three.

UNIT- IV:

Beams on elastic foundation: Introduction - Modulus of foundation and basic equation - Beams of infinite length under concentrated and uniformly distributed loads - Analysis of semi-infinite beams making use of functions for infinite beams.

UNIT- V:

Boundary Value Problems (BVP): Approximate Solution of Boundary Value Problems, Modified Galerkin Method for One-Dimensional BVP, Matrix Formulation of the Modified Galerkin Method.

References:

1. William Weaver and James M. Gere, "*Matrix Analysis Framed Structures* ", CBS, 2004.
2. Devadas Menon," *Advanced Structural Analysis*", Narosa, 2009.
3. A. K. Jain, "*Advanced Structural Analysis*", Nem Chand & Bros. 2015.
4. R. C. Hibbler," *Structural Analysis*", Pearson, 2015.
5. P. Seshu," *Text Book of Finite Element Analysis*", PHI, 2003.

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

20CE E104

STRUCTURAL HEALTH MONITORING (ELECTIVE-II)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: To enable the student to understand the fundamental concepts of

1. Distress in the structure.
2. Assess the health of structure. Audit for structural health monitoring
3. Static and dynamic field tests.
4. Repairs, strategies for repairs and rehabilitation methods of the structure
5. Piezo–electric materials and other smart materials,

Course Outcomes: At the end of the course, students will be able to

1. Appraise importance of Diagnosis the distress in the structure, develop an understanding the root causes and factors.
2. Assess the health of structure using static field methods.
3. Assess the health of structure using dynamic field tests.
4. Identify the locations for repairs and various repair methods, can able to suggest rehabilitation methods for structure
5. Adapt and implement EMI technique

UNIT- I:

Structural Health: Factors affecting Health of Structures, Causes of Distress, Regular Maintenance.

Structural Health Monitoring**:** Concepts, Various Measures, Structural Safety in Alteration.

UNIT- II:

Structural Audit: Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

UNIT- III:

Static Field Testing: Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement.

UNIT- IV:

Dynamic Field Testing: Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.

UNIT –V:

Introduction to Repairs and Rehabilitations of Structures: Case Studies (Site Visits), piezo–electric materials and other smart materials, electro–mechanical impedance (EMI) technique, adaptations of EMI technique.

References:

1. Daniel Balageas, Claus Peter Fritzen, Alfredo Güemes," *Structural Health Monitoring*", John Wiley and Sons, 2006.
2. Douglas E Adams,"*Health Monitoring of Structural Materials and Component Methods with Applications*", John Wiley and Sons, 2007.
3. J. P. Ou, H. Li and Z. D. Duan,"*Structural Health Monitoring and Intelligent Infrastructure, Vol1"*, Taylor and Francis Group, London, UK, 2006.
4. Victor Giurglutiu," *Structural Health Monitoring with Wafer Active Sensors*", Academic Press Inc, 2007.

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

20ME M103

RESEARCH METHODOLOGY AND IPR

Instruction	2 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	3

Objectives: To make the students to

1. Motivate to choose research as career
2. Formulate the research problem, prepare the research design
3. Identify various sources for literature review and data collection report writing
4. Equip with good methods to analyze the collected data
5. Know about IPR copyrights

Outcomes: At the end of the course, student will be able to

1. Define research problem, review and asses the quality of literature from various sources
2. Improve the style and format of writing a report for technical paper/ Journal report, understand and develop various research designs
3. Collect the data by various methods: observation, interview, questionnaires
4. Analyze problem by statistical techniques: ANOVA, F-test, Chi-square
5. Understand apply for patent and copyrights

UNIT – I:

Research Methodology: Research Methodology: Objectives and Motivation of Research, Types of Research, research approaches, Significance of Research, Research Methods verses Methodology, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India, Benefits to the society in general. Defining the Research Problem: Selection of Research Problem, Necessity of Defining the Problem

UNIT – II:

Literature Survey Report writing: Literature Survey: Importa purpose of Literature Survey, Sources of Information, Assessment of

of Journals and Articles, Information through Internet. Report writing: Meaning of interpretation, layout of research report, Types of reports, Mechanics of writing a report. Research Proposal Preparation: Writing a Research Proposal and
Research Report, Writing Research Grant Proposal

UNIT – III:

Research Design: Research Design: Meaning of Research Design, Need of Research Design, Feature of a Good Design, Important Concepts Related to Research Design, Different Research Designs, Basic Principles of Experimental Design, Developing a Research Plan, Steps in sample design, types of sample designs.

