Department of Electrical and Electronics Engineering

Chaitanya Bharathi Institute of Technology (A)

Gandipet, Hyderabad-500075.

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 organisations for self-sustained growth of society.

VISION and MISSION of the Department

Vision

To be in forefront in assimilating cutting edge technologies in the field of Power & Electronics arena

Mission

To solve practical problems through industry institute interaction for implementation and to encourage taking up multidisciplinary research while maintaining ethics and morals for the sustainable development of the society.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
SCHEME OF INSTRUCTION AND EXAMINATION
VII-Semester of B.E/B.Tech under CBCS
B.E. (EEE)

SEMESTER-VII

S. 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/D		CIE	SEE	
THEORY								
1.	**16EE C31**	Power System Operation and Control	4	-	3	30	70	4
2.	**16EE C32**	Utilization of Electrical Energy	3	-	3	30	70	3
3.	**16EE C33**	DSP and Embedded Systems	4	-	3	30	70	4
4.	**16EE EXX**	Program Specific Elective- 4	3	-	3	30	70	3
5.	**16XX OYY**	Open Elective-I	3	-	3	30	70	3
PRACTICALS								
6.	**16EE C34**	Power Systems Simulation Lab	0/1	2	3	25	50	2
7.	**16EE C35**	Digital Signal Processor and Embedded Systems Lab`	0/1	2	3	25	50	2
8.	**16EE C36**	Project Seminar	0	3	-	50	-	2
			19	**07**	**-**	**250**	**450**	**23**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

Course Code	Program Specific Elective-4
16EEE14	Basic VLSI Design
16EEE15	Computer Methods in Power Systems(CMPS)
16EEE16	Power Quality Engineering(PQE)
16EEE17	Special Electrical Machines(SEM)

Course Code	Open Elective-I
16PY O01	History of Science and Technology
16EG O02	Gender Sensitization
16CE O02	Disaster Mitigation and Management (DMM)
16CS O10	Machine Learning Using Phyton
16ME O01	Entrepreneurship

16EE C31

POWER SYSTEM OPERATION AND CONTROL

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70Marks
CIE	30 Marks
Credits	4

Course Objectives:

1. To understand the formulation of Load-Flow problems applying different methods and economic operation of power systems
2. To understand the importance of Load Frequency Control and stability of power systems.
3. To study the reactive power control and basic FACTS controllers

Course Outcomes: After completion of this course, students will be able to:

1. Acquire knowledge in assessing the importance of load flow studies in power system operation. Carryout Load-Flow studies with different methods compare and interpret the results.
2. Acquire knowledge in conducting Economic operation of power system without and with losses
3. Acquire knowledge in conducting Load Frequency Control for single and two area systems and also distinguish between different control methods.
4. Acquire knowledge in analyzing the Stability aspects of power system.
5. Acquire knowledge in assessing the system improvement through reactive power control and FACTS controllers.

UNIT-I

Load Flow Studies: Formulation of Y bus for a system, modeling of tap changing and phase shifting transformer, Formulation of load flow problem, Solution of load flow by Gauss Seidel, Newton- Raphson, Decoupled and Fast Decoupled methods, comparison of different load flow methods.

UNIT-II

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, B_{mn} Coefficients, Economic operation including transmission losses.

UNIT-III

Load Frequency Control: Governor Characteristics, Regulation of two generators, coherency, concept of control area, Incremental power balance of a control area, Single area control, Flat frequency control, Flat tie-line frequency control, Tie-line bias control, Advantages of pool operation, Development of model for two- area control.

UNIT-IV

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, synchronous machine models with and without saliency, Equal area criterion, Application of equal area criterion, Swing equation, Step by step solution of Swing equation, factors effecting transient stability, Auto Reclosures, mathematical formulation of voltage stability problem.

UNIT-V

Reactive Power Control: Reactive power generation by synchronous generators, Automatic voltage regulators, FACTS Controllers, SVC, TCSC, STATCOM, UPFC.

Text Books:

1. I. J. Nagrath and D.P. Kothari, Modern Power System Analysis, TMH Publication, 4th Edition 2011
2. C.L.Wadhwa, Electrical Power System, New Age International Publications, 3rd Edition, 2014
3. O. Elgard, Electric Energy Systems Theory, TMH Publication, 2nd Edition, 2001.

Suggested Reading:

1. A. Chakrabarthy and S. Halder, Power System Analysis Operation & control, PHI Publications, 3rd Edition, 2010
2. J.J.Grainger and William D Stevenson, Power System Analysis, Mc Graw Hill Publishers, 2016
3. S. Sivanagaraju, and G. Srinivas, 'Power system, Operation and Control', Pearson publications, 2010.

16EE C32

UTILIZATION OF ELECTRICAL ENERGY

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 adaptability of heating and welding concepts for a given application
2. Know the necessity of illumination and batteries for specified requirement
3. Know selection of proper traction system and its corresponding drive for industrial applications

Course outcomes: After completion of this course, Students will able to:

1. Select the proper furnace system for a given requirement
2. Distinguish the adaptability of heating and welding concepts for a given application
3. Identify the necessity of illumination for specified requirement
4. Select proper traction system and its corresponding drive for industrial applications
5. Able to estimate energy consumption levels at various modes of operation.

UNIT-I

Electric Heating: Introduction, Classification of electric heating, Electric Resistance Heating, Resistance Ovens, Properties of good heating material, Different types of heating material, Causes of failure of heating element, Design of heating element- Numerical Problems.

Arc Furnaces: Direct Arc Furnace, Indirect Arc Furnace, Induction Heating, Direct Core-type Induction Furnace, Vertical Core-Type Induction Furnace, Indirect Core-Type Induction Furnace, Coreless Induction Furnace, High Frequency Eddy-current Heating, Dielectric Heating- Numerical Problems.

UNIT-II

Electric Welding: Introduction, Classification of Welding Processes, Formation and Characteristics of Electric Arc, Effect of Arc Length, Electrodes for Metal Arc Welding, Advantages of Coated Electrodes, Types of Joints - Welding Transformer.

