With effect from the academic year 2021-22

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

AICTE MODEL CURRICULUM

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-VII

Sl. No.	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			
			Hours per week			Duration in Hours	Maximum Marks		Credits
			L	T	P		CIE	SEE	
THEORY									
1	**18EEC25**	Power System Protection	3	-	-	3	30	70	3
2	**18EEC26**	Electrical Drives	3	-	-	3	30	70	3
3	**18EEC27**	Signals & Systems	3	-	-	3	30	70	3
4	**18EEEXX**	Core Elective-5	3	-	-	3	30	70	3
5	**18XXOYY**	Open Elective-2	3	-	-	3	30	70	3
PRACTICALS									
6	**18EEC28**	Power Systems-II Lab	-	-	3	3	25	35	1.5
7	**18EEC29**	Electrical Drives Lab	-	-	3	3	25	35	1.5
8	**18EEC30**	Project: Part-1	-	-	4	-	50		2
		Total	**15**	**-**	**10**	**21**	**250**	**420**	**20**

L: Lecture T: Tutorial P: Practical

CIE - Continuous Internal Evaluation SEE - Semester End Examination

Course Code	Core Elective-5
18EEE17	Power System Dynamics and Control
18EEE18	Switch Mode Power Converters
18EEE19	Electrical Machine Design
18EEE20	High Voltage Engineering

Course Code	Open Elective-2
18MEO03	Research Methodologies
18MEO04	Entrepreneurship
18EGO01	Technical Writing Skills
18CSO04	Basics of Data Science using R
18CSO07	Basics of Cyber Security

With effect from the academic year 2021-22

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

AICTE MODEL CURRICULUM

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-VIII

Sl. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			
			Hours per week			Duration In Hours	Maximum Marks		Credits
			L	T	P		CIE	SEE	
THEORY									
1.	**18EEEXX**	Core Elective-6	3	-	-	3	30	70	3
2.		Open Elective-3	3	-	-	3	30	70	3
PRACTICALS									
3.	**18EEC31**	Technical Seminar	-	-	2	-	50	-	1
4.	**18EEC32**	Project: Part-2	-	-	20	Viva voce	100	100	10
		Total	**6**		**22**		**210**	**240**	**17**

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

Course Code	Core Elective-6
18EEE21	Advanced Electric Drives
18EEE22	Digital Signal Processing
18EEE23	Smart Grid
18EEE24	Digital Control System

Course Code	Open Elective-3
18MEO07	Intellectual Property Rights (IPR)
18CEO02	Disaster Mitigation and Management (DMM)
18ITO02	Python Programming
18EGO02	Gender Sensitization
18PY O01	History of Science and Technology

VII – SEMESTER

With effect from the academic year 2021-22

18EEC25 POWER SYSTEM PROTECTION

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

Course Objectives:

1. To analyze principles of operation of the different Protection Devices.
2. To understand the different protection schemes employed in the protection of power system
3. To acquire knowledge of Numerical Protection Algorithm

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

1. Understand basic terminology of relays and types of over current protection of power system.
2. Distinguish the type of distance protection with principle & their application to three phase transmission lines.
3. Choose suitable differential scheme for the protection of various equipment in electrical power system.
4. Describe the principle of operation, and able to calculate the ratings of circuit breakers.
5. Familiarize with different protection methods against over-voltages.
6. Identify various elements of numerical relays, their functions and different techniques used in their design.

UNIT-I

Introduction to Protection Schemes: Need for protection, Backup protection, Zones of protection, Definitions of relay pickup, dropout and reset values, Classification of relays, Operating principles and construction of electromagnetic and induction relays.

Overcurrent Protection: Time-current characteristics, current settings, time settings, overcurrent protection schemes, direction relay, applications of Definite Time, IDMT and Directional relays distribution feeders, Earth fault and phase fault protection schemes, directional earth fault relay, static over current relay, fuse characteristics, types of fuses

UNIT-II

Distance Protection: Introduction, Impedance relay, reactance relay, MHO relay, effect of arc resistance and Power Swings on the performance of Distance Relaying, Selection of distance relays, Three-stepped Distance protection, Comparison of different distance protection schemes, Distance protection of three-phase lines.

UNIT-III

Differential protection: Introduction, simple differential protection, zone of differential protection, Percentage differential relay, Earth-leakage protection, Percentage Differential Protection of Transformers, Differential protection of transformer against Inrush phenomenon, Inter-turn faults in transformer. Differential protection of Bus-bars, Internal and External faults, Protection of Three-phase bus bars. Introduction to the Basic protection of Generator and Induction Motors

UNIT-IV

Circuit Breakers: Arc interruption, restriking voltage, recovery voltage, RRRV, current chopping, resistance switching, classification of circuit breakers, selection of circuit breakers

Over voltage protection: causes for over voltages, protection of transmission lies against direct lightning strokes, ground wires, arcing horns, lightning arrestors, surge absorbers, Peterson coils, insulation coordination

UNIT-V:

Basics of Numerical Protection: Block diagram of numerical relay, Sampling theorem, Least Error Square Technique, Digital Filtering, Numerical Relaying for overcurrent, Differential and distance protection (Elementary Treatment).

Text Books:

1. Badriram& Viswakarma, "Power System Protection and Switchgear", Tata McGraw Hill, 2011
2. Y.G. Paithankar & S.R. Bhide, "Fundamentals of power system protection", Prentice Hall, India, 2010.

Suggested Readings:

1. T.S.Madhava Raao, Power System Protection: Static Relays, Tata McGraw-Hill Education 1989
2. P.M.Anderson, Power System Protection, John Wiley, 2012
3. Electricity Training Association, Power System Protection. Vol.2.: Systems and Methods, Institute of engineering and Technology, 1995

With effect from the academic year 2021-22

18EEC26 **ELECTRICAL DRIVES**

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

Course Objectives:

1. To Understand the characteristics of various Electric Drives and its control using different power electronic converter circuits
2. To apply and analyse the concept of speed control DC motor drives with single phase, three phase converters and choppers.
3. To apply and analyse the concept of speed control induction motor by using AC voltage controller, VSI, CSI and cyclo-converter.
4. To apply and analyse the concept of speed control of synchronous motors using VSI, CSI and cyclo-converter.

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

1. Analyze 1-Φ & 3-Φ converters fed DC motors as well as chopper fed DC motors.
2. Understand the operational variance between single and multi-quadrant operation of various Electric Drives.
3. Comprehend the speed control of an AC-AC & DC-AC converter fed induction motor on stator and rotor side.
4. Illustrate the principles of speed control of synchronous motor with VSI, CSI and cyclo-converter.
5. Differentiate the features of closed loop operation of DC and AC electric drive and their controllers

UNIT-I

Electric Drive: Introduction, Block diagram and parts of electric drive

Dynamics of Electrical Drives: Types of Load- Types and Characteristics of load torque – Dynamics of motor-load combination – steady state & transient stability of an electrical drive.

Phase control converters fed DC drivers: Review of speed control techniques of DC motors, Single Phase and Three-phase semi and fully controlled converters connected to DC separately excited and DC series motors– continuous current mode of operation, output voltage and current waveforms, Speed and Torque expressions, Speed- Torque Characteristics. Problems on Converter fed DC motors.

UNIT –II

Four quadrant operation of DC drive: Introduction to four quadrant operation, motoring operation, electric braking – Plugging, Dynamic and regenerative braking operations. Four quadrant operation of D.C motors by dual converters – Closed loop operation of DC motor

UNIT –III

Chopper fed DC drives: Single, two and four quadrant chopper fed dc separately excited and series excited motors– continuous current operation, output voltage and current wave forms, speed torque expressions, speed torque characteristics, Problems on Chopper fed DC Motors, closed loop operation.

UNIT-IV

Induction Motor Drives-1: Variable voltage characteristics–Control of Induction Motor by AC Voltage Controllers – Waveforms –Speed torque characteristics, Variable Voltage Variable Frequency control of induction motor by voltage source inverter (VSI), current source inverter (CSI) and cyclo-converters, Comparison of VSI and CSI, closed loop operation of induction motor drives.

UNIT-V

Induction Motor Drives-2: Static rotor resistance control, closed loop speed control with static rotor resistance control, Slip power recovery schemes–Static Scherbius drive, Static Kramer Drive and their performance, speed torque characteristics.