UNIT – IV:

Data Collection and Analysis: Data Collection: Methods of data collection, importance of Parametric, non parametric test, testing of variance of two normal population, use of Chi-square, ANOVA, Ftest, z-test

UNIT – V:

Patents and Copyright: Patent: Macro economic impact of the patent system, Patent document, How to protect your inventions. Granting of patent, Rights of a patent, how extensive is patent protection. Copyright: What is copyright. What is covered by copyright. How long does copyright last? Why protect copyright? Related Rights: what are related rights? Enforcement of Intellectual Property Rights: Infringement of intellectual property rights, Case studies of patents and IP Protection

References:

1. C.R Kothari, "*Research Methodology, Methods & Technique*"; New Age International Publishers, 2004
2. R. Ganesan, "*Research Methodology for Engineers*", MJP Publishers, 2011
3. Y.P. Agarwal, "*Statistical Methods: Concepts, Application and Computation*", Sterling Publs., Pvt., Ltd., New Delhi, 2004.
4. AjitParulekar and Sarita D' Souza, "*Indian Patents Law – Legal & Business Implications*"; Macmillan India ltd , 2006
5. B. L.Wadehra; "*Law Relating to Patents, Trade Marks, Copyright Designs & Geographical Indications*"; Universal law Pu Pvt. Ltd., India 2000.

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

6. P. Narayanan; *"Law of Copyright and Industrial Designs*"; Eastern law House, Delhi 2010

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

20CE C103

STRUCTURAL DESIGN LAB

Instruction (Practical)	4 Hours per week
Duration of Semester End Examination	0 Hours
Semester End Examination	0 Marks
CIE	50 Marks
Credits	2

Course Objectives: **Course Objectives: To enable the student**

1. Learn the principles of idealization of beam grids and frames for the given plan of a building
2. Know the methods of calculating loads on the building elements
3. Grasp the concepts of Analysis of building frames manually & also using software elements
4. Understand the concepts of design of building elements with a practical approach, and also concepts of grouping the designs.
5. Learn the professional practices of preparing structural drawings with good detailing.

Course Outcomes: At the end of the course, student is able to

1. Idealize beam grids and frames for the given plan of a building
2. Calculate loads on building elements for a given plan
3. Analyse building frames using a manual method and software
4. Design all structural elements of a given building with a practical approach and grouping the design.
5. Prepare structural drawings with good detailing, in a professional way.

Design Project:

Design and Detailed drawing of complete G+ 3 structures: Idealization of beam grid and frames for a given plan – Load calculations and preliminary design – Analysis of frames using software, manual check for atleast one frame – Design of building elements using software – grouping of members – design of typical elements (manually) - detailing of reinforcement for various groups of elements – preparation of structural drawings – introduction to processional practices in drawing.

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

References:

1. V. L. Shah and V. R. Karve, "*Illustrated Design of Reinforced Concrete Buildings (Design of G+3 Storeyed Buildings + Earthquake Analysis & Design)* ", Assorted Editorial; 8th edition (2017).
2. **SP: 34 (1987),"***Handbook on Concrete Reinforcement and Detailing*", Bureau of Indian Standards.
3. **IS: 456 (2000),"***Plain and Reinforced Concrete - Code of Practice*", Bureau of Indian Standards.
4. **SP: 16** (1978),"Design Aids for Reinforced Concrete to IS 456:1978",*Bureau of Indian Standards*.

20CE C104

ADVANCED CONCRETE LAB

Instruction (Practical)	4 Hours per week
Duration of Semester End Examination	0 Hours
Semester End Examination	0 Marks
CIE	50 Marks
Credits	2

Course Objectives: To enable the student

1. Understand the stress- strain behavior of high strength concretes
2. Assesses the correlation between cube strength cylindrical strengths, split tensile strength and modulus of rupture of concrete
3. Knows the effect of cyclic loading on steel
4. Grasps the various procedures of conducting non-destructive tests on existing concrete members.
5. Understand the behavior of concrete beams under flexural and shear.
6. Understands the behavior of concrete beams under torsion.

Course Outcomes: At the end of the course, student is able to

1. Deduce the stress - strain values for a given high strength concrete and checks its suitability for a purpose.
2. Interpret the correlation between the cube strength, cylindrical strength split tensile strength And modulus of rupture and determines any missing value among these, others being known.
3. Suggest suitable grade and quantity of steel for resisting cyclic loads.
4. Conduct suitable non-destructive test for the condition assessment of existing concrete members
5. Take proper precaution to avoid flexural and shear failures in concrete beams
6. Strengthen the concrete members to resist torsion.

List of Experiments / Assignments:

1. Study of stress - strain curve of high strength concrete
2. Correlation between cube strength, cylinder strength, split tensile strength and modulus of rupture.
3. Effect of cyclic loading on steel.
4. Non-Destructive testing of existing concrete members.