Electric Arc welding: Carbon Arc Welding, Submerged Arc Welding, Atomic Hydrogen Welding.
Resistance Welding: Spot Welding, Seam Welding, Projection Welding, Butt Welding, Flash Butt Welding, Upset Welding, Electron Beam Welding, Laser Welding - Numerical Problems

UNIT-III
Illumination: Introduction, Terms used in illumination, laws of illumination, Polar Curves of C.P. Distribution – Determination of M.S.C.P. and M.H.C.P. from Polar Diagrams- Rousseau's construction, Lighting Schemes- Design of Lighting Schemes- Application to factory lighting, Street lighting and Flood lighting - Numerical Problems

Electric Lamps: Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems - Numerical Problems

UNIT-IV
Electric Traction-I: Introduction, Systems of electric traction and track electrification- DC system, single phase and 3-phase low frequency and high frequency system, composite system, kando system, comparison between AC and DC systems- Train Movement-Typical Speed/Time Curve - Factors affecting scheduled speed - Simplified Speed/Time Curve - Average and Schedule Speed - Tractive Effort for Propulsion of a Train - Power Output from Driving Axles - Energy Output from Driving Axles - Numerical Problems.

UNIT-V
Electric Traction-II: Specific Energy Output - Evaluation of Specific Energy Output - Energy Consumption - Specific Energy Consumption - Adhesive Weight - Coefficient of Adhesion - Mechanism of Train Movement - Numerical Problems

Text Books:
1. C L Wadhwa, Generation, Distribution and Utilization of Electrical Energy- 3 rd Edition New age international publishers, 2015.
2. B.L. Theraja, A Textbook of Electrical Technology Volume-III Transmission and Distribution S. Chand Limited, 23rd Edition, 2013.
3. Partab H, Art and Science of Utilization of Electric power, Dhanpatrai & Sons, 2014

Suggested Reading:
1. J.B.GUPTA, Utilization of Electric Power and Electric Traction-S.K.Kataria & Sons, 2013.
2. R K. Rajput, Utilization of Electrical Power-, 2 nd Edition, Laxmi Publications (p) Ltd, 2016.

16EE C33

DSP & EMBEDDED SYSTEMS

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives:
1. To introduce basic concepts of signals and systems and representation of digital system.
2. To introduce digital signal processor
3. To introduce fundamentals of Real time operation and ARM processor

Course Outcomes: After completion of this course, students will be able to:
1. Identify the digital system and find its response.
2. Design FIR and IIR filter.
3. Be familiar with architecture and features of TMS 320F/2047 DSP.
4. Understand the basic concepts of real time operating systems
5. Be familiar with architecture and features of ARM processor.

UNIT-I
Introduction to signals and systems: Classification of Signals & Systems, Linear shift invariant systems, stability and causality, Sampling of Continuous signals, Signal Reconstruction, quantizing & encoding, linear constant co-efficient difference equations, properties of discrete system- linearity. Analog to digital conversion - Nyquist criteria

UNIT-II
Fourier transforms and filters: Magnitude and phase response discrete time systems - Computation of DFT and IDFT -Properties of Discrete Fourier Transform, - Linear and circular Convolution of sequence using DFT. Fast Fourier transform: Radix-2 decimation in time and decimation in frequency FFT algorithms, Inverse FFT. Introduction to IIR Low pass butter worth & Chebyshev digital filters using impulse invariant and bilinear transformation techniques, FIR Rectangular and Kaiserwindows

UNIT-III
DSP Processors: Differences between DSP and other mp architectures,. Basic architectural features, DSP computational building blocks, Bus and Memory

architecture, Address generation unit, speed issues, fixed point DSPs - Architecture of TMS 320C 54X Processor , addressing modes, on-chip peripherals, Real Time operating constraints

UNIT-IV

Real-Time Operating Systems: Tasks and Task States, Tasks and Data, Semaphores, Shared Data, Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment. Semaphores and Queues, Hard Real-TimeScheduling Considerations, Host and Target machines, Linker/Locators for Embedded Software.

UNIT-V

A**dvanced architectures:** ARM Processor, memory organization and Instruction level parallelism, Net advanced embedded systems: Bus protocols, 12C bus and CAN bus, Internet- Enabled Systems

Text Books:

1. Avatar Singh and S. Srinivasan, " Digital Signal Processing Implementations Using DSP Microprocessors", Thomson Brooks, 2004.
2. Wayne Wolf, "Computers as Components - Principles of Embedded Computer System Design", Morgan Kaufmann Publisher, 2006.

Suggested Reading:

1. B. Ventakaramani, M. Bhaskar, "Digital Signal Processes, Architecture Processing and Applications", Tata McGraw Hill, 2002.
2. David E-Simon, "An Embedded Software Primer", Pearson Education, 2007.
3. K.V.K.K.Prasad, "Embedded Real-Time Systems: Concepts, Design & Programming", Dreamtech press, 2005.

16EE C34

POWER SYSTMES SIMULATION LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives:

1. To understand the load flows, transient stability studies, economic load dispatch and load frequency control in power system
2. To understand the time and frequency response of the system
3. To Simulate and compare the output of converters with different loads

Course Outcomes: After completion of this course, students will be able to:

1. Acquire knowledge about Load frequency control
2. Analyse Load flow studies and economic load dispatch
3. Acquire knowledge about transient stability studies
4. Analyse semi, full and buck & boost converters
5. Acquire knowledge about time and frequency response of the system

List of Experiments:

1. Determination of power angle diagram for Salient and Non-salient pole synchronous machine.
2. Frequency response characteristics using Bode plot
3. Root Locus & Nyquist method
4. Design of lag, lead and lag-lead compensator
5. Computation of line parameters
6. Modeling of Transmission Lines
7. Load Flow Studies.
8. Fault Analysis.
9. Transient stability studies.
10. Economic load dispatch.
11. Load Frequency control of single-area and two-area systems
12. Single-phase semi-converter with R and RL loads
13. Single-phase full-converter with R and RL loads
14. Analysis of Buck and Buck-Boost converter

Note: At least **TEN** experiments should be conducted in the Semester

16EE C35

DIGITAL SIGNAL PROCESSING & EMBEDDED SYSTEMS LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives:

1. To learn to analyze and synthesize signal using DSP
2. To acquire knowledge on digital control of electrical appliances
3. To practice programming using embedded processor and to learn to interface various electrical equipments to embedded controller

Course Outcomes: After completion of this course, students will be able to:

1. Control AC machines using DSP
2. Control DC machines using DSP
3. To simulate control signals using MATLAB
4. To generate the output sequence using micro controller.
5. Control the operation of different equipments to embedded controller

List of Experiments:

1. Verification of Convolution Theorem Using MATLAB.
2. Computation of DFT, IDFT using Direct and FFT methods.
3. Verification of Sampling Theorem
4. Design of Butterworth and Chebyshev LP & HP filters.
5. DC Motor speed control using DSP.
6. Three phase IM speed control using DSP
7. Simulation of switching sequence for relay operations.
8. Simulation of switching sequence with time delay.
9. Simulation of relay operations using different ports.
10. Interfacing 7 segment display using SPI through microcontroller.
11. Interfacing ADC through microcontroller.
12. Interfacing DAC through microcontroller.
13. Interfacing stepper Motors through microcontroller.