Text Books:

1. G. K. Dubey, “Power Semiconductor Controlled Drives”, Prentice Hall, 1989.
2. R. Krishnan, “Electric Motor Drives: Modeling, Analysis and Control”, Prentice Hall, 2001.
3. M.H.Rashid, “Power Electronic Circuits, Devices and applications”, PHI.

Suggested Reading:

1. G. K. Dubey, “Fundamentals of Electrical Drives”, CRC Press, 2002.
2. W. Leonhard, “Control of Electric Drives”, Springer Science & Business Media, 2001.

With effect from the academic year 2021-22

18EEC27 **SIGNALS AND SYSTEMS**

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

Course Objectives:

1. To introduce the concepts of continuous time and discrete time systems and analyse systems in complex frequency domain.
2. To demonstrate sampling theorem and its applications.
3. To elucidate the techniques of Laplace and Z- transforms and their applications on various systems

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

1. Understand the basics of signals and systems and classify them
2. Analyse systems in complex frequency domain.
3. Understand sampling theorem and its implications.
4. Explore the applications of Laplace transforms to continuous time systems
5. Apply the Z-transform techniques to discrete time systems

UNIT-I

Introduction to Signals and Systems: Signals and systems as seen in everyday life, in various branches of engineering and science, Signal properties: periodicity, absolute integrability, deterministic and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability and their examples.

UNIT-II

Behaviour of continuous and discrete-time LTI systems: Impulse response and step response, convolution, input-output behaviour with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems, System representation through differential equations and difference equations, State-space Representation of systems, State-Space Analysis, Multi-input, Multi-output representation, State Transition Matrix and its Role, Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

UNIT-III

Fourier Transforms: Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients, Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Property of duality in Fourier. The Discrete- Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem.

UNIT-IV

Laplace and z- Transforms: Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behaviour. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis

UNIT-V

Sampling and Reconstruction: The Sampling Theorem and its implications, Spectra of sampled signals, Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects, Relation between continuous and discrete time systems, Introduction to the applications of signal and system theory- Feedback control systems,

Text Books:

1. A.V. Oppenheim, A. S. Willsky and S. H. Nawab, “Signals and systems”, Prentice Hall India, 1997
2. J. G. Proakis and D. G. Manolakis, “Digital Signal Processing: Principles, Algorithms and Applications”, Pearson, 2006.

Suggested Reading:

1. H. P. Hsu, “Signals and systems”, Schaum’s series, McGraw Hill Education, 2010.
2. S. Haykin and B. V. Veen, “Signals and Systems”, John Wiley and Sons, 2007.

With effect from the academic year 2021-22

18EEC28 **POWER SYSTEMS-II LAB**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Course Objectives:

1. To simulate and understand the load flows, Fault Analysis of power system.
2. To understand the transient stability studies, Economic power scheduling and Load frequency control in power system.
3. To understand the importance of protective relay kits and also study the various components in substations

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

1. Apply the load flow studies for any given power system.
2. Analyze the fault in the real time power system.
3. Estimate the consequences of transient stability, economic power scheduling and load frequency control.
4. Examine function of different types of relays for different power system applications.
5. Illustrate the functionality of each component in the substation.

List of Experiments

1. Simulation of Load Flow Studies
2. Simulation of Fault Analysis.
3. Simulation of Transient stability studies.
4. Simulation of Economic power scheduling.
5. Simulation of Load Frequency control of one area system.
6. IDMT characteristics of Over-current relay.
7. Differential protection of 1-phase transformer.
8. Draw the Characteristics of Static relays.
9. Operation of relays in long transmission line.
10. Over Current & Earth Fault Relay Testing Kit (Static Type)
11. Study of Universal Relay Testing Kit
12. Generator Differential Protection Study Unit
13. Study of Distance Relay Testing Kit / Impedance Relay kit
14. Visiting nearby substation and submitting the report.

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

With effect from the academic year 2021-22

18EEC29 **ELECTRICAL DRIVES LAB**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Course Objectives:

1. To experiment and analyse the motor performance connected with power semiconductor source.
2. To be familiar with different speed control techniques of Drives.
3. To validate the experimental results with simulations.

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

1. Analyse the control strategies to modify the output parameters of dc and ac drives.
2. Develop, testing and experimental procedures by applying basic knowledge in electrical and electronics.
3. Demonstrate the principle of energy efficient motors by load matching.
4. Interpret the performance of a given drive by suitable experimentation.
5. Investigate the performance of a given drive by using suitable simulation software.

List of experiments:

PART-A

1. Speed control of DC drive using Thyristor controlled rectifier.
2. Speed control of DC drive using DC-DC Chopper.
3. Four-Quadrant Operation of DC drive.
4. Closed loop speed control of dc motor using PID controller.
5. Speed control of single-phase induction motor speed using TRIAC.
6. Speed control of Three-Phase Induction Motor using V/f control.
7. Speed Control of Three-Phase Induction Motor using AC-AC converter.
8. Regenerative/ Dynamic braking operation for AC drive.

PART-B

1. Simulation of Speed control of DC Motor using BJT-H bridge.
2. Simulation of Regenerative/ Dynamic breaking operation of DC motor.
3. Simulation of Step/ Ramp speed response of DC motor.
4. Simulation of VSI-fed 3-Phase Induction Motor drive.
5. Simulation of CSI-fed 3-Phase Induction Motor drive.
6. Simulation of Permanent Magnet synchronous motor drive.

Note: Any **Six** experiments from **Part-A** and **Four** from **Part-B** should be performed.

18EEC30 **PROJECT: PART-1**

Instruction	4 Hours per week
Semester End Examination	50 Marks
Credits	2

Prerequisite: Knowledge of preparing slides by using power point presentations, Capable of searching for suitable literature and Presentation skills.

Course Objectives:
This course aims to:
1. The student takes up investigative study in the broad field of Engineering / Technology, either fully theoretical/practical or involving both theoretical and practical.
2. The work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor.
3. This is expected to provide a good initiation for the student(s) towards R&D.

Course Outcomes:
Upon completion of this course, students will be able to:
1. List the various approaches to the selected problem.
2. Interpret the advantages and disadvantages of various approaches.
3. Apply the selected approach for simulating / modelling / designing the problem.
4. Analyse and write a report on the results of the simulation / modelling of the problem selected.
5. Justify and present the results of the simulation / model / design before the departmental committee.

The objective of Project Part -1 is to enable the student take up investigative study in the broad field of Engineering Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) towards R&D.
The work shall include:

Survey and study of published literature on the assigned topic;
Working out a preliminary Approach to the Problem relating to the assigned topic;
Conducting preliminary Analysis/Modelling/Simulation/Experiment/Design/Feasibility;
Preparing a Written Report on the Study conducted for Presentation to the Department;
Final Seminar, as oral Presentation before a departmental Committee.

Guidelines for the award of Marks: (Max. Marks: 50)

Evaluation by	Max. Marks	Evaluation Criteria / Parameter
Supervisor	20	Project Status / Review
	5	Report
Department Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Preparation

If we have built castles in the air, our work need not be lost; that is where they should be. Now lay the foundation under them. But a fool is one who, having no goal, redoubles his efforts.

With effect from the academic year 2021-22

18EEE17 **POWER SYSTEM DYNAMICS AND CONTROL**

(Core Elective-5)

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

Course Objectives:

1. To understand the power system stability and its impact on the system.
2. To analyze linear dynamical systems and use of numerical integration methods
3. To model different power system components for the study of stability and methods to improve stability

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

1. Acquire the concepts of various types of stability and its control
2. Apply different numerical techniques for stability studies
3. Understand the concepts of small and large disturbance stability
4. Acquire the concepts of different models of synchronous machines and its controllers
5. Recognize the importance of enhancing the power system stability

UNIT-I

Introduction to Power System Operations: Introduction to power system stability, Power System Operations and Control. Stability problems in Power System, Impact on Power System Operations and control

UNIT-II

Analysis of Linear Dynamical System and Numerical Methods: Analysis of dynamical System, Concept of Equilibrium, Small and Large Disturbance Stability, Modal Analysis of Linear System, Analysis using Numerical Integration Techniques, Issues in Modelling: Slow and Fast Transients, Stiff System.