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

5. Behavior of Beams under flexure, Shear
6. Torsion

References:

1. A. M. Neville," *Properties of concrete*", 5th Edition, Prentice Hall, 2012
2. M. S. Shetty, "Concrete *technology"*, S. Chand and Co., 2006.

20CE C105

DESIGN OF HIGH-RISE STRUCTURES

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

To make the student learn**:**

1. the differences between the regular buildings and tall buildings
2. various structural systems usually considered for the functional design of the tall buildings
3. various methods of calculation lateral forces (both wind forces and seismic/ earth quake forces) on the tall buildings
4. the provisions of relevant IS codes (IS:875 - Part-3, IS:1893 - Part-1) in calculating the lateral forces mentioned above, on tall buildings
5. the importance of ductility of various structural members in resisting the seismic loads on tall buildings and the relevant provisions of the IS code (IS: 13920) regarding the reinforcement detailing in achieving this ductility in RCC members.
6. the concept of performance based design in resisting seismic forces on tall buildings

Course Outcomes:

The students can

1. Understand the loads acting on the tall buildings.
2. Learn the concept of analysis of high rise building for wind loads
3. Learn the concept of analysis of high rise building for seismic loads
4. Learn the different structural systems for high rise buildings
5. Learn the assessment of nonlinear performance of the structures

Course Syllabus:

UNIT-I

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

Introduction:

Importance of Lateral Loads for high rise buildings, types of foundations for tall buildings. Second order effects of gravity loading, Creep and shrinkage in columns, Differential shortening of columns, Floor levelling problems, Panel zone effects, P-Delta effects

UNIT-II

Wind Loads:

Introduction to wind loads, characteristics of wind, Computation of wind loads on buildings as per IS code, Principles of analysis, Introduction to Computational Fluid Dynamics, Wind Tunnel testing.

UNIT-III

Seismic Loads:

Introduction to Earthquakes, Characteristics of Earthquake, Computation of seismic loads on tall buildings – Equivalent static load method, Response Spectrum Method. Vibration Control – active control & passive control. Liquefaction effects, Introduction to Time history Analysis

UNIT – IV

Structural systems:

Necessity of special structural systems for tall buildings, Structural Systems for **Steel Buildings -** Braced frames, Staggered Truss System, Eccentric Bracing System, Outtrigger & Belt truss system, Tube Systems**;** Structural Systems for **Concrete Buildings -** shear walls, frame tube structures, bundled tube structures**;** Design of shear wall as per IS code

UNIT- V

Performance Based Design: Behavior of reinforced concrete members in bending - moment curvature relationship; Plastic hinge, Factors affecting rotation capacity of a section, Plastic moment - Redistribution of moments. Pushover Analysis

Suggested Reading:

1. Taranath B. S., "*Structural Analysis and Design of Tall Buildings*", McGraw-Hill Book Company, 1988.
2. Simlu E, "*Wind Effect on Structures: An Introduction to Wind Engineering*", Wile and Sons, 1978.
3. Fintel, M, "*Hand Book of Concrete Engineering*", Von Nostrand, 1974.
4. Emilio Rosenblueth, "*Design of Earthquake Resistant Structures*", Pentech Press Ltd., 1990.
5. Schuellar, W, "*High Rise Building Structures*" , John Wiley & Sons Inc, 1977.
6. Bryan Stafford Smith & Alex Coull, "*Tall Building Structures: Analysis & Design*", Wiley India Pvt Ltd, 1991.
7. Lynn S. Beedle, "*Advances in Tall Buildings*", CBS Publishers and Distributors Delhi, 1996.

.

20CE C106

ADVANCED SOLID MECHANICS

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks

Course objectives: To enable the student

1. To make the students understand the concepts of elasticity and equip them with the knowledge to independently handle the problems of elasticity.
2. To enhance the competency level and develop the self-confidence through quality assignments in theory of Elasticity and plasticity.
3. To inculcate the habit of researching and practicing in the field of elasticity and plasticity.

Course Out Comes: The students

1. Will be able to solve the problems of 3-D elasticity with confidence.
2. Can independently work with the problems of 2-D elasticity in Cartesian/Polar Coordinates.
3. Are familiarized with the use of Airy's stress function in 2-D problems of elasticity in Cartesian/Polar Coordinates.
4. Are equipped with the knowledge of various theories of torsion of prismatic bars of various cross sections and can solve the problems of torsion.
5. Will be able to solve plasticity problems in Structural engineering

UNIT- I:

Definition of stress and strain: Notation of stresses in three dimensions – Generalized Hooks law.

General Theorems: Differential equations of equilibrium in 3-D - Equations of Equilibrium in terms of displacements – Boundary Conditions - conditions of compatibility - Transformation of stress components under change of co-ordinate system.