Note: Any **Ten** experiments from should be conducted from the above list in the semester.

16EE C36

PROJECT SEMINAR

Instruction	3 Hours per week
CIE	50 Marks
Credits	2

The objective of 'Project Seminar' 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
Department Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Preparation

16EE E14

Program Specific Elective-4
BASIC VLSI DESIGN

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 MOSFET structures and operations
2. To learn to design logic circuits using pMOS and nMOS
3. To learn to design concepts of CMOs and HDL Programing.

Course Outcomes: After completion of this course, students will be able to:

1. To design logic circuits using pMOS and nMOS technologies
2. To design cMOS logic circuits.
3. To simulate logical circuits using HDL programming
4. To understand different modeling strategies
5. To understand FPGA design strategies.

UNIT-I

MOS CIRCUIT DESIGN PROCESS: Introduction of MOSFET: Symbols, Enhancement mode-Depletion mode transistor operation – Threshold voltage derivation – body effect – Drain current Vs voltage derivation – channel length modulation. nMOS and pMOS inverter – Determination of pull up to pull down ratio –Stick diagrams – VLSI Circuit Design Flow.

UNIT-II

MOS TECHNOLOGY: Chip Design Hierarchy – IC Layers – Photolithography and Pattern Transfers – Basic MOS Transistors – CMOS Fabrication: n-well – p-well – twin tub – Latch up and prevention (SOI) – Submicron CMOS Process-Masks and Layout - CMOS Design Rules: Lambda based layout.

UNIT-III

LOGIC DESIGN USING nMOS and cMOS: Gate delays – Logical Effort - CMOS Static Logic – Transmission Gate Logic – Tri-State Logic – Pass Transistor Logic – Dynamic CMOS Logic –Realization of logic gates – using nMOS and CMOS technologies– Stick diagrams of logic gates-Simple full adder – four input Encoder- Decoder.

UNIT-IV

VERILOG HDL: Hierarchical modeling concepts – Basic concepts: Lexical conventions – Data types – Modules and ports. Gate level modeling – Dataflow modeling – Behavioral modeling – Design examples of Combinational and Sequential circuits – Switch level modeling.

UNIT-V

VLSI IMPLEMENTATION STRATEGIES: Introduction – Design of Adders: carry look ahead-carry select-carry save. Design of multipliers Introduction to FPGA – Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures.

Text Books:

1. Douglas A.Pucknell & Kamran Eshraghian," Basic VLSI Design", 3rd edition, Prentice Hall India, 2001.
2. Wayne Wolf, "Modern VLSI Design: System -on-chip design", Pearson Education, 3rd edition, 2002.

Suggested Reading:

1. David A. Johns & Ken Martin, "Analog Integrated Circuit Design", John Wiley & Sons, 2004.
2. Neil. H.E. Weste & Kamran Eshraghian," principles of CMOS VLSI Design: A systems perspective", 2nd edition, Pearson Education, 2004.

16EE E15

COMPUTER METHODS IN POWER SYSTEMS

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To study the formulation of various incidence matrices and network matrices such as YBUS, YBR and Zloop
2. To know about the formation of ZBUS for given power system network.
3. To understand the calculation of fault currents using ZBUS in three phase power system network.

Course Outcomes: After completion of this course, students will be able to:

1. Draw the graph and find the network metrics for the given power system network.
2. Modify the Zbus for changes in the network structure.
3. Determine the fault currents in three-phase power system for different faults
4. Acquire the knowledge of different transformation techniques
5. Find the ZBUS for given three-phase network.

UNIT-I

Graph Theory: Definitions, Incidence Matrices, Element node incidence matrix, Bus incidence matrix, Branch path incidence matrix, Basic and Augmented cut set incidence matrices, Basic and Augmented branch incidence matrices, Basic and Augmented loop incidence matrices, Construction of Primitive network element.

UNIT-II

Formulation of Network Matrices: Formation of Ybus, YBR and Zloop by Singular Transformation Method, Derivation of YBR, Yloop, Zbus and Ybus from non-singular transformation method.

UNIT-III

Formation of ZBus: Partial network, Algorithm for the Modification of ZBus Matrix for addition element for the following cases: Addition of element from a new bus to reference, Addition of element from a new bus to an old bus, Addition

of element between an old bus to reference and Addition of element between two old busses, Modification of ZBus for the changes in network.

UNIT-IV

Three-phase Networks: Representation and performance equation of 3-phase network elements ,Three phase network elements with balanced and unbalanced excitation, Transformation matrices, Symmetrical and Clarke's components, Algorithm for formation of 3-phase bus impedance matrix, Modification of three phase ZBUS for changes in network

UNIT-V

Short Circuit Studies: Basic assumption in short circuit studies, System representation, General equations for short circuit study in phase variables and Symmetrical components for fault current and node voltage, Short circuit calculations for balanced three phase network using ZBUS, Fault impedance and admittance matrices, Analysis of 3-phase line to ground and double line to ground faults, Flow chart for short circuit study.

Text Books:

1. Stagg & El-Abiad, Computer methods in Power System Analysis, 9th Edition, Tata McGraw Hill, 1983.
2. M.A.Pai, Computer techniques in Power System Analysis, 3rd Edition, Tata McGraw Hill, 2014.

Suggested Reading:

1. L.P.Singh, Advanced Power System Analysis & Dynamics, 6th Edition, New Age International Publishers, 2014.
2. Kusic Gearge L, Computer Aided Power System Analysis, 2nd Edition, CRC Press, 2008.

16EE E16

POWER QUALITY ENGINEERING

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. Understand the basic concepts of power quality and acquire the knowledge in measurement and standards of PQ problems
2. Acquire the knowledge to analyze voltage sag in distribution systems
3. Acquire the knowledge of theoretical concepts and standards of Power Quality issues in industrial systems.
4. Acquire the knowledge in identifying sources of harmonic & mitigation of harmonics in industrial systems.
5. Acquire the knowledge in Solutions to Wiring and Grounding Problems.

UNIT-I

Power Quality problems in distribution systems: Sag, Swells, Interruptions, Wave-form Distortions: harmonics, noise, notching, dc-offsets, fluctuations. Flicker and its measurement. Tolerance of Equipment: CBEMA curve. Power quality monitoring, PQ measurement equipment.