UNIT-III

Modeling of Synchronous Machines: Physical Characteristics, Rotor position dependent model, d-q Transformation, Model with Standard Parameters. Steady State Analysis, Short Circuit Transient Analysis, Synchronization of Synchronous Machine to an Infinite Bus, Modeling of Excitation and Prime Mover Systems, Physical Characteristics and Models.

UNIT-IV

Stability Analysis: Angular stability analysis in Single Machine Infinite Bus System, Angular Stability in multi-machine systems–Intra-plant, Local and Inter-area modes, Frequency Stability, Centre of Inertia Motion, Load Sharing, Governor droop, Single Machine Load Bus System-Voltage Stability

UNIT-V

Enhancing System Stability: Planning Measures, Stabilizing Controllers (Power System Stabilizers), Operational Measures-Preventive Control, Emergency Control.

Text Books:

1. K.R. Padiyar, “Power System Dynamics, Stability and Control”, B. S. Publications, 2002.
2. P. Sauer and M. A. Pai, “Power System Dynamics and Stability”, Prentice Hall, 199

Suggested Reading:

1. P. Kundur, “Power System Stability and Control”, McGraw Hill, 1995
2. P. M. Anderson & A. A. Fouad “Power System Control and Stability”, Galgotia, New Delhi,1981

With effect from the academic year 2021-22

18EEE18 **SWITCH MODE POWER CONVERTERS**

(Core Elective-5)

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

Course Objective:

1. To study the design aspects of DC-DC converters and SMPS.
2. To comprehend the basic concepts of resonant converters.
3. To familiarize with the design of inductor, transformer for power converter circuits and to know various voltage control techniques in inverters.

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

1. Design different types of DC-DC converters.
2. Comprehend different types of SMPS for electrical applications.
3. Understand the operation of different resonant converters.
4. Design a suitable filter along with the suitable selection of transformer and switches that are used in power electronic converter circuits.
5. Compare different voltage control techniques in inverters.

UNIT-I

Basic Converter Circuits: Design of critical inductance and capacitance of Buck, Boost and Buck Boost Regulators, Cuk Converter Choice of Switching Frequency-Design Aspects

UNIT-II

Isolated SMPS: Fly back Converters, Forward Converters, Half Bridge and Full Bridge Converters, Push Pull Converters and SMPS with multiple outputs, Choice of Switching Frequency-Design Aspects

UNIT-III

Resonant Converters: Classification, Basic resonant circuit concepts, Load resonant, Resonant switch converters, Resonant D.C Link Inverters with Zero Voltage Switching, High frequency Link Integral Half-Cycle converters.

UNIT-IV

Design of Inductor and Transformer: Selection of Output Filter Capacitor, Selection of Energy Storage Inductor, Design of High Frequency Inductor and High Frequency Transformer, Selection of Switches, Snubber Circuit Design.

UNIT-V

Voltage Control in Inverters: Voltage control Techniques in inverters, Bipolar sinusoidal modulation and unipolar sinusoidal modulation, modulation index and output voltage, three-phase sinusoidal modulation

Text Books:

1. Mohan N. Undeland . T & Robbins W, Power Electronics Converters, Application and Design. John Wiley, 3rd edition, 2007.
2. Mohammed H. Rashid, “Power Electronics, Devices, circuits and applications”, Pearson Education, 4th Edition, 2017
3. H. W. Whittington, B. W. Flynn and D. E. MacPherson, Switched Mode Power Supplies, Design and Construction, Universities Press, 2009.

Suggested Reading:

1. Umanand L., Bhat S.R., Design of magnetic components for switched Mode Power Converters. , Wiley Eastern Ltd.,1992
2. V. Ramanarayanan, Course Material on Switched Mode Power Conversion

With effect from the academic year 2021-22

18EEE19 **ELECTRICAL MACHINE DESIGN**

(Core Elective-5)

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

Course Objectives:

1. To understand the design parameters of various electrical machines**.**
2. To analyze the electrical and mechanical characteristics of electrical machines**.**
3. To become familiar with CAD usage.

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

1. Recognize the various parameters required for machine design.
2. Interpret the electrical machines based on different design constraints.
3. Assess the size of a machine with the given data.
4. Describe the various computational methods applicable in machine design.
5. Design an electric machine with the given conditions.

UNIT-I

Basics of Machine design aspects: Major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings, thermal considerations, heat flow, temperature rise, rating of machines.

UNIT-II

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

UNIT-III

Design of Induction Motors: Output equation, Sizing of an induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, magnetic leakage calculations, leakage reactance of poly phase machines, magnetizing current, short circuit current.

UNIT-IV

Design of Synchronous Machines: Output equation, Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, estimation of air gap length, design of rotor, design of damper winding, determination of full load field mmf, design of turbo alternators, Cooling of alternators.

UNIT-V

Computer aided Design (CAD): Limitations (assumptions) of traditional designs, need for CAD analysis, synthesis and hybrid methods, design optimization methods, variables, constraints and objective function, problem formulation. Introduction to FEM based machine design.

Text Books:

1. K. Sawhney, “A Course in Electrical Machine Design”, Dhanpat Rai and Sons, 1970.
2. K. M. V. Murthy, “Computer Aided Design of Electrical Machines”, B.S. Publications, 2008.

Suggested Reading:

1. S. K. Sen, “Principles of Electrical Machine Design with computer programmes”, Oxford and IBH Publishing, 2006.
2. V. N. Mittal and Arvind Mittal “Design of Electrical Machines” Standard Publishers Distributors, New Delhi, 2009.

With effect from the academic year 2021-22

18EEE20 **HIGH VOLTAGE ENGINEERING**

(Core Elective-5)

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

Course Objectives:

1. To know the breakdown mechanism in gases, liquids and solid dielectrics.
2. To understand the methods of generation and measurement of high voltages and currents.
3. To know the testing of HV electrical equipment and High Voltage laboratories.

Course Outcomes: After completion of this course, students will demonstrate:

1. Define Townsend's first and second ionization coefficients
2. Illustrate various breakdown mechanisms in gas, liquid and solid insulating materials.
3. Analyze the generation of dc, ac and impulse voltage and currents.
4. Discuss the various measurement methods of dc, ac and impulse voltages and currents.
5. Explain the testing of high voltage equipment, HV laboratories and safety precautions in HV labs.

UNIT-I

Breakdown in Gases: Mechanism of breakdown, Types of collisions, Ionization processes, Townsend's First and second Ionization coefficients, Townsend's breakdown mechanism, Streamer theory of breakdown, Panchen's Law, Corona discharges.

UNIT-II

Breakdown in liquid and solid insulating materials: Pure liquids and commercial liquids, Breakdown in pure and commercial liquid, Solid dielectrics and Composite dielectrics, Intrinsic breakdown, Electro-mechanical breakdown, Thermal breakdown, Breakdown due to treeing and tracking, Breakdown due to internal discharges.

UNIT-III

Generation of High Voltages and Currents: Generation of high dc voltages, Generation of high ac voltages, Generation of Impulse voltages and currents, Tripping and control of impulse generators.

UNIT-IV

Measurement of High Voltage and Currents: Measurement of Peak voltage, Impulse voltages and high Direct current measurements, Cathode Ray Oscillographs for Impulse voltage and current measurements, Measurement of dielectric constant and loss factor, Partial discharge measurements.

UNIT-V

High Voltage testing of Electrical Apparatus: Testing of Insulators, bushings, isolators, circuit breakers, Cables, Power capacitors and Power transformers. High Voltage laboratory, Indoor and Outdoor laboratories, Safety precautions in HV labs

Text Books:

1. M.S. Naidu and V. Kamaraju, "High Voltage Engineering", McGraw Hill Education, 2013.
2. C.L. Wadhwa, "High Voltage Engineering", New Age International Publishers, 2007.

Suggested Reading:

1. E.Kuffel, W.S.Zaengl & J.Kuffel, "High Voltage Engineering Fundamentals", Newness Publication, 2000
2. M. Khalifa, "High Voltage Engineering: Theory and Practice", Dekker, 1990

With effect from the academic year 2021-22

18ME O03 **RESEARCH METHODOLOGIES**

(Open Elective-2)

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

Objectives:

1. To make the students to formulate the research problem.
2. To identify various sources for literature review and data collection.
3. To prepare the research design.
4. To equip the students with good methods to analyze the collected data.
5. To explain how to interpret the results and report writing.