UNIT- II:

Plane stress and plane strain: differential equations of equili
boundary conditions - compatibility equations

Stresses on an oblique plane – Stress Invariants - principal stresses - stress ellipsoid - max shear stresses - Octahedral shear stress – Strain energy per unit volume - Strain of a line element - principal strains.

UNIT- III:

Two dimensional problems in rectangular coordinates: Stress function Applications - solution by polynomials - Saint- Venant's principle - determination of displacements - bending of simple beams - gravity loading.

Two dimensional problems in polar coordinates: Airy's stress function - general solution of two- dimensional problem in polar coordinates - stress distribution symmetrical about an axis – Effect of hole on stress distribution in a plate in tension, Stresses in a circular disc under diametrical loading - strain components in polar coordinates

UNIT- IV:

Torsion of Prismatic Bars: torsion of prismatic bars - bars with elliptical cross sections – other elementary solution - membrane analogy - torsion of rectangular bars - solution of torsion problems by energy method - use of soap films in solving torsion problems

UNIT- V:

Theory of Plasticity: Introduction – Idealized Stress-Strain curve, concepts and assumptions - yield criterions – Von Mises Yield Criterion, Tresca Yield Criterion, Plastic Stress-strain relations- Principle of Normality and plastic potential.

.

References:

1. Timoshenko S. and Goodier, "*Theory of Elasticity*", Mc Graw hill Publications, 2015.
2. J.Chakraborty,"*Theory of Plasticity*", Mc Graw hill Publications, 2007.
3. S. Singh, "*Theory of Elasticity*", Khanna Publishers, 2003

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

20CE E107

REPAIR AND RETROFITTING OF STRUCTURE
(ELECTIVE-III)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: To enable the student

1. Gain knowledge of Distress and reasons for distress in concrete
2. Learns the basic concepts of serviceability and durability, corrosion etc.
3. Understand the concepts of different repair materials and their suitability
4. Understand the fundamental principles of retrofitting and rehabilitation
5. Learns the basic concepts of Structural health monitoring.

Course Outcomes: At the end of the course, student is able to

1. Identify reasons for distress and suggest remedial measures
2. Analyze the causes for corrosion and identify the durability factors for the safety of structures
3. Identify and suggest various repair materials
4. Analyze and suggest the retrofitting methods
5. Identify the suitable Tests required for SHM

UNIT - I

Maintenance: Repair and rehabilitation - Facets of maintenance - Importance of maintenance various aspects of inspection – Assessment procedure for evaluating damaged structure - Causes of deterioration. Repair Strategies: Causes of distress in concrete structures – Construction and design failures - Condition assessment and distress-diagnostic techniques - Assessment procedure for inspection a evaluating a damaged structure.

UNIT - II

Serviceability and durability of concrete: Quality assurance for concrete construction - Concrete properties – Strength - Permeability – Thermal properties and cracking. – Effects due to climate - Temperature - Chemicals - Corrosion – Design and construction errors – Effects of cover thickness and cracking.

UNIT - III

Materials and techniques for repair: Special concretes and mortar - Concrete chemicals - Special elements for accelerated strength gain - Expansive cement - Polymer concrete - Sulphur infiltrated concrete - Ferro cement - Fibre reinforced concrete - Bacterial concrete – Rust eliminators and polymers coating for rebars during repair – Foamed concrete - Mortar and dry pack – Vacuum concrete - Gunite and shotcrete

- Epoxy injection - Mortar repair for cracks - Shoring and underpinning -Methods of corrosion protection - Corrosion inhibitors – Corrosion resistant steels - Coating and cathodic protection.

UNIT - IV

Repair, rehabilitation and retrofitting techniques: Repairs to overcome low member strength - Deflection - Cracking - Chemical disruption - Weathering corrosion - Wear - Fire - Leakage and marine exposure - Repair of structure – Common types of repairs – Repair in concrete structures – Repairs in under water structures – Guniting – Shot create –Underpinning - Strengthening of structures – Strengthening methods – Retrofitting – Jacketing.

UNIT – V

Health monitoring and demolition techniques: Long term health monitoring techniques - Engineered demolition techniques for dilapidated structures - Use of sensors – Building instrumentation.

Suggested Reading:

1. Barry A. Richardson, “Defects and Deterioration in Building FN Spon Press, London, 1991.

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

2. J. H. Bungey, “Testing of Concrete in Structures”, Chapman and Hall, New York, 1989.
3. A.R. Santakumar, “Concrete Technology”, Oxford University Press, New Delhi, 2006.
4. B.L. Gupta and Amit Gupta, ‘Maintenance and Repair of Civil Structures”, Standard Publications, New Delhi, 2010.
5. Peter H. Emmons, “Concrete Repair and Maintenance Illustrated”, RS Means, John Wiley & Sons, New York, 1981.
6. W.H. Ransom, “Building Failures: Diagnosis and Avoidance”, E & FN Spon Press, London, 1992.
7. P.K. Mehta and P.J.M. Monteiro, “Concrete - Microstructure, Properties and Materials”, McGraw-Hill, New York, 2014.
8. N. Jackson and R.K, Dhir, “Civil Engineering Materials”, Basingstoke, Macmillan, London, 1988.