UNIT-II

Voltage Sags-Characterization: Voltage Sag Magnitude, Sag Magnitude in Radial and Non-Radial Systems, Voltage sag Calculations in Meshed Systems, Magnitude-Duration Plots.

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. PQ monitoring standards.

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 for Overvoltage Protection, Definitions, Reasons for Grounding, 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.

16EE E17

SPECIAL ELECTRICAL MACHINES

Instruction	3 Hours per week
Duration of Semester Examination	3 Hours
Semester End Examination	70 Marks
Sessional	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 design features of special electrical machines

Course Outcomes: After completion of this course, students will be able to:

1. Identify appropriate machine for a specific application.
2. Recognize the principle of operation and characteristics of the given special machine.
3. Familiar with driver circuit used for special machines
4. Develop equivalent circuit of a given special electrical machine
5. Distinguish the special machine with the obtained characteristics

UNIT-I

Stepper Motors and its Mathematical Analysis: Introduction, Synchronous Induction (or Hybrid) Stepper Motor, Hybrid stepping motor: Construction, Principle of operation, energisation with two phase at a time, An Open -Loop Controller for a 2-Phase Stepper Motor, Variable Reluctance (VR) Stepping Motor, Open -Loop Control of 3-Phase VR Step Motor, Voltage current relation and torque expression, Transformation of equation into d-q reference frame, Normalization of d-q axis.

UNIT-II

Switched reluctance motor : Introduction , Improvements in the design of conventional reluctance motors, Some distinctive difference between SR and conventional reluctance motor, Principle of operation of SRM, Some design aspects of stator and rotor pole arcs, Power converter for SR motor, A numerical example, Derivation of torque expression, General -Linear case.

UNIT-III

Permanent magnet materials and motors: Introduction, Minor hysteresis loops and recoil line, Stator frame (pole and yoke part) of conventional PMDC motors,

Equivalent circuit of PM, Development of electronically commutated DC motor from conventional DC motor.

UNIT-IV

BLDC motors: Types of construction, Principle of operation, Sensing and switching logic scheme, Drive and power circuits, Theoretical Analysis and Performance prediction.

UNIT-V

Linear induction motor: Development of double sided LIM from rotary type IM, A schematic of LIM drive from electric traction, Field analysis of a DSLIM, Fundamental assumption, Transverse edge (or finite width) effects in LIM, Solution for current distribution in rotor, Force calculation on rotor of finite width : estimation of resistivity factor.

Text Books:

1. K. Venkatarathnam, “Special Electrical Machines”, Universities Press(India) Pvt. Ltd., 2013
2. E.G. Janardhan, “Special Electrical Machines”, Prentice Hall India, 2014

Suggested Reading:

1 . H. Bülent Ertan, M. Yildirim Üçtug, Ron Colyer, Alfio Consoli, “Modern Electrical Dives” Springer Science+Bussiness Media, 2000

Yesterday is a HISTORY; Tomorrow is a MYSTERY. Today is a GIFT. That’s why they call it the PRESENT. Enjoy life to the fullest.

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16PY O01

Open Elective-I

History of Science and Technology

Instruction	3 Hours per week
Duration of Semester Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To enablestudents to understand science as a socio-cultural product in specific socio-historical contexts.
2. To expose students to philosophical, historical and sociological perspectives to look atscience as a practice deeply embedded in culture and society.
3. To inculcate the scientific culture and ethics in the development of technologies.

Course Outcomes:

1. Demonstrate knowledge of broad concepts in the history of science, technology ranging over time, space and cultures.
2. Recognize the values of a wide range of methodologies, conceptual approaches and the impact of competing narratives within the history of science, technology.
3. Identify, locate and analyze relevant primary and secondary sources in order to construct evidence-based arguments.
4. Think independently and critically, using appropriate methodologies and technologies to engage with problems in the history of science, technology.
5. Demonstrate academic rigor and sensitivity to cultural and other diversity, and understanding of the ethical implications of historical and scientific enquiry within a global context.

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, Newphilosophies, Quantum reality, Energy sources, Electricity: a revolution intechnology, Majoradvances.

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

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 Readings:

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

16EG O02

GENDER SENSITIZATION

Instruction	3 Hourss per week
Duration of SEE Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course will introduce the students to

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To expose the students to debates on the politics and economics of work. To help students reflect critically on gender violence.

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

1. Develop a better understanding of important issues related to what gender is in contemporary India.
2. Be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature, and film.
3. Attain a finer grasp of how gender discrimination works in our society and how to counter it. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
4. Understand what constitutes sexual harassment and domestic violence and be made aware of New forums of Justice.
5. Draw solutions as to how men and women, students and professionals can be better equipped to work and live together as equals.

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.

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.

16CE O02

DISASTER MITIGATION AND MANAGEMENT

Instruction	3 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 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 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.

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.

16CS O10

MACHINE LEARNING USING PYTHON

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 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: On Successful completion of this course, student will be able to

1. Understand the basics concepts of Machine Learning and Python.
2. Apply feature engineering techniques and visualization tools to the data.
3. Analyze the various types of data by using python based machine learning techniques.
4. Identify and evaluate various recommender systems.
5. Design solutions to real world problems using deep learning algorithms.

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/

16ME O01

ENTREPRENEURSHIP

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Objectives: Student will understand

1. The environment of industry and related opportunities and challenges
2. Concept and procedure of idea generation
3. Elements of business plan and its procedure
4. Project management and its techniques
5. Behavioral issues and Time management

Outcomes: After completing this course, students will be able to:

1. Identify opportunities and deciding nature of industry
2. Brainstorm ideas for new and innovative products or services
3. Analyze the feasibility of a new business plan and preparation of Business plan
4. Use project management techniques like PERT and CPM
5. Analyze behavioural aspects and use time management matrix

UNIT-I

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-II

Identification and Characteristics of Entrepreneurs: First generation entrepreneurs, environmental influence and women entrepreneurs, Conception and evaluation of ideas and their sources, Selection of Technology, Collaborative interaction for Technology development.

UNIT-III

Business Plan: Introduction, Elements of Business Plan and its salient features, Technical Analysis, Profitability and Financial Analysis, Marketing Analysis, Feasibility studies, Executive Summary.