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

1. Define research problem. (BL-1)
2. Review and assess the quality of literature from various sources. (BL-2)
3. Understand and develop various sresearch designs. (BL-2)
4. Analyze problem by statistical techniques: ANOVA,F-test,Chi-square. (BL-4)
5. Improve the style and format of writing a report for technical paper/Journal report. (BL-4)

UNIT – I

Research methodology: Objectives and motivation of research, types of research- descriptive vs. analytical, applied vs. fundamental, quantitative vs. qualitative, conceptual vs. empirical, research approaches, significance of research, research methods vs. methodology, research process, criteria of good research, problems encountered by researchers in India, technique involved in defining a problem.

UNIT–II

Literature survey: Importance of literature survey, sources of information-primary, secondary, tertiary, assessment of quality of journals and articles, information through internet.

UNIT – III

Research design: Meaning of research design, need of research design, feature of a good design important concepts related to research design, different research designs, basic principles of experimental design, steps in sample design.

UNIT – IV

Data collection: Collection of primary data, Secondary data, measures of central tendency-mean, mode, median, measures of dispersion- range, mean deviation, standard deviation, measures of asymmetry (skewness), important parametric tests -z, t, F, Chi-Square, ANOVA significance.

UNIT-V

Research report formulation and presentation: Synopsis, dissertation, technical paper and journal paper, writing research grant proposal, making presentation with the use of visual aids, writing a proposal for research grant.

Text Books:

1. C.R Kothari, "Research Methodology Methods & Technique", New Age International Publishers,2004.
2. R. Ganesan, "Research Methodology for Engineers", MJP Publishers,2011.
3. Vijay Upagade and AravindShende, "Research Methodology", S. Chand &Company Ltd., New Delhi,2009.

Suggested Reading:

1. G. NageswaraRao, "Research Methodology and Quantitative methods", BS Publications, Hyderabad,2012.
2. Naval Bajjai, "Business Research Methods", Pearson Education,2011.

With effect from the academic year 2021-22

18ME O04 **ENTREPRENEURSHIP**

(Open Elective-2)

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

Objectives:

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

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

1. Understand the concept and essence of entrepreneurship. (BL-2)
2. Identify business opportunities and nature of enterprise. (BL-3)
3. Analyze the feasibility of new business plan. (BL-4)
4. Apply project management techniques like PERT and CPM for effective planning and execution of projects. (BL-3)
5. Use behavioral, leadership and time management aspects in entrepreneurial journey (BL-3)

UNIT-I

Entrepreneurship: Definition, functions of entrepreneurship, qualities of entrepreneurs, identification and characteristics of entrepreneurs, entrepreneur vs. intrapreneur, first generation entrepreneurs, women entrepreneurs, conception and evaluation of ideas and their sources.

UNIT-II

Indian industrial environment: Competence, opportunities and challenges, entrepreneurship and economic growth, small scale industry in India, objectives, linkage among small, medium and heavy industries, types of enterprises, corporate social responsibility.

UNIT-III

Business plan: Introduction, elements of business plan and its salient features, business model canvas, technical analysis, profitability and financial analysis, marketing analysis, feasibility studies, executive summary, selection of technology and collaborative interactions.

UNIT-IV

Project management: During construction phase, project organization, project planning and control using CPM, PERT techniques, human aspects of project management, assessment of tax burden.

UNIT-V

Behavioral aspects of entrepreneurs: Personality, determinants, attributes and models, leadership concepts and models, values and attitudes, motivation aspects, time management: approaches of time management, their strengths and weaknesses. time management matrix and the urgency addiction .

Text Books:

1. Vasant Desai, “Dynamics of Entrepreneurial Development and Management”, Himalaya Publishing House, 1997.
2. Prasanna Chandra, “Project-Planning, Analysis, Selection, Implementation and Review”, Tata Mcgraw-Hill Publishing Company Ltd.1995.
3. S.S. Khanka, “Entrepreneurial Development”, S. Chand & Co. Pvt. Ltd., New Delhi,2015.

Suggested Reading:

1. Robert D. Hisrich, Michael P. Peters, “Entrepreneurship”, 5/e, Tata Me Graw Hill Publishing Company Ltd., 2005.
2. Stephen R. Covey and A. Roger Merrill, “First Things First”, Simon and Schuster Publication,1994.

With effect from the academic year 2021-22

18EGO01 **TECHNICAL WRITING SKILLS**

(Open Elective-2)

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

Course Objectives: The course will introduce the students to:

1. Process of communication and channels of communication in general writing and technical writing in particular.
2. Learn Technical Writing including sentence structure and be able to understand and use technology specific words.
3. Write business letters and technical articles.
4. Write technical reports and technical proposals.
5. Learn to write agenda, record minutes of a meeting, draft memos. Understand how to make technical presentations.

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

1. Communicate effectively, without barriers and understand aspects of technical communication.
2. Differentiate between general writing and technical writing and write error free sentences using technology specific words
3. Apply techniques of writing in business correspondence and in writing articles.
4. Draft technical reports and technical proposals.
5. Prepare agenda and minutes of a meeting and demonstrate effective technical presentation skills.

Unit I

Communication – Nature and process.
Channels of Communication – Downward, upward and horizontal communication. Barriers to communication.
Technical Communication – Definition, oral and written communication. Importance and need for Technical communication. Nature of Technical Communication. Aspects and forms of Technical communication. Technical communication Skills – Listening, Speaking, Reading & Writing.

Unit II

Technical Writing – Techniques of writing. Selection of words and phrases in technical writing. Differences between technical writing and general writing. Abstract and specific words. Sentence structure and requisites of sentence construction. Paragraph length and structure.

Unit III

Business correspondence – Sales letters, letters of Quotation, Claim and Adjustment letters.
Technical Articles : Nature and significance, types. Journal articles and Conference papers, elements of technical articles.

Unit IV

Technical Reports : Types, significance, structure, style and writing of reports. Routine reports, Project reports.
Technical Proposals : Definition, types, characteristics, structure and significance.

Unit V

Mechanics of Meetings : Preparation of agenda, participation, chairing and writing minutes of a meeting. Memorandum. Seminars, workshops and conferences.
Technical Presentations : Defining purpose, audience and locale, organizing content, preparing an outline, use of Audio Visual Aids, nuances of delivery, importance of body language and voice dynamics.

Text Book :

1. Meenakshi Raman & Sangeeta Sharma, "Technical Communications-Principles and Practice", Oxford University Press, Second Edition, 2012.
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

With effect from the academic year 2021-22

18CSO04 **BASICS OF DATA SCIENCE USING R**

(Open Elective-2)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Probability and Statistics, basics of programming languages.

Course Objectives: The objectives of this course are

1. Understand R programming language.
2. Explore the programming skills needed to use R tool for statistical analysis of Biological data.
3. Analyze biological data.

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

1. Summarize the basics of R and in-built data visualization packages.
2. Describe the data analysis using Bayesian and stochastic modelling.
3. Relate gibbs, Z- sampling distributions and compare the binomial, chi-square, wilcoxon and Fisher's exact tests in hypothesis testing.
4. Explore the ANOVA in Regression analysis and classify the multivariate data.
5. Experiment with the biological data using R tool and apply clustering algorithms to biological data.
6. Identify R commands for data manipulation and database technologies for datasets of bioinformatics.

UNIT - I

Basics of R: Introduction, R features, setting up and exploring R environment, loading packages, types of data objects in R, working with R data objects, Controlling work space, importing files. Programming with R: Variables and assignment, operators, control structures, Functions-built-in, writing own functions, package creation.

UNIT - II

Data Analysis and Graphics: Data summary functions in R, Graphics technology in R, saving graphics, additional graphics packages. Bayesian Data Analysis: Need of Bayesian approach, Application of Bayes rule, Priors, Likelyhood functions, evaluating the posterior, Applications of Bayesial Statistics in Bioinformatics. Stochastic Modeling: Stochastic process and Markov Processes, Classification of Stochastic processes, modeling a DNA sequence with Markov Chain, Characteristics of Markov Chain.

UNIT - III

MCMC using Brugs: ABO blood type example. Gibbs sampling. Statistical Inference: Sampling distributions, Parameter estimation, interval estimation, bootstrapping, R packages for bootstrapping. Hypothesis Testing: Package ctest, Binomial test, comparing variances, Wilcoxon tests, Chi-Square test, Fisher's Exact tests, Likelihood Ratio tests.