20CE E109

DESIGN OF ADVANCED CONCRETE STRUCTURES (ELECTIVE-IV)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	3

Course objectives: To enable the student

1. To make the students effectively analyse and design Curved and Deep Beams.
2. To enable the students understand the nuances of internal stresses and design of Domes, and thoroughly learn the analysis and design procedures for bunkers and silos.
3. To make the student attain the detailed knowledge to understand the performance of flat slabs and design them by both DDM and EFM.
4. To make the students understand the structural behaviour Raft, Pile and Machine foundations and be able to design them.
5. To make them understand and appreciate the importance of ductile detailing. The student should also be able to design solid shear walls.

Course out Comes: Upon the completion of this course, the student should be able to

1. Analyse and Design curved and deep beam as per the field requirements.
2. be able to find the stresses in domes for various loads and design them.
3. With the thorough knowledge acquired during the course, the student is able to analyzeand design Bunkers and Silos with ease.
4. be able to assess the structural behaviour of Raft, Pile and Machine foundations and design them.
5. Gets reasonable expertise to implement ductile detailing and also design solid shear walls.

UNIT – I:

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

Beams curved in plan: Introduction – Design Principles – Structural Design of beams circular and semi-circular in plan, continuously and symmetrically supported, rectangular in cross-section.
Deep Beams: Introduction – flexural and shear stresses in deep beams. – I.S. Code provisions – design of simply supported and continuous Deep beams.

UNIT - II:

Domes: Introduction - Stresses and forces in domes - design of spherical and conical domes.
Bunkers and Silos: Introduction - Design principles and theories - IS Code provision - design of rectangular bunkers - design of cylindrical soils.

UNIT – III:

Flat Slabs: Introduction, components, IS code provisions, Design Methods, design for flexure and shear

UNIT – IV:

Pile foundations: Structural design of piles and pile caps.
Raft Foundations: Definitions, Types – Design of Raft foundation, flat plate type and beam-slab type for buildings with column grids up to five by five.

UNIT - V:

Ductile Detailing: Ductile detailing of RCC beams and columns using IS: 13920 -1993 code
Design of Shear Walls: Design and Detailing of Shear Walls considering shear wall-frame interaction in a tall RC structure subjected to seismic loading.

References:

1. N.KrishnaRaju," *Advanced Reinforced Concrete Design*", CBS Publishers, 2005.
2. H.J. Shah, "*Reinforced Concrete"*, Charotar Publishers, 2014.
3. P.C.Varghese, "*Advanced Reinforced Concrete Design"*, PHI, 2005
4. B.C.Punmia, Ashok Kumar Jain," *Comprehensive R.C.C. Designs*", Laxmi Pub. 2005.

20CE A101

DISASTER MITIGATION AND MANAGEMENT

(Audit Course I and II - Common to all branches)

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
CIE	0 Marks
Credits	Pass/Fail

Course Objectives: To enable the student

1. To equip the students with the basic knowledge of hazards, disasters, risks and vulnerabilities including natural, climatic and human induced factors and associated impacts
2. To impart knowledge in students about the nature, causes, consequences and mitigation measures of the various natural disasters
3. To enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters
4. To enable the students to understand and assimilate the impacts of any disaster on the affected area depending on its position/ location, environmental conditions, demographic, etc.
5. To equip the students with the knowledge of the chronological phases ina disaster management cycle and to create awareness about the disaster management framework and legislations in the context of national and global conventions

Course Outcomes: At the end of the course the student

1. Ability to analyse and critically examine existing programs in disaster management regarding vulnerability, risk and capacity at different levels
2. Ability to understand and choose the appropriate activities and tools and set up priorities to build a coherent and adapted disaster management plan
3. Ability to understand various mechanisms and consequences of human induced disasters for the participatory role of engineers in disaster management
4. To understand the impact on various elements affected disaster and to suggest and apply appropriate measures for t

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

5. Develop an awareness of the chronological phases of disaster preparedness, response and relief operations for formulating effective disaster management plans and ability to understand various participatory approaches/strategies and their application in disaster management

UNIT- I:

Introduction: Basic definitions- Hazard, Disaster, Vulnerability, Risk, Resilience, Mitigation, Management; classification of types of disaster- Natural and manmade; International Decade for natural disaster reduction (IDNDR); International strategy for disaster reduction (ISDR), National disaster management authority
(NDMA).