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, 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

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.
3. Sudha G.S., "Organizational Behavior", National Publishing House, 1996.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
SCHEME OF INSTRUCTION AND EXAMINATION
VIII-Semester of B.E/B.Tech under CBCS
B.E. (EEE)

SEMESTER-VIII

S. 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/D		CIE	SEE	
THEORY								
1.	**16EEEXX**	Program Specific Elective - 5	3	-	3	30	70	3
2.	**16EEEXX**	Program Specific Elective -6	3	-	3	30	70	3
3.	**16XXXXX**	Open Elective -II	3	-	3	30	70	3
PRACTICALS								
4.	**16EE C37**	Seminar	-	3	-	50	-	2
5.	**16EE C38**	Project	-	6	Viva voce	50	100	6
			09	**09**	**-**	**190**	**310**	**17**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

Course Code	Program Specific Elective-5	Equivalent NPTEL Courses
16EE E18	Electrical Machine Design(EMD)	
16EE E19	Flexible AC Transmission Systems(FACTS)	FACTS Devices
16EE E20	Power System Reliability (PSR)	
16EE E21	Smart Grid(SG)	Introduction to Smart Grids

Course Code	Program Specific Elective-6	Equivalent NPTEL Courses
16EE E22	Embedded System Design (ESD)	Embedded System Design with ARM
16EE E23	Advanced Power System Protection (APSP)	
16EE E24	Power System Operation and Deregulation(PSOD)	
16EE E25	Electrical Estimation and Costing(EEC)	

Course Code	Open Elective-II	Equivalent NPTEL Courses
16EG O01	Technical Writing Skills	
16ME O04	Intellectual Property Rights (IPR)	Intellectual Property Rights
16 ME O08	Industrial Administration and Financial Management (IAFM)	
16CS O03	IOT and Applications	Introduction to IoT
16CS O04	Basics of Data Science Using R	Machine Learning

Note: Student undergoing internship is permitted to take-up Equivalent NPTEL courses with the prior permission from BoS.

16EE C37

SEMINAR

Instruction	3Hours per week
CIE	50 Marks
Credits	2

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. Summaryand 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**	**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

16EE C38

PROJECT

Instruction	6 Hours per week
CIE	50 Marks
SEE	100 Marks
Credits	6

The object of Project is to enable the student extend further the investigative study, 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: 50)

Evaluation by	**Max .Marks**	**Evaluation Criteria / Parameter**
Department Review Committee	05	Review 1
	08	Review 2
	12	Submission
Supervisor	05	Regularity and Punctuality
	05	Work Progress
	05	Quality of the work which may lead to publications
	05	Report Preparation
	05	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

16EE E18

Program Specific Elective-5
ELECTRICAL MACHINE DESIGN

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. Design the given AC electrical machine for a given power rating.
2. Calculate the various parameters required for designing.
3. Choose the proper material for a given requirement of the machine.
4. Use software tools for DC & AC machine design.
5. Acquire the knowledge of CAD

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: Sizing of a transformer, main dimensions, KVA output for single and three-phase transformers, window space factor, overall dimensions, design of cooling tank, methods for cooling of transformers.

UNIT-III

Design of Induction Motors: 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: Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, armature parameters, estimation of air gap length, design of rotor, design of damper winding, determination of full load field mmf, design of turbo 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. A. 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. K. L. Narang, "A Text Book of Electrical Engineering Drawings", SatyaPrakashan, 1969.
3. A. Shanmugasundaram, G. Gangadharan and R. Palani, "Electrical Machine Design Data Book", New Age International, 1979.

16EE E19

FACTS
(Flexible AC Transmission 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 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 the course students will be able to:

1. Select the appropriate FACTS device/controller based on the needs of inter connected power transmission systems.
2. Analyze various converter topologies used in FACTS for harmonic reduction.
3. Demonstrate the knowledge 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. Demonstrate 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: Basic concept of Voltage-Sourced Converters, 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.

16EE E20

POWER SYSTEM RELIABILITY

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To understand probability theory and distributions
2. To understand component reliability types and causes of failures reliability logic diagram for different configuration.
3. To Understand discrete Markov chains and continuous Markov process and the importance of reliability evaluation of repairable systems

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

1. Acquire knowledge and to apply probability theory and distribution functions to engineering applications.
2. Acquire knowledge to study and to classify types of causes of failures, reliability logic diagram for different configurations.
3. Acquire knowledge to study discrete and continuous Markov chains and process and give thrust to reliability evaluation of repairable systems.
4. Evaluate various generation and load models
5. Apply reliability analysis on a given generation and distribution system.

UNIT-I

Elements of probability theory -Probability distributions: Discrete and continuous random variables, density and distribution functions, Mathematical expectation-Mean and Variance, Binominal distribution, Poisson distribution, Normal .distribution, Exponential distribution, Weibull distribution.

UNIT-II

Reliability: Definition, Component reliability, Hazard rate, derivation of the reliability function in terms of the hazard rate. Causes of failures, types of failures.Bath tub curve, MTTR, MTBF. Reliability logic diagrams for series, parallel, series-parallel, non series-parallel configurations. Minimal cut-set and decomposition methods.

UNIT-III

Markov Modeling: General modelling concepts, stochastic transitional probability matrix, time dependent probability evaluation and limiting state probability evaluation. Absorbing states. Continuous Markov Processes: Modelling concepts, State space diagrams, Stochastic Transitional Probability Matrix, Evaluating limiting state Probabilities. Reliability evaluation of repairable systems.

UNIT-IV

Generating System Reliability Analysis: Generation system model- capacity outage probability tables -Recursive relation for capacitive model building '- sequential addition method -unit removal- Evaluation of loss of load and energy indices. Evaluation of equivalent transitional rates of identical and nonidentical units -Evaluation of cumulative probability and cumulative frequency of nonidentical generating units -2'-level daily load representation - merging generation and load models

UNIT-V

Distribution System Reliability Analysis: Radial networks –Evaluation of Basic reliability indices, performance indices -load point and system reliability indices - customer oriented, loss and energy oriented indices. Parallel networks- inclusion of bus bar failures, scheduled maintenance -temporary and transient failures - weather effects - common mode failures -Evaluation of various indices.

Text Books:

1. Roy Billinton and Ronald N. Aallan "Reliability Evaluation of Engineering Systems", Concepts and Techniques, 2nd Edition Springer International Edition, 1992
2. Roy Billinton and Ronald N. Aallan "Reliability Evaluation of Power Systems", 2nd Edition, BS Publications, 1996.

Suggested Reading:

1. J. Endrenyi, " ReliabilityModeling in Electrical Power Systems", Wiley Inter science publications,1978.

16EE E21

SMART GRID

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 and tools for smart grid design
2. To understand the stability analysis tools for smart grid and importance of state estimation
3. To know various computing tools for smart grid design.