UNIT - IV

ANOVA and Regression: ANOVA table, perforating ANOVA using R, graphical analysis of ANOVA comparison, Regression: Correlations, linear regression model, fitting and testing of regression model, generalization of the model. Working with Multivariate Data: Multivariate data, sample statistics, display of multivariate data, outliers and principal components. Classification of discriminate analysis- classification with two population and more than two populations, cross validation classification trees.

UNIT - V

Clustering methods: measures of dissimilarities, K-means clustering, K-Medoid clustering, Hierarchical clustering-Agglomerate and divisive. R Packages: Bio-conductor and Seqin R.

Data Technologies: R for Data manipulation, example, Database technologies, Bioinformatics resources on the WWW.

Textbooks:

1. Kim Seefeld, Ernest Linder, "Statistics using R with Biological examples", 2007 (https://cran.r-project.org/doc/contrib/Seefeld_StatsRBio.pdf).
2. Robert Gentleman, "R Programming for Bioinformatics", 1st Edition, CRC Press, 2008.

Suggested Reading:

1. ArvilCohhlan "A Little Book of R for Bioinformatics", Release 1.0, CC ver 3.0

Online Resources:

1. https://epdf.tips/r-programming-for-bioinformatics.html
2. https://epdf.tips/r-programming-for-bioinformatics.htmlhttps://www.cyclismo.org/tutorial/R/objectOriented.html
3. https://www.w3schools.in/r/object-oriented/

With effect from the academic year 2021-22

18CSO07 **BASICS OF CYBER SECURITY**

(Open Elective-2)

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

Pre-requisites: Operating System, Computer Network, Cryptography.

Course Objectives: This course aims to:

1. Identify and present indicators that a cybercrime has occurred and understand methods and tools used in cybercrimes.
2. Collect, Process, Analyze and Present Computer Forensics Evidence.
3. Understand the legal perspectives and Organizational implications of Cyber Security

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

1. List the different types of cybercrimes and analyze legal frameworks to handle cybercrimes.
2. Identify the Tools and Methods used in cybercrimes.
3. Analyze and resolve cyber security issues and laws governing Cyberspace.
4. Describe the need of Digital Forensics and the importance of digital evidence in prosecution.
5. Interpret the commercial activities in the event of significant information security incidents in the Organization.
6. Discuss the vulnerabilities in networking protocols and their mitigation techniques.

UNIT - I

Introduction to Cyber Crime: Cyber Crime: Definition and Origins of the Word, Cybercrime and Information Security, Classification of Cyber Crimes, Cyber Crime: The Legal Perspective, Cyber Crime: An Indian Perspective, A Global Perspective of Cyber Crime.

UNIT - II

Cyber Offenses: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector. Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT - III

Cyber Security: The Legal Perspectives: Cyber Crime and the Legal Landscape around the World, Need of Cyber laws: the Indian Context, The Indian IT Act, Challenges to Indian Law and Cyber Crime Scenario in India, Digital Signatures and the Indian IT Act, Cyber Crime and Punishment, Cyber Law, Technology and Students: The Indian Scenario.

UNIT - IV

Understanding Cyber Forensics: Introduction, Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Cyber Forensics Investigation, Challenges in Computer Forensics.

UNIT - V

Cyber Security: Organizational Implications: Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

Text Books:

1. Sunit Belpre and Nina Godbole, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley India Pvt. Ltd, 2011.
2. Kevin Mandia, Chris Prosise, Incident Response and computer forensics, Tata McGraw Hill, 2006.

Suggested Reading:

1. Alfred Basta, Nadine Basta, Mary Brown, Ravinder Kumar, Cyber Security and Cyber Laws, Paperback – 2018.
2. Mark F Grady, Fransesco Parisi, The Law and Economics of Cyber Security, Cambridge university press, 2006.

Online Resources:

1. https://www.edx.org/learn/cybersecurity
2. https://www.coursera.org/courses?query=cyber%20security
3. https://swayam.gov.in/course/4002-cyber-law

VIII- SEMESTER

With effect from the academic year 2021-22

18EEC31 **TECHNICAL SEMINAR**

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

Course Objectives:

1. To introduce students to critical reading, understanding, summarizing, explaining and preparing report on state-of- the-art topics in a broad area of his/her specialization.
2. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.
3. Documenting the seminar report in a prescribed format.

Course Outcomes:

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

1. Collect, Organize, Analyze and Consolidate information about emerging technologies from the literature.
2. Exhibit effective communication skills, stage courage, and confidence.
3. Demonstrate intrapersonal skills.
4. Explain new innovations/inventions in the relevant field.
5. Prepare and experience in writing the Seminar Report in a prescribed format.

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state-of-the-art topics in a broad area of his/ her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

The seminar must be clearly structured and the power point presentation shall include following aspects:

1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Each student is required to:

1. Submit a one-page synopsis of the seminar talk for display on the notice board.
2. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes in PowerPoint, followed by Question and Answers session for 10 minutes.
3. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by the department.

- Seminars are to be scheduled from 3rdweek to the last week of the semester and any change in schedule shall be discouraged.
- For the award of sessional marks, the students are judged by three (3) faculty members and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation.

Note: Topic of the seminar shall be preferably from any peer reviewed recent Journal publications.

Guidelines for awarding marks (CIE): Max. Marks: 50		
S.No	**Description**	**Max. Marks**
1	Contents and relevance	10
2	Presentation skills	10
3	Preparation of PPT slides	05
4	Questions and answers	05
5	Report in a prescribed format	20

With effect from the academic year 2021-22

18EEC32 **PROJECT: PART-2**

Instruction	20 P Hours per Week
Duration of SEE	Viva Voce
SEE	100 Marks
CIE	100 Marks
Credits	10

Prerequisite: Student must have earned the credit of 'Project: Part - 1'.

Course Objectives:

1. The object of Project: Part2 is to enable the student extend further the investigative study, either fully theoretical/practical or involving both theoretical and practical work.
2. The work shall be carried out under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry.
3. Preparing an Action Plan for conducting the investigation, including team work;

Course Outcomes:

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

1. Recall the details of the approach for the selected problem.
2. Interpret the approach to the problem relating to the assigned topic.
3. Determine the action plan to conduct investigation.
4. Analyze and present the model / simulation /design as needed.
5. Evaluate, present and report the results of the analysis and justify the same.

The objective of 'Project: Part-2' is to enable the student extend further the investigative study taken up, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned;
2. Review and finalization of the Approach to the Problem relating to the assigned topic;
3. Preparing an Action Plan for conducting the investigation, including team work;
4. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed;
5. Final development of product/process, testing, results, conclusions and future directions;
6. Preparing a paper for Conference presentation/ Publication in Journals, if possible;
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar presentation before Departmental Committee.

Guidelines for awarding marks in CIE: (**Max. Marks: 100**)

Evaluation by	**Max. Marks**	**Evaluation Criteria / Parameter**
Departmental Review Committee	10	Review 1
	15	Review 2
	25	Submission
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	10	Quality of the work which may lead to publications
	10	Report Preparation
	10	Analytical / Programming / Experimental Skills

With effect from the academic year 2021-22

18EEE21 **ADVANCED ELECTRIC DRIVES**

(Core Elective – 6)

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

Course Objectives:

1. To Understand the principles of commutation in converters and study the performance, stability and control aspects of DC motors and Induction motors.
2. To Understand the microprocessor-based control of electric drives
3. To Study the working principles and control aspects of special motors: Brushless DC motor, Switched Reluctance Motor drives.

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

1. Identify and consider the requirement of power converters for a given application.
2. Illustrate the digital methods of DC motor speed control techniques.
3. Show how the changes effect in different speed control schemes of Induction motor.
4. Analyse the performance of Synchronous motor with and without sinusoidal supply.
5. Recognize and formulate problems encountered by special motor drives for a particular application.

UNIT I

Review of Power Converters: Over view of Power converters in Electric Drives, Commutation in Thyristorpower converters, Principle of natural commutation and forced commutation, Discontinuous conduction in converters, DC choppers, Force commutated inverters, Frequency conversion. Inverter voltage control, Harmonic neutralisation, Voltage controller.