UNIT- II:

Natural Disasters: Hydro meteorological disasters: Causes, Early warning systems- monitoring and management, structural and non-structural measures for floods, drought and Tropical cyclones; Geographical based disasters: Tsunami generation, causes, zoning, Early warning systems- monitoring and management, structural and non-structural mitigation measures for earthquakes, tsunami, landslides, avalanches and forest fires. Case studies related to various hydro meteorological and geographical based disasters.

UNIT- III:

Human induced hazards: Chemical disaster- Causes, impacts and mitigation measures for chemical accidents, Risks and control measures in a chemical industry, chemical disaster management; Case studies related to various chemical industrial hazards eg: Bhopal gas tragedy; Management of chemical terrorism disasters and biological disasters; Radiological Emergencies and case studies; Case studies related to major power break downs, fire accidents, traffic accidents, oil spills and stampedes, disasters due to double cellar construction in multistoreyed buildings.

UNIT- IV: Disaster Impacts: Disaster impacts- environmental, physical, social, ecological, economical, political, etc.; health, psycho-social issues; demographic aspects- gender, age, special needs; hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT- V:

Concept of Disaster Management: Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; risk analysis, vulnerability and capacity assessment; Post-disaster environmental responsewater, sanitation, food safety, waste management, disease control; Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

References:

1. Pradeep Sahni, *" Disaster Risk Reduction in South Asia*", Prentice Hall, 2003.
2. B. K. Singh, *" Handbook of Disaster Management*: *techniques & Guidelines*", Rajat Publication, 2008.
3. Ministry of Home Affairs". *Government of India, "National disaster management plan, Part I and II",*
4. K. K. Ghosh," *Disaster Management",* APH Publishing Corporation, 2006.
5. http://www.indiaenvironmentportal.org.in/files/file/disaster_management_india1.pdf
6. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs)
7. Hazards, Disasters and your community: A booklet for students and the community, Ministry of home affairs.

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

20CE C107

MODEL TESTING LAB

Instruction (Practical)	4 Hours per week
Duration of Semester End Examination	0 Hours
Semester End Examination	0 Marks
CIE	50 Marks
Credits	2

Course Objectives: To enable the student to

1. Learn to estimate natural frequencies and mode shapes of a beam.
2. Understand the evaluation process of dynamic response of a building model using shake table / mini shake table
3. Learn to compute the response of building models to wind loads, using wind tunnel set up.
4. Know the pattern of deflection and cracking in RC slab elements and portal frames under gravity loading.
5. Understands the use of Piezo electric sensors in the determination of vibration characteristics of a beam

Course Outcomes: At the end of the course, student is able to 1. Estimate the natural frequencies and mode shapes of a beam.

2. Evaluate the dynamic response of a building model using shake table / mini shake table set up.
3. Evaluate the response of building models under wind loads, using wind tunnel setup.
4. Determine the pattern of deflection and cracks in RC slab elements and portal frames, under static loading.
5. Use Piezoelectric sensor for the determination of vibration characteristics of a beam.

List of Experiments:

1. Estimation of natural frequencies and mode shapes of a beam.
2. Evaluation of dynamic response of building model using shake table set up.
3. Evaluation of response of building models subjected to wind loads using wind tunnel set up.
4. Deflections and crack pattern study of RC slab elements s to static loading.

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

5. Deflections and crack patterns in portal frame subjected to gravity loading.
6. Demonstration of use of Piezoelectric Sensors for the determination of Vibration Characteristics of a beam

20CE C108

NUMERICAL ANALYSIS LAB

Instruction (Practical)	4 Hours per week
Duration of Semester End Examination	0 Hours
Semester End Examination	0 Marks
CIE	50 Marks
Credits	2

Course Objectives: To enable the student

1. Find Roots of non-linear equations by Bisection method and Newton's method.
2. Do curve fitting by least square approximations
3. Solve the system of Linear Equations using Gauss - Elimination/ Gauss
   - Seidal Iteration/ Gauss - Jordan Method
4. To Integrate Numerically Using Trapezoidal and Simpson's Rules
5. To Find Numerical Solution of Ordinary Differential Equations by Euler's Method, Runge- Kutta Method.
6. Apply computational methods in engineering using MAT Lab program

Course Outcomes: At the end of the course, student is able to

1. To find roots of non linear equations by using numerical methods
2. To know how to fit the given data in different curves
3. To know how to solve system of linear equations by using direct and indirect methods
4. To know how to integrate by using numerical methods
5. To find solution of first order ODE by numerical methods
6. To know how to apply computational methods in engineering by using MAT Lab program

List of Programmes

1. Find the Roots of Non-Linear Equation Using Bisection Method.
2. Find the Roots of Non-Linear Equation Using Newton's Method.
3. Curve Fitting by Least Square Approximations.
4. Solve the System of Linear Equations Using Gauss - Eli Method.