Course outcomes: After completion of this course, students will be able to:

1. Recognize the concept of Smart Grid communication and Measurement
2. Comprehend the concept of tools used for Smart Grid Design
3. Know the concept of Stability Analysis Tools for Smart Grid
4. Understand the concept of State Estimation
5. Understand the transmission and distribution management systems

UNIT-I:

Today's Grid versus the Smart Grid, Smart Grid communication and Measurement, Communication and measurement, Monitoring, PMU, Smart meters and Measurement Technologies: Wide area monitoring systems(WAMS),Phasor Measurement Units (PMU) ,Smart meters,Smart applications,Advanced Metering Infrastructure(AMI),GIS and Google mapping Tools ,Multiagent systems (MAS) Technology: Multiagent systems for smart Grid Implementation, Multiagent Specifications, Multi agent Technique. Micro Grid and Smart Grid Comparison

UNIT-II

Performance analysis tools : Analysis of Smart grid Design, Load flow studies: GS Method, Newtonrap son Method, Fast Decoupled Method , Distributed Load Flow Methods, Congestion management effect, contingencies and their classification : Steady state contingency analysis, Performance Indices, Sensitivity Based Approaches.

UNIT-III

Stability Analysis Tools: Definition of stability in power system, voltage stability assessment: voltage stability and voltage collapse, Classification of Voltage Stability, static stability, Dynamic stability, Analysis Techniques for dynamic voltage stability studies, voltage stabilityassessment Techniques, Angle stability Assessment, Transient stability

UNIT-IV

State Estimation: State estimation, Formulation of Weighted Least Square Estimation (WLS),Detection And Identification Of Bad Data ,State estimation for smart grid, Dynamic state estimation, observability analysis

UNIT-V

Transmission and Distribution Management Systems: Data Sources, Energy Management System, Wide Area Applications, Visualization Techniques, Data Sources and Associated External Systems, SCADA, Customer Information System, Modeling and Analysis Tools, Distribution System Modeling, Topology Analysis, System Monitoring, Operation, Management, Outage Management System.

Text Books:

1. James Momoh, "Smart Grid Fundamentals of Design and Analysis" IEEE Press, Wiley Publications, 2012
2. Bharat Modi, Anuprakash, Yogesh Kumar, "Fundamentals of Smart grid Technology", Katson publishers, 2015 .

Suggested Reading:

1. Salman K Salman, Introduction to the Smart grid: concepts, technologies and evolution, IET publications, 2017
2. Clark W Gellings, The Smart grid: Enabling Energy efficiency and demand response, The fairmount press Inc, 2009
3. Janaka Ekanayake, Liyanage, Wu, Akihiko Yokoyama, Jenkins, Smart Grid, Wiley Publications, 2012.

16EE E22

Program Specific Elective-6
EMBEDDED SYSTEM DESIGN

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 basics of embedded processing.
2. To understand the concept of Real time operating systems.
3. To understand a design of embedded architecture

Course Outcomes: After completion of this course, students will be able to:

1. Acquire the knowledge on ARM processor
2. Have knowledge on RTOS functional units
3. Have basic knowledge on embedded programming
4. Have basic knowledge on advanced embedded processors
5. Have a basic knowledge on development of embedded system

UNIT–I

Introduction to Embedded Systems: An Embedded system, Classification, processor in the system, other hardware units, structural units in a processor, processor selection for an embedded system, memory devices, memory selection for an embedded system, introduction to ARM processors.

UNIT – II

Devices and Buses: I/O devices, Serial communication using IIC and CAN buses, advanced I/O buses between the networked multiple Devices, Device drivers: Classification, Parallel port device drivers in a system, Serial port device drivers in a system.

UNIT – III

Interprocess communication and synchronization of processes, Task and Threads: Multiple processes in an application, problem of sharing data by multiple tasks and routines, Embedded programming in C++ and Java.

UNIT – IV

Real time Operating Systems: Operating system services, Real time operating system services, interrupt routines in RTOS Environment, RTOS Task scheduling, embedded Linux internals, OS Security issues, Mobile OS.

UNIT – V

Hardware-Software Co-Design in an Embedded System: Embedded system project Management, Embedded system Design and Co-Design issues in system development process. Design cycle in system development phase for an embedded system, Emulator and ICE, Use of software tools for development of Embedded systems, Case studies of programming with RTOS (Examples: Automatic chocolate vending machine, vehicle tracking system, Smart card).

Text Books:

1. Raj Kamal, "Embedded Systems" Architecture, Programming and Design, TMH, 2006.
2. Jonathan W Valvano, "Embedded Micro Computer Systems" Real Time Interfacing, Books / cole, Thomson learning 2006.
3. Arnold S Burger, "Embedded System Design" An Introduction to Processes, Tools and Techniques by CMP books, 2007.

Suggested Readings:

1. David.E. Simon, "An Embedded Software Primer", Pearson Edition, 2009.
2. Andrew N.sloss, Dominic Symes, Chris Wright, "ARM System Developer's guide", Elsevier publications 2005.

16EE E23

ADVANCED 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. Study the operating principles and application aspects of static relays
2. Understand the protection of bus-bars & various neutral grounding techniques.
3. Disseminate with the general principles of pilot protection and travelling wave relays.

Course Outcomes: After completion of this course, students will be able to:

1. Comprehend the basic components of static relays and their characteristics
2. Understand the operating principles of different distance relays.
3. Acquaint with the various grounding methods & bus-bar protection
4. Explicate the principles of transformer protection and auto re-closures.
5. Know various types of pilot protection schemes, their adaptability and basic principle of travelling wave relays.

UNIT-I

Static Relays: Advantages and disadvantages, Comparators, Amplitude and Phase comparison schemes, Duality between Amplitude and phase comparators, General equation for comparators for different types of relays, Static comparators, Coincidence circuits, Phase splitting methods, Hall effect comparators, Operating principles, Use of level detectors, Time delay circuits, Filters, Thyristors, Triggering circuits and DC power supplies.

UNIT-II

Static Relay Hardware: Operating principles, Static time current relays, Differential relays, Distance relays, Quadrilateral relay, Elliptical relay, Relay response, Principle of R-X diagram, Effect of arc resistance, source impedance and line length on the performance of distance relay, Power swings, Loss of synchronism and its effect on distance relays.

UNIT-III

Bus Bar protection and Grounding: Bus bars, Differential protection. Neutral Grounding: Grounded and Underground Neutral Systems, Effects of Un grounded Neutral on system permanence. Methods of Neutral Grounding: Solid, Resistance, Reactance – Arcing Grounds and Grounding Practices.