UNIT II

DC Drives: General considerations, Evaluation of a dc drive performance Forced commutation schemes to improve the performance of the drives, Steady-State Analysis of the Three-Phase Converter Controlled rectifiers, Steady-state analysis of chopper-controlled dc motors, Closed loop control of solid state DC drives, DC motor speed control using microprocessor (Block Diagram and Flowchart Approach only)

UNIT III

Induction Motor Drive: Speed control of IM, Analysis of IM on non-sinusoidal voltage waveforms, Scalar and vector control of induction motor, Direct torque and flux control of induction motor, Analysisof CSI fed IM ,Performance of CSI fed IM, Static slip energy recovery schemes employing Converter cascades in the rotor circuit Dynamic behavior and stability of Variable frequency IM, Induction motor speed control using microprocessor (Block Diagram and Flowchart Approach only).

UNIT IV

Synchronous Motor Drive: Analysis of SM fed from non-sinusoidal supplies, Performance of SM on non-sinusoidal voltages, Performance of CSI fed SM, Marginal angle control of SM, stability of SM on non-sinusoidal supplies, Self-controlled synchronous motor drive, Vector control of synchronous motor, Synchronous motor speed control using microprocessor (Block Diagram and Flowchart Approach only).

UNIT V

Special Motor Drives: Introduction to various special motor drives. **Switched reluctance motor**- drive construction, Working principle, Normalized torque-speed characteristics, Speed Control Schemes, **Brushless DC Motor**–construction, Working principle, Torque-speed characteristics, Speed Control Schemes,Permanent magnet motor drives, **Solar Powered Drive-** motors suitable for pump drives, solar powered pump drives, **Battery Powered Drives**-battery powered vehicles, basics, current status and scope for growth

Text Books:

1. Vedam Subramanyam, 'Thyristor Control of Electric Drives', Tata McGraw Hill Publishing Co., New Delhi,1987.
2. G.K.Dubey, Fundamentals of Electrical Drives; Narosa Publishing House, 1995.
3. P.S.Bimbra, Generalised theory of Electrical Machines, Khanna Publication, 2006.

Suggested Reading:

1. R. Krishnan, 'Electric Motor Drive: Modeling, Analysis and Control' Prentice Hall of India, 2001.
2. B.K.Bose, 'Power Electronics and AC Drives', Prentice Hall, 2002

With effect from the academic year 2021-22

18EEE22 **DIGITAL SIGNAL PROCESSING**

(Core Elective – 6)

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

Course Objectives:

1. To explain mathematical representation of signals in continuous, discrete time and frequency domain.
2. To demonstrate analysis of discrete time systems using Z-transforms, Discrete-Fourier Transform (DFT) and the FFT algorithms
3. To illustrate design of IIR and FIR digital filters for various applications.

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

1. Represent signals mathematically in continuous and discrete-time domain
2. Analyse discrete-time systems using z-transformation
3. Analyse the Discrete-Fourier Transform (DFT) and FFT algorithms
4. Design analog IIR filter and covert into digital IIR filters by using various digitized techniques
5. Design analog FIR filter by using various windowing techniques

UNIT-I

Discrete-time signals and systems: Sequences, representation of signals on orthogonal basis; Representation of discrete systems using difference equations, Sampling and reconstruction of signals, aliasing, Sampling theorem and Nyquist rate.

UNIT-II

Z-transformations: Region of Convergence, Analysis of Linear Shift Invariant systems using z-transform, Properties of Z-transform for causal signals, Interpretation of stability in z-domain, Inverse z-transforms.

UNIT-III

Discrete Fourier Transform: Frequency Domain Analysis, Discrete Fourier Transform (DFT), Properties of DFT, Convolution of signals, Fast Fourier Transform (FFT) Algorithm, Parseval's Identity, Implementation of Discrete Time Systems.

UNIT-IV

IIR Filters: Design of Butterworth, Chebyshey filters, IIRfilter design by impulse invariant bilinear transformation, impulse invariance method, step invariance method.

UNIT-V

FIR Filters: Characteristics of FIR Digital Filters. Frequency response, comparison of FIR, IIR filters, Window techniques, Design of these filters using Rectangular, Hamming, Bartlet, Kaiser windows, Architecture and features of TMS 320F/2047 and ADSP signal processing chips, Applications of DSP.

Text Books:

1. S. K. Mitra, "Digital Signal Processing: A computer based approach", McGraw Hill, 2011.
2. A.V. Oppenheim and R. W. Schafer, "Discrete Time Signal Processing", Prentice Hall, 1989.
3. J. G. Proakis and D.G. Manolakis, "Digital Signal Processing: Principles, Algorithms and Applications", Prentice Hall, 1997.
4. P. VenkataRamani, M. Bhaskar, "Digital Signal Processo1; Architecture, Programming & Application", TataMcGrawHill-2004

Suggested Reading:

1. Anandkumar A, Digital Signal Processing, Second edition PHI learning, 2015
2. L. R. Rabiner and B. Gold, "Theory and Application of Digital Signal Processing", Prentice Hall,1992.
3. J. R. Johnson, "Introduction to Digital Signal Processing", Prentice Hall, 1992.
4. D. J. DeFatta, J. G. Lucas andW. S. Hodgkiss, "Digital Signal Processing", John Wiley & Sons,1988

With effect from the academic year 2021-22

18EEE23 **SMART GRID**

(Core Elective – 6)

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

Course Objectives:

1. To study the importance of smart grid and components of smart grid
2. To understand the communication technologies, infrastructure required for smart metering
3. To know various functions of distribution automation and operation of micro grid

Course outcomes: At the end of this course, students will be able to:

1. Discuss the components and operation of Smart Grid at transmission and distribution level
2. Select the communication technology required for smart grid applications
3. Illustrate components and operation of smart metering and implementation of demand side integration
4. Analyze the different types of micro grid, storage systems and communication infrastructure
5. Explain the equipment used in distribution automation and implement the distribution management system functions

UNIT-I

Introduction to smart grid: Today's Grid versus the Smart Grid, drivers of smart grid, functionalities and key components of smart grid, smart grid components for transmission system, smart grid functionalities at distribution level, smart grid vision and road map to India, policies, standards, regulations, national smart grid mission framework,

UNIT-II

Communication Technologies: Dedicated and shared communication channels, switching techniques, communication channels: wired communication, twisted pair, optical fiber, radio communication, Ethernet, wireless LAN, Bluetooth, WiMAX, standards for information exchange

UNIT-III

Smart Metering Infrastructure: Evolution of electricity metering, benefits of smart metering, components of smart metering, hardware requirements, communication infrastructure and protocols for smart metering: Home area network, neighborhood area network, data concentrator, meter data management system, Demand side integration(DSI): services, implementation of DSI, hardware support

UNIT-IV

Micro Grids: Introduction, mini/micro grids, architecture of micro grid, types of micro grid, Dc micro grid, ac micro grid, AC. DC micro grid, Protocols and standards, communication to monitor real time network status, energy storage in micro grids, benefits of distributed generation and energy storage in micro grid systems

UNIT-V:

Distribution Automation: Substation automation equipment: current transformers, voltage transformers, relay IED, faults in distribution system: components for fault isolation and restoration, voltage regulation, Distribution Management systems: Data sources and associated external systems, modelling and analysis tools, Applications: Network reconfiguration, volt/var control, outage management system, operation of DER, fault diagnosis and location

Text Books:

1. Janaka Ekanayake, Liyanage, Wu, Akihiko Yokoyama, Jenkins, Smart Grid, Wiley Publications, 2012
2. Stuart Borlas'e, "Smart Grid: Infrastructure, Technology and solutions" CRC Press

Suggested Reading:

1. James Momoh, "Smart Grid Fundamentals of Design and Analysis" IEEE Press, Wiley Publications, 2012
2. Smart grid Hand Book for Regulators and policy makers, Nov 2017 published by India Smart Grid Forum
3. Bharat Modi, Anuprakash, Yogesh Kumar, "Fundamentals of Smart grid Technology", Katson publishers, 2015

With effect from the academic year 2021-22

18EEE24 **DIGITAL CONTROL SYSTEMS**

(Core Elective-6)

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

Course Objectives:

1. To represent a continuous time system in its discrete form and develop a mathematical modeling.
2. To analyze a discrete time system using Z-transform tool and also to design discrete controllers and compensators.
3. To study the Classical Approach Theory of Discrete-time systems and to analyze non-linear system using Lyapunov stability concept.