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

5. Solve the System of Linear Equations Using Gauss - Seidal Iteration Method.
6. Solve the System of Linear Equations Using Gauss - Jordan Method.
7. Integrate numerically using Trapezoidal Rule.
8. Integrate numerically using Simpson's Rules.
9. Numerical Solution of Ordinary Differential Equations by Euler's Method.
10. Numerical Solution of Ordinary Differential Equations by RungeKutta Method.

References:

1. RudraPratap," *Getting started with MATLAB: A quick Introduction for Scientists and Engineers*", Oxford University press, 2010.
2. Grewal B. S," *Numerical Methods in Engineering and Science with Programs in C, C++ & MATLAB*", Khanna Publishers 2014.
3. Dukkipati Rao V, "*Applied Numerical Methods using MATLAB*", New Age International Pvt. Ltd. Publishers, 2011.

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

20CE C109

MINI PROJECT WITH SEMINAR

Instruction	4 Hours per week
CIE	50 Marks
Credits	2

Outcomes: Students are able to

1. Formulate a specific problem and give solution.
2. Develop model/models either theoretical/practical/numerical form.
3. Solve, interpret/correlate the results and discussions.
4. Conclude the results obtained.
5. Write the documentation in standard format.

Guidelines:

- As part of the curriculum in the II- semester of the programme each students shall do a mini project, generally comprising about three to four weeks of prior reading, twelve weeks of active research, and finally a presentation of their work for assessment.
- Each student will be allotted to a faculty supervisor for mentoring.
- Mini projects should present students with an accessible challenge on which to demonstrate competence in research techniques, plus the opportunity to contribute something more original.
- Mini projects shall have inter disciplinary/ industry relevance.
- The students can select a mathematical modelling based/Experimental investigations or Numerical modeling.
- All the investigations are clearly stated and documented with the reasons/explanations.
- The mini-project shall contain a clear statement of the research objectives, background of work, literature review, techniques used, prospective deliverables, and detailed discussion on results, conclusions and references.

Department committee: Supervisor and two faculty coordinators

Guidelines for awarding marks (CIE): Max. Marks: 50

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
Supervisor	20	Progress and Review
	05	Report

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

Department Committee	05	Relevance of the Topic
	05	PPT Preparation
	05	Presentation
	05	Question and Answers
	05	Report Preparation

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

20CE E115

DESIGN OF BRIDGES
(ELECTIVE-V)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: To impart the knowledge in various design principles of Bridge Engineering,

1. The student should be able to design simple bridges individually and be effective contributor in design groups while working on large projects.
2. To make the student conversant with the latest developments in the field of bridge engineering.
3. The student should have a fair familiarity with Indian codes and codes of other countries.

Course Outcomes:

1. Attains ability to design slab and T beam bridges and gets well versed with lateral load distribution for T girders.
2. Acquires sound knowledge about various structural actions of box girder bridges . He also gets the ability to analyse box girders
3. Using some approximate methods and design single cell box girder bridges.
4. Gets thorough knowledge in Railway loadings and can design both Plate girder and Truss girder bridges with ease and efficiency.
5. The student gets comprehensive idea about long span flexible bridges and the problems associated with them. He gets to know the
6. Wind effects and the importance of aerodynamic stability. He also will be able to design elastomeric bearings for bridges.
7. The student gets a clear understanding of bridge foundations and also acquires knowledge about various construction techniques.

UNIT – I:

Introduction: Types of bridges – Materials of construction, Plann layout, Hydraulic design, Provisions of IRC-6 and IRC-21, Design bridges, Design of T-girder bridges, Lateral load distribution in T-be

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

bridges – Courbon's method, Guyon Massenet method – Design of slabs subjected to concentration loads using Pigeaud's curves.

UNIT – II:

Box girder bridges – various structural actions, Methods of analysis, Beams on elastic foundation method, grillage method and space frame analysis, Shear lag and Edge stiffing effects – Provisions of IRC-18 and IRC-21, Design of simply supported single cell PSC box girder bridge.

UNIT – III:

Steel bridges and composite bridges - Bridge rules and Bridge code of RDSO, Truss girder steel railway bridges – Design of stringer beams, cross girders and truss system, Wind load effects Design of composite bridges as per IRC-22

UNIT – IV:

Long span flexible bridges – suspension bridges and cable stayed bridges – stiffening girders and stress, towers, cables – Importance of wind and aerodynamic stability. Bearings – Types of bearing, Design of elastomeric bearings

UNIT – V:

Sub structure – Piers and towers – Types of forces, Stability analysis of solid type piers, Types of bridge foundations and their design principles, Construction techniques – Cast in-situ, Prefabricated, Incremental launching and Free cantilever construction techniques.