UNIT-IV

Transformer Differential Protection: Effect of magnetizing inrush currents, Grounding transformers, Switched schemes, Auto-reclosing, Single and multi-shot auto reclosing, Single pole and three pole auto reclosing.

UNIT-V

Pilot Wire and Carrier Protection: Circulating current scheme, Balanced Voltage scheme, Translay scheme, Half wave comparison scheme, Phase comparison carrier current protection, Carrier transfer scheme, Carrier blocking scheme, Digital protection of EHV/ UHV transmission line based upon traveling wave phenomena.

Text Books:

1. Badriram and Viswakarma D.N., 'Power System Protection and Switchgear', Tata McGraw Hill, April, 2001.
2. Madhavarao T.S., 'Power System Protection Static relays with microprocessor applications', Tata McGraw Hill, 2001.
3. A.T. Johns and S.K. Salman, 'Digital protection for power systems', IEE series, 1989.
4. Stanley H Horowitz, A.G. Phadke, 'Power system relaying', 4th Edition, Wiley publications, 2014.

Suggested Reading:

1. Warrington A.R. Van C, 'Protective Relays', Vol I & II Chapman & Hall, John Wiley & Sons, 1977.
2. Bhuvanesh A OZA, Nirmal kumar C. Nair, Rashesh P Mehta, Vijay H.M., 'Power system protection and Switchgear', Tata McGraw Hill, 2010.
3. J. Lewis Blackburn, Thomas J Domin, 'Protective relaying Principles and Applications', CRC press, 2014.
4. L.P. Singh, 'Digital Protection: Protective Relaying from Electromechanical to Microprocessor', John Wiley & Sons, 1994.

16EE E24

POWER SYSTEM OPERATION AND DEREGULATION

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 optimal power flow and power system security.
2. To understand various methods of state estimation
3. To discuss about power system deregulation and available transfer capability of lines

Course Outcomes: After completion of this course, students will be able to:

1. Calculate the optimal power flows for the given power system
2. Carry out contingency analysis
3. Determine the state estimation of the system and difference between conventional LF and SE.
4. Understand the benefits of deregulation
5. Determine the available transfer capability of a line and know the various pricing methods in Deregulated power system.

UNIT- I:

Optimal Power Flow: Introduction, OPF formulation, OPF solution technique, Linear programming OPF, Interior point method, unit commitment solution methods, priority list method, dynamic programming method.

UNIT-II:

Power System Security: Introduction, Factors affecting power system security, Contingency analysis, AC power flow security analysis with contingency case selection, concentric relaxation, Bounding area method.

UNIT-III:

State Estimation: Introduction, Power system state estimation, Methods of Least squares, Maximum likelihood Weighted Least squares estimation, Matrix formulation, State estimation by orthogonal decomposition, detection and identification of Bad measurements, Network observability and pseudo measurements.

UNIT-IV:

Power System Restructuring: Introduction, Motivation for restructuring of power system, Electricity market entities and model, benefits of deregulation, terminology, deregulation in Indian power sector, Operations in power markets, power pools, transmission networks and electricity markets.

UNIT-V:

ATC, Transmission Open Access and Pricing: Introduction, definitions, methods of determination of ATC, ATC calculation considering the effect of contingency analysis, Transmission open access, types of services, cost components of transmission system, transmission pricing methods, Incremental cost based transmission pricing.

Text Books:

1. K.Bhattacharya, M. Bollen and J.E. Daalder Operation of Restructured Power Systems, 1 st Edition Springer Publishers 2012.
2. P. Venkatesh, B. V. Manikandan, S. Charles Raja- A. Srinivasan, "Electrical Power Systems Analysis, Security, Deregulation"– PHI, 2012.

Suggested Reading:

1. Md Shahidephpour and M. Alomoush, 'Restructured Electrical Power Systems', Marcel Dekker Inc, 2001.
2. T.K.Nagsarkar, M.S.Sukhija, Power System Analysis, Illustrated Edition, Oxford publications, 2007
3. A. J. Wood &B.F.Woollenberg- Power Generation, Operation and Control, 3rd Edition. John Wiley, 2013.

16EE E25

ELECTRICAL ESTIMATION AND COSTING

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 design and estimation of wiring
3. To design overhead and underground distribution lines, substations and illumination

Course Outcomes: After completion of this course, students will be able to:

1. Understand the design considerations of electrical installations.
2. Design electrical installation estimation and costing for buildings and small industries.
3. Design electrical installation estimation and costing for commercial and small industries.
4. Design electrical installation estimation and costing for 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.

UNIT-II

Residential Building Electrification: General Rules guidelines for wiring of residential installation and positioning of equipments**,** 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 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 considerations for planning of an electrical installation system for commercial building, 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 type 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, Line supports. Factors governing height of pole, Conductor materials, Determination of size of conductor for overhead transmission line, Cross arms, Pole brackets and clamps, Guys and Stays, Conductors configuration spacing and clearances, Conductors configuration spacing and clearances, Span lengths, Overhead line insulators, Insulator materials, Types of insulators, Lightning Arrestors, Phase plates, Danger plates, Anti climbing devices, Bird guards, Beads of jumpers. Anti climbing devices, Beads of jumpers. Muffs, 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, some important specifications.

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. "Er. V. K. Jain, Er. Amitabh Bajaj","Design of Electrical Installations", University Science Press.
3. "Gupta J. B., Katson, Ludhiana", "Electrical Installation, estimating and costing", S. K. Kataria and sons, 2013.
4. "Surjit Singh", "Electrical Estimation and Costing". Dhanpatrai & Co. second edition, 2001.

Suggested Reading:

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.
5. Code of Practice for earthling, Indian Standard Institution, IS: 3043-1966.
6. Code of Practice for Installation and Maintenance of induction motors, Indian Standard Institution, IS: 900-1965.
7. Code of Practice for electrical wiring, Installations (system voltage not exceeding 650 Volts), Indian Standard Institution, IS: 2274-1963.

16EG O01

Open Elective- II
TECHNICAL WRITING SKILLS

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 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.
2. 1.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

16ME O04

INTELLECTUAL PROPERTY RIGHTS

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Objectives: Student will learn

1. Fundamental aspects of IP
2. Aspects of IPR acts.
3. Awareness of multi disciplinary audience
4. Awareness for innovation and its importance
5. The changes in IPR culture and techno-business aspects of IPR

Outcomes: At the end of the course, a student

1. Will respect intellectual property of others
2. Learn the art of understanding IPR
3. Develop the capability of searching the stage of innovations.
4. Will be capable of filing a patent document independently.
5. Completely understand the techno-legal business angle of IPR and converting creativity into IPR and effectively protect it.