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

1. Understand the concepts of discrete representation of the continuous time system
2. Analyze the stability of open loop and closed loop discrete-time systems.
3. Develop the state space models for discrete time systems and to examine the effect of pole-zero cancellation on a system
4. Design digital controllers to improve the system reliability
5. Apply the concepts of quadratic function to analyze the stability of linear and nonlinear systems

UNIT-I

Discrete Representation of Continuous Systems: Basics of Digital Control Systems. Discrete representation of continuous systems. Mathematical Modeling of sample and hold circuit. Effects of Sampling and Quantization. Choice of sampling frequency. ZOH equivalent.

UNIT-II

Discrete Time System Analysis and its Stability: Z-Transform and Inverse Z Transform for analyzing discrete time systems. Pulse Transfer function. Pulse transfer function of closed loop systems. Mapping from s-plane to z plane. Solution of Discrete time systems. Time response of discrete time system. Stability analysis of Discrete Time System by Jury test and using bilinear transformation.

UNIT-III

State Space Approach for discrete time systems: State space models of discrete systems, State space analysis. Controllability and observability analysis. Effect of pole - zero cancellation on the controllability & observability. Pole placement by state feedback.

UNIT-IV

Design of Digital Control System: Design of Discrete PID Controller, Design of discrete state feedback controller. Design of set point tracker. Design of Discrete Observer for LTI System. Design of Discrete compensator.

UNIT-V

Lyapunov's Stability Analysis: The concept of linear and nonlinear systems, Quadratic function, Sylvester's criterion for definiteness of quadratic function, Lyapunov's stability criterion, Direct method of Lyapunov for the linear system, Methods of constructing Lyapunov function for non linear systems- Krasovskii's method.

Text Books:

1. K. Ogata, "Digital Control Systems", Prentice Hall India Learning Private Limited, Second edition, 2005.
2. M. Gopal, "Digital Control Engineering", New age international Publications, 2003
3. M.Gopal, ''Digital control and State Variable Methods'', 3rd Edition TMH, Sep -. 2008

Suggested Readings:

1. B.C. Kuo, "Digital Control System",2nd Edition, Oxford University Press,2003
2. G.F. Franklin, J.D. Powell & M. L. Workman "Digital Control of Dynamic Systems", 3rd Edition 2006
3. R.T. Stefani et al., "Design of feedback control systems, Oxford University", Press,2002

With effect from the academic year 2021-22

18ME O07 **INTELLECTUAL PROPERTY RIGHTS**

(Open Elective-3)

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

Objectives:

1. Fundamental aspects of IP.
2. Salient features of IPR acts.
3. The methods of registrations of Intellectual property.
4. Awareness for innovation and its importance of protection.
5. The changes in IPR culture and techno-business aspects of IPR.

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

1. Understand the evolution of IP, working of organization's at global level to protect and promote IP. (BL-2)
2. Familiarize with the patent filing process at national and international level. (BL-2)
3. Draw the logical conclusion of research, innovation and patent filing. (BL-3)
4. Compare different kinds of IP and their patenting system. (BL-4)
5. Understand the techno-legal-business angle of IP, infringement and enforcement mechanisms for protection. (BL-2)

UNIT-I

Introduction: Definition of intellectual property, the need for intellectual property rights (IPR), kinds of intellectual property rights, IPR in India – genesis and development, IPR abroad, importance of WTO, TRIPS agreement, patent cooperation treaty, Berne and universal copyright conventions.

UNIT-II

Patents: Definition of patent, commercial significance , term of patent, patentable subject- matter, rights and obligations of patentee, searching of existing patents, drafting of patent, specification of patent, filing of a patent, the different layers of the patent system (national, regional and international options), compulsory licensing and licenses of rights, revocation of patents, differences between utility model and patent.

UNIT-III

Industrial designs: Definition of designs, registration of design, rights and duties of proprietor of design, piracy of registered design.

Trademarks: Meaning of trademarks, purpose of protecting trademarks, registration of trademarks, passing off, assignment and licensing of trademarks, infringement of trademarks.

Geographical indications: Definition, differences between GI and trademarks.

UNIT-IV

Copy right: Nature and scope of copy right, term of copyright, subject matter of copyright, rights conferred by copyright ,publication, broad casting, telecasting, computer program, database protection, assignment and transmission of copyright, infringement of copy right trade secrets and know-how agreement.

UNIT-V

Enforcement of intellectual property rights: Infringement of intellectual property rights, enforcement measures, emerging issues in intellectual property protection, case studies of patents and IP Protection.

Unfair competition: What is unfair competition, relationship between unfair competition and intellectual property laws.

Text Books:

1. Ajit Parulekar and Sarita D'Souza, "Indian Patents Law-Legal & Business Implications",Macmillan India Ltd., 2006.
2. B.L.Wadehra, "Law relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications", Universal law Publishing Pvt Ltd., India,2000.
3. P.Narayanan, "Law of Copyright and Industrial Designs"; Eastern law House, New Delhi,2010.

Suggested readings:

1. CronishW.R , " Intellectual Property Patents, Copyright, Trade Marks and Allied rights", Sweet & Maxwell,1993.
2. P.Narayanan, "Intellectual Property Law" Eastern Law Edn.,1997.

With effect from the academic year 2021-22

18CE O02 **DISASTER MITIGATION AND MANAGEMENT**

(Open Elective-3)

Instruction	3 L Hours per Week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Course Objectives: This course aims to,

1. Equip the students with the basic knowledge of hazards, disasters, risks and vulnerabilities.
2. Impart knowledge in students about the nature, causes, consequences and mitigation measures of the variousHydro-meteorological disasters.
3. Introduce the concepts of causes, consequences and mitigation measures of the various Geographical disasters.
4. Enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters.
5. Equip the students with the knowledge of the impacts of disaster, chronological phases in a disaster management cycle and to create awareness about the disaster management framework and legislations in the context of Central and State Level Authorities.

Course Outcomes: Upon completion of this course, the student will be able to,

1. Identify and understand the fundamental terminologies in disaster management.
2. Distinguish between the Hydro-meteorological disasters and apply the concepts of structural and non-structuralmitigation measures.
3. Categorize different Geographical Disasters and apply the knowledge in utilizing the early warning systems.
4. Analyze various mechanisms and consequences of human induced disasters.
5. Develop an awareness of disaster management phases and formulating effective disaster management plans, ability to understand various participatory roles of stakeholders- Central and State Government bodies at different levels.

UNIT- I:

Introduction: Basic definitions- Hazard, Disaster, Vulnerability, Risk, Resilience, Mitigation, Management; classification of types of disaster- Natural and manmade; Introduction to Disaster management cycle; International Decade for natural disaster reduction (IDNDR); International strategy for disaster reduction (ISDR), Nationaldisaster management authority (NDMA).

UNIT- II:

Natural Disasters:

Hydro meteorological disasters:

Causes, Early warning systems- monitoring and management, structural and non-structural measures for floods, drought and Tropical cyclones; Applications. Case studies related to various hydro-meteorological disasters.

UNIT- III:

Geographical based disasters: Causes, zoning, Early warning systems- monitoring and management, structural and non-structural mitigation measures for earthquakes, tsunami, landslides, avalanches and forest fires. Case studies related to various geographical based disasters.

UNIT- IV:

Human Induced Disasters: Chemical disaster- Causes, impacts and mitigation measures for chemical accidents, Risks and control measures in a chemical industry, chemical disaster management; Case studies related to various chemical industrial hazards eg: Bhopal gas leakage; Management of chemical terrorism disasters and biological disasters; Case studies related to power break downs, fire accidents, traffic accidents, oil spills and stampedes, building failure disasters.

UNIT- V:

Concept of Disaster Impacts and Management:

Disaster impacts- environmental, physical, social, ecological, economical, political, etc.; health, psycho-social issues; demographic aspects, gender, age, special needs; hazard locations; global and national disaster trends;climate change and urban disasters.

Disaster management cycle and its phases, risk analysis, vulnerability and capacity assessment; Post-disaster environmental response water, sanitation, food safety, waste management, disease control; Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Text Books:

1. PradeepSahni, "Disaster Risk Reduction in South Asia", Prentice Hall, 2003.
2. B. K. Singh, "Handbook of Disaster Management: Techniques & Guidelines", Rajat Publication, 2008.