References:

1. Wai-Fah Chen LianDuan , "*Bridge Engineering Handbook*",, CRC Press, USA, 2000
2. R. M. Barker and J. A. Puckett, John Wiley & Sons, "*Design of Highway Bridges*", New York, 1997
3. P. P. Xanthakos, John Wiley & Sons, "*Theory and Design of Bridges*", New York, 1994
4. Raja Gopalan, "*Bridge Superstructure*" – Narosa Publishing – 2010.
5. N. KrishnamRaju, "*Design of Bridges*" Oxford and IBH Publishing – 2010.
6. Johnson Victor, "*Essentials of Bridge Engineering*", Oxford & IBH Publishers, Sixth edition 2018.

20CS O101

BUSINESS ANALYTICS (OPEN ELECTIVE – Common to All Branches)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The main objectives of this course are to

1. Understanding the basic concepts of business analytics and applications
2. Study various business analytics methods including predictive, prescriptive and prescriptive analytics
3. Prepare the students to model business data using various data mining, decision making methods

Course Outcomes: After completion of the course, students will be able

1. To understand the basic concepts of business analytics
2. Identify the application of business analytics and use tools to analyze business data
3. Become familiar with various metrics, measures used in business analytics
4. Illustrate various descriptive, predictive and prescriptive methods and techniques
5. Model the business data using various business analytical methods and techniques

Unit-I:

Introduction to Business Analytics: Introduction to Business Analytics, need and science of data driven (DD) decision making, Descriptive, predictive, prescriptive analytics and techniques, Big data analytics, Web and Social media analytics, Machine Learning algorithms, framework for decision making, challenges in DD decision making and future.

Unit-II:

Descriptive Analytics: Introduction, data types and scales, t measurement scales, population and samples, measures of central te

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

percentile, decile and quadrille, measures of variation, measures of shape-skewness, data visualization

Unit-III:

Forecasting Techniques: Introduction, time-series data and components, forecasting accuracy, moving average method, single exponential smoothing, Holt's method, Holt-Winter model, Croston's forecasting method, regression model for forecasting, Auto regression models, auto-regressive moving process, ARIMA, Theil's coefficient

Unit-IV:

Decision Trees: CHAID, Classification and Regression tree, splitting criteria, Ensemble and method and random forest. **Clustering**: Distance and similarity measures used in clustering, Clustering algorithms, K-Means and Hierarchical algorithms, **Prescriptive Analytics**- Linear Programming(LP) and LP model building,

Unit-V:

Six Sigma: Introduction, introduction, origin, 3-Sigma Vs Six-Sigma process, cost of poor quality, sigma score, industry applications, six sigma measures, DPMO, yield, sigma score, DMAIC methodology, Six Sigma toolbox

References:

1. U Dinesh Kumar, "*Data Analytics*", Wiley Publications, 1st Edition, 2017
2. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, "*Business analytics Principles, Concepts, and Applications with SAS*", Associate Publishers, 2015
3. S. Christian Albright, Wayne L. Winston, "*Business Analytics - Data Analysis and Decision Making*", 5th Edition, Cengage, 2015

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc18-mg11/preview
2. https://nptel.ac.in/courses/110105089/

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

20EE O101

WASTE TO ENERGY (OPEN ELECTIVE – Common to All Branches)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	3

Course objectives: To make the students to

1. To know the various forms of waste
2. To understand the processes of Biomass Pyrolysis.
3. To learn the technique of Biomass Combustion.

Course outcomes: After completion of this course, students will be able to:

1. Understand the concept of conservation of waste
2. Identify the different forms of wastage
3. Chose the best way for conservation to produce energy from waste
4. Explore the ways and means of combustion of biomass
5. Develop a healthy environment for the mankind

UNIT-I

Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

UNIT-II

Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT-III

Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

UNIT-IV

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT-V

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes Thermo chemical conversion - Direct combustion - biomass gasification pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

References:

1. Desai, Ashok V.," *Non-Conventional Energy"*, Wiley Eastern Ltd., 1990.
2. Khandelwal, K. C. andMahdi, S. S., *Biogas Technology - A Practical Hand Book",* Vol.I &II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Challal, D. S, "*Food, Feed and Fuel from Biomass"*, IBH Publishing Co. Pvt. Ltd., 1991.
4. C. Y. WereKo-Brobby and E. B. Hagan," *Biomass Conversion and Technology*", John Wiley & Sons, 1996.

PROFESSOR & HEA
Department of Civil Enginee
Chaitanya Bharathi Institute of Tech
GANDIPET, HYDERABAD-5000