UNIT-I

Overview of Intellectual Property: Introduction and the need for intellectual property right (IPR), IPR in India – Genesis and Development, IPR abroad, Some important examples of IPR. Importance of WTO, TRIPS agreement, International Conventions and PCT

Patents: Macro economic impact of the patent system, Patent and kind of inventions protected by a patent, Patent document, How to protect your inventions. Granting of patent, Rights of a patent, how extensive is patent protection. Why protect inventions by patents. Searching a patent, Drafting of a patent, Filing of a patent, the different layers of the international patent system, (national, regional and international options), compulsory licensing and licensers of right & revocation, Utility models, Differences between a utility model and a patent. Trade secrets and know-how agreements

UNIT-II

Industrial Designs: What is an industrial design. How can industrial designs be protected? What kind of protection is provided by industrial designs? How long does the protection last? Why protect industrial designs?

UNIT-III

Trademarks: What is a trademark, Rights of trademark? What kind of signs can be used as trademarks. Types of trademark, function does a trademark perform, How is a trademark protected? How is a trademark registered. How long is a registered trademark protected for? How extensive is trademark protection. What are well-known marks and how are they protected? Domain name and how does it relate to trademarks? Trademark infringement and passing off.

UNIT-IV

Copyright: What is copyright. What is covered by copyright. How long does copyright last? Why protect copyright? Related Rights: what are related rights. Distinction between related rights and copyright. Rights covered by copyright? Copy rights in computer programming.

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, Delhi 2010

Suggested Reading:

1. W.R1 Cronish, "Intellectual Property; Patents, copyright, Trad and Allied rights", Sweet & Maxwell, 1993.
2. P. Narayanan, "Intellectual Property Law", Eastern Law Edn., 1997.
3. Robin Jacob and Daniel Alexander, "A Guide Book to Intellectual Property Patents, Trademarks, Copy rights and designs", 4/e, Sweet, Maxwell,.

16ME O08

INDUSTRIAL ADMINISTRATION AND FINANCIAL MANAGEMENT

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Objectives: Students able to learn

1. Various types of business organizations and organization structures and importance of plant location and plant layout.
2. Importance of industrial engineering techniques like method study and work measurement.
3. The significance of quality control and production planning and control
4. The importance of project management techniques
5. The total cost of a product based on elements of cost

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

1. Understand the role of different types of business organizations along with the need and importance of various types of layouts used in manufacturing industries
2. Apply the techniques of method study and work measurement in industry to enhance productivity
3. Understand the importance of quality control and plot the control charts
4. Apply the techniques of project management in industry
5. Calculate the total cost of the product based on its elements.

UNIT-I

Industrial Organization: Definition of an organization, types of various business organizations, organization structures and their relative merits and demerits, functions of management.

Plant location and layouts: Factors affecting the location of plant and layout, types of layouts and their merits and demerits.

UNIT-II

Work study: Definitions, objectives of method study and time study, steps in conducting method study, symbols and charts used in method study, principles of motion economy, calculation of standard time by time study and work sampling, performance rating factor, types of ratings, jobs evaluation and performance appraisal, wages, incentives, bonus, wage payment plans

UNIT-III

Inspection and quality control: Types and objectives of inspection, S.Q.C., its principles. Quality control chart and sampling plans, quality circles, introduction to ISO.

Production planning and control: Types of manufacture, types of production, principles of PPC and its function, production control charts.

UNIT-IV

Optimization: Introduction to linear programming and graphical solutions, assignment problems.

Project Management: Introduction to CPM and PERT, determination of critical path.

Material Management: Classification of materials, materials planning, duties of purchase manager, determination of economic ordering quantities, types of materials purchase.

UNIT-V

Cost accounting: Elements of cost, various costs, types of overheads, break even analysis and its applications, depreciation, methods of calculating depreciation fund, nature of financial management, time value of money, techniques of capital budgeting and methods, cost of capital, financial leverage.

Text Books:

1. Pandey I.M. , "Elements of Financial Management", Vikas Publ. House, New Delhi, 1994.
2. James C Van Horne, John M Wachowicz, Jr., "Fundamentals of Financial Management", 13/e, Prentice Hall Financial Times.
3. Khanna O.P., "Industrial Engineering and Management", Dhanapat Rai & Sons.

Suggested Reading:

1. S.N. Chary, "Production and Operations Management", 3/e, Tata McGraw Hill, 2006.
2. Paneer Selvam, "Production and Operations Management", Pearson Education, 2007.
3. Joseph Monk, "Operations Management", TMH Publishers, New Delhi, 2004.
4. Buffa Elwood S, "Modern Production /Operations Management", John Wiley Publishers, Singapore, 2002.
5. Everrete E. Adama & Ronald J. Ebert, "Production & Operations Management", 5/e, Prentice Hall of India, 2005.
6. S.D. Sharma, "Operations Research" ,Kedarnath, Ramnath & Co., Meerut, 2009.

16CS O03

IOT AND APPLICATIONS

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	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.

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. Develop real time IoT based projects.
5. Advance towards research based IoT.

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/0 interfaces, 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", CRC Press, 2017.
2. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi, 2018.
3. Arshdeep Bahga and Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

Suggested Reading:

1. Dr. SRN Reddy, Rachit Tirnkral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs, 2018.
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013.
3. Raj Kamal, "Internet of Things:Architecture and Design", McGraw Hill, 2017.
4. Cuno Pfister, "Getting Started with the Internet of Things", 0 Reilly Media, 2011.
5. O. Vermesan, P. Friess**, "**Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers, Series in Communications, 2013.

Online Resources:

1. Li Da Xu, Wu He, and Shancang Li, "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, et al. "Research and design of agriculture informatization system based on IOT." Journal of Computer Research and Development 48 (2011): 316-331.
4. Somov, Andrey, et al. "Bacteria to power the smart sensor applications: Biofuel cell for low-power IoT devices." 2018 IEEE 4th World Forum on Internet of Things (WF-IoT). IEEE, 2018.
5. Han, Shuqing, et al. "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.

16CS O04

BASICS OF DATA SCIENCE USING R

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	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. Understanding the basics of R, various statistical measures, algorithms useful for data analysis.
2. Explore the programming skills needed to use R tool for biological data.
3. Analyze biological data using R tool.
4. Apply classification and clustering algorithms to bilogical data.
5. Identify and work with the technologies and resources related to 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.

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. Arvil Cohhlan "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/