VISION OF THE INSTITUTE

Vision:

To empower the students through Academic excellence and Ethics so as to bring about social transformation and prosperity.

MISSION OF THE INSTITUTE

Mission:

- To expand the frontiers of knowledge through quality education.
- To provide value added Research and development.
- To embody a spirit of excellence in Teaching, Creativity, Entrepreneurship and Outreach.
- To provide a platform for synergy of Academy, Industry and Community.
- To inculcate high standards of Ethical and Professional behavior.

VISION OF EEE DEPARTMENT

Vision:

To be recognized as a Centre of Excellence in the field of Education and Research so as to produce competent & Ethical Engineers capable enough to contribute to the society.

MISSION OF EEE DEPARTMENT

Mission:

- To develop innovative, efficient and proficient electrical engineers.
- To keep the curriculum industry friendly, with due regard to the University curriculum.
- To be a place for innovative blended learning and entrepreneurship development in multidisciplinary areas.
- To promote ethical and moral values among the students so as to make them emerge as responsible professionals.

EEE DEPT PROGRAM EDUCATIONAL OBJECTIVES (PEO's)

PEO1: To produce Electrical and Electronics Engineering graduates who have strong foundation in Mathematics, Sciences and Basic Engineering

PEO2: To provide intensive training in problem solving, laboratory skills and design skills to use modern engineering tools through higher education and research.

PEO3: Ability to pursue higher studies and to seek employment in a variety of engineering technology positions and work successfully in their chosen career aspirations and generate entrepreneurs.

PEO4: To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate engineering issues to broader social context through life-long learning.

PROGRAM OUTCOMES (POs) OF EEE DEPARTMENT

Program Outcomes are the statements that describe what learners will know and be able to do when they graduate from a program.

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10.Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11.Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12.Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES(PSO'S) OF EEE DEPARTMENT

PSO 1: The EEE program must demonstrate knowledge and hands-on competence in the application of electrical and electronics circuits in a rigorous mathematical environment at or above the level of algebra and trigonometry.

PSO 2: The EEE program must demonstrate that graduates can apply interdisciplinary project management techniques to electrical and electronics systems.

PSO 3: The EEE program must demonstrate that graduates can analyze, design and develop hardware and software for control systems, measurements, power electronics and power systems

Year/Semester	III B. Tech/ I Sem	L	T	P	C
Regulation Year	2019-20	2	1	0	3
Subject	POWER ELECTRONICS				
Branch	EEE				

Course Objectives:

- To study the characteristics of various power semiconductor devices and to design firing circuits for SCR.
- To understand the operation of single phase full–wave converters.
- To study the operation of three phase full–wave converters
- To understand the operation of different types of DC-DC converters
- To understand the operation of inverters and application of PWM techniques for voltage control.
- To analyze the operation of AC-AC regulators

UNIT- I:

Introduction:

Thyristors–Silicon Controlled Rectifiers (SCR's) - Static Characteristics - Turn-on and Turn off Methods of SCR – Dynamic & Gate Characteristics of SCR - Snubber circuit- Characteristics of Power MOSFET and IGBT.

UNIT–II:

Single Phase AC-DC Converters:

Single Phase half wave-controlled rectifiers - R load and RL load with and without freewheeling diode - Single Phase fully controlled bridge converter with R load, RL load and RLE load - Continuous and Discontinuous conduction - Effect of source inductance in 1-phase fully controlled bridge rectifier with continuous conduction – Expression for output voltages - Numerical Problems.

UNIT–III:

Three Phase AC-DC Converters:

Three Phase half wave Controlled Rectifier with R and RL load -Three Phase fully controlled rectifier with R and RL load - Expression for Output Voltage - Three Phase Dual Converters - Numerical Problems.

UNIT – IV:

DC–DC Converters:

Operation of Basic Chopper - Classification - Control Techniques - Analysis of Buck, Boost and Buck-Boost converters in Continuous Conduction Mode (CCM) and Discontinuous Conduction Mode (DCM) - Output voltage equations using volt-sec balance in CCM & DCM – Expressions for output voltage ripple and inductor

current ripple (for RL load only)- Numerical Problems.

UNIT – V:

DC–AC Converters:

Introduction - Classification - Single Phase half bridge and full bridge inverters with R and RL loads - Three Phase square wave inverters - 120^0 conduction and 180^0 conduction modes of operation - PWM inverters - Sinusoidal Pulse Width Modulation – Operation of Current Source Inverter.

UNIT – VI:

AC – AC Converters:

Introduction - Single Phase AC voltage controller - Phase control with R and RL loads – Integral cycle control – Sequential AC Voltage Controllers - Three phase AC voltage regulator with R load – Single phase step down Cyclo converter - Numerical Problems.

Course Outcomes:

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

- Explain the characteristics of various power semiconductor devices and analyze the static and dynamic characteristics of SCR's and design firing circuits for SCR.
- Explain the operation of single phase full–wave converters and analyze harmonics in the input current.
- Explain the operation of three phase full–wave converters.
- Analyze the operation of different types of DC-DC converters.
- Explain the operation of inverters and application of PWM techniques for voltage control.
- Analyze the operation of AC-AC regulators.

TEXT BOOKS

1. Power Electronics: Converters, Applications and Design by Ned Mohan, Tore M Undeland, William P Robbins, John Wiley & Sons, 3rd Edition, 2009.
2. Power Electronics: Circuits, Devices and Applications by M. H. Rashid, Prentice Hall of India, 4th Edition, 2018.

REFERENCE BOOKS

1. Elements of Power Electronics by Philip T. Krein oxford, 2nd Edition 2014.
2. Power Electronics: Essentials & Applications by L. Umanand, Wiley PVT Limited, India, 3rd Edition 2013.
3. Power Electronics by P.S. Bhimbra, Khanna Publishers, 2018.
4. Thyristorised Power Controllers by G. K. Dubey, S. R. Doradla, A. Joshi and R. M. K.Sinha, New Age International (P) Limited Publishers, 2nd Edition, 2010.
5. Power Electronics by Daniel W. Hart, Mc Graw Hill Education, 2017.

Year/Semester	III B. Tech/ I Sem	L	T	P	C
Regulation Year	2019-2020	2	1	0	3
Subject	ELECTRICAL MEASUREMENTS				
Branch	EEE				

Course Objectives:

- To study the principle of operation and working of different types of instruments and errors involved
- To select suitable instrument for measuring single and three phase power
- To select suitable instrument for measuring energy and to study the principle of operation of instrument transformers
- To understand the principle of operation and working of dc and ac potentiometers
- To understand the principle of operation of various bridges for the measurement of parameters such as resistance, inductance and capacitance
- To study the operation and applications of CRO, digital voltmeter and digital multimeter

UNIT- I:

Measuring Instruments:

Characteristics of instruments, precision, accuracy, sensitivity, resolution, tolerance, errors, types of errors **–** Classification of instruments – Deflecting, controlling