Suggested Reading:

1. Ministry of Home Affairs, Government of India, "National Disaster Management Plan, Part I and II",
2. K. K. Ghosh, "Disaster Management", APH Publishing Corporation, 2006.
3. http://www.indiaenvironmentportal.org.in/files/file\disaster_management_india1.pdf
4. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs)
5. Hazards, Disasters and your community: A booklet for students and the community, Ministry of Home Affairs.
6. Disaster Medical Systems Guidelines, Emergency Medical Services Authority, State of California, EMSA no.214,June 2003.
7. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and PsychosocialSupport in Emergency Settings, Geneva: IASC.
8. http://ndma.gov.in/ (Home page of National Disaster Management Authority)

With effect from the academic year 2021-22

18ITO02 **PYTHON PROGRAMMING**

(Open Elective-3)

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

Course Objectives:

1. To facilitate learning to use lists, tuples and dictionaries in Python programs.
2. To familiarize with functions and file handling.
3. To learn data structures of Python programming,
4. To impart knowledge on OOPs concepts and handle exceptions in Python.
5. To introduce GUI Programming and familiarize with data visualization.

Course Outcomes:

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

1. Understand the fundamental concepts and control structures of python programming.
2. Write user defined iterative & recursive functions, identify appropriate predefined functions and perform file handling Operations.
3. Use suitable data structures such as sequences, dictionaries and sets in python programming.
4. Apply concepts of OOP, exception handling and build regular expressions using Python.
5. Design and Develop GUI based applications and visualize the data.

UNIT-I

Introduction to Python Programming: Using Python, The IDLE Programming Environment, Input and Output Processing, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, More About Data Output: New line, Item Separator, Escape Characters, Formatting parameters.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables.

Repetition Structures: Introduction, while loop, for loop, Sentinels, Input Validation Loops, Nested Loops.

UNIT-II

Functions: Introduction, Defining and Calling a Function, Designing a Program to Use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Value-Returning Functions Generating Random Numbers, Writing Our Own Value-Returning Functions, The math Module, Random Module, Time Module and Storing Functions in Modules.

Python File Input-Output: Opening and closing file, various types of file modes, reading and writing to files, manipulating directories.

UNIT-III

Lists and Tuples: Sequences, Introduction to Lists, List slicing, Finding Items in Lists with the in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists, Two-Dimensional Lists, Tuples.

Strings: Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings.

Dictionaries and Sets: Dictionaries, Sets, Serializing Objects.

Recursion: Introduction, Problem Solving with Recursion, Examples of Recursive Algorithms.

UNIT-IV

Classes and Object-Oriented Programming: Procedural and Object-Oriented Programming, Classes, Working with Instances, Techniques for Designing Classes.

Exception Handling: What is exception, various keywords to handle exception such try, catch, except, else, finally, raise.

Regular Expressions: The match() Function, The search() Function, The sub() Function, The findall() and finditer() Functions, Flag Options.

UNIT-V

GUI Programming: Graphical User Interfaces, Using the tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons.

Introduction to plotting in Python – Basic Plots- Line and Scatter Plot, box plot, bar plots, Histograms and plotting data contained in files.

Text Book:

1. Tony Gaddis, "Starting Out With Python", 3rd Edition, Pearson, 2015.

Suggested Reading:

1. ReemaThareja "Python Programming", Oxford Press, 2017
2. Kenneth A. Lambert, "Fundamentals of Python", Delmar Cengage Learning, 2013.
3. Fabio Nelli, "Python Data Analytics (With Pandas, NumPy, and Matplotlib)", Apress, 2nd Edition, 2018.
4. James Payne, "Beginning Python using Python 2.6 and Python 3", wrox programmer to programmer, 2010.
5. Paul Gries, "Practical Programming: An Introduction to Computer Science using Python", 3rd Edition, 2016.

Web Resource:

1. https://www.python.org/

With effect from the academic year 2021-22

18EGO02 **GENDER SENSITIZATION**

(Open Elective-3)

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

Course Objectives: This course will introduce the students to:

1. Sensibility regarding issues of gender in contemporary India.
2. A critical perspective on the socialization of men and women.
3. Popular debates on the politics and economics of work while helping them reflect critically on gender violence.

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

1. Understand the difference between "Sex" and "Gender" and be able to explain socially constructed theories of identity.
2. Recognize shifting definitions of "Man" and "Women" in relation to evolving notions of "Masculinity" and "Femininity".
3. Appreciate women's contributions to society historically, culturally and politically.
4. Analyze the contemporary system of privilege and oppressions, with special attention to the ways gender intersects with race, class, sexuality, ethnicity, ability, religion, and nationality.
5. Demonstrate an understanding of personal life, the workplace, the community and active civic engagement through classroom learning.

UNIT – I

Understanding Gender:

Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1)

Socialization: Making Women, Making Men (*Towards a World of Equals*: Unit -2)

Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT – II

Gender And Biology:

Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4) Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10) Two or Many? Struggles with Discrimination.

UNIT – III

Gender and Labour:

Housework: the Invisible Labour (*Towards a World of Equals*: Unit -3) "My Mother doesn't Work." "Share the Load."

Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7)

Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT-IV

Issues Of Violence

Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*

Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.

Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)

Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

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

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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.

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18PY O01 **HISTORY OF SCIENCE AND TECHNOLOGY**

(Open Elective-3)

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

Course Objectives: This course aims to:

1. Gain the knowledge about origin of science in the Stone Age and its progress during Antiquity period.
2. Familiar with scientific views in the Medieval period and during the Industrial revolution.
3. Aware of modern scientific developments from 19th century onwards.

Course Outcomes: Upon completion of this course, the student will be able to:

1. Demonstrate the process of beginning of science and civilization, knowledge acquisition and philosophical approach of science and its advancements in the Stone Ages and Antiquity period.
2. Illustrate the advancements in science and technology in the medieval period across Asia and Arab countries and decline and revival of science in Europe.
3. Explain the scientific approach and its advances of the Europeans and how the role of engineer during the industrial revolution and the major advancements.
4. Make use of the advancements in the field of science and technology by adopting new philosophies of 19th and first half of 20th century in finding ethical solutions to the societal problems.
5. Interpret the changes in specializations of science and the technology and build the relation between information and society from second half of 20th century onwards.

UNIT-I

Science - The Beginning (through 599 BC): The Stone Ages, Knowledge among hunter gatherers, Agricultural Revolution and other revolutions, Civilization, Major advances.

Science in Antiquity (600 BC - 529 AD): Philosophy, a precursor to science, Hellenistic world and the Roman Empire, Other cultures of the period, major advances.

UNIT-II

Medieval Science (530 AD - 1452 AD): The decline of science in Europe, Science in China, Science and mathematics in India, Arab science, revival of science in Europe, technology revolution of the Middle ages, Major advances.

The Renaissance and the Scientific Revolution (1453 AD – 1659 AD): Renaissance, Scientific Revolution, Technology, Major advances.

UNIT-III

Scientific Method: Measurement and Communication (1660 AD – 1734): European domination, The scientific method, Major advances.

The Industrial Revolution (1735 AD – 1819 AD): Industrial Revolution, Rise of the engineer, Major Advances.

UNIT-IV

Science and Technology in the 19th Century (1820 AD – 1894 AD): Philosophical basis of 19th-century science, Science and the public, Science and technology, Major advances.

Rise of Modern Science and Technology (1895 AD – 1945 AD): The growth of 20thcentury science, New philosophies, Quantum reality, Energy sources, Electricity: a revolution in technology, Major advances.

UNIT-V

Big Science and the Post-Industrial Society (1946 AD – 1972 AD): Big science, Specialization and changing categories, Technology changes society, Major advances.

The Information Age (1973 AD – 2015 AD): Information and society, Globalization, The post-industrial society, Problems of the Information age, Major Advances.

Text Books:

1. Bryan Bunch and Alexander Hellemans, “The History of Science and Technology”, Houghton Mifflin Company (New York), 2004.
2. JD Bernal, “Science in History”, 4 Volumes, Eklavya Publishers, 2012.

Suggested Reading:

1.“The 100 Most Influential Scientists of All Time”, Edited by Kara Rogers, Britannica Educational Publishing, 2010.
2. Alberto Hernandez, “A Visual History of Science and Technology”, The Rosen Publishing Group, 2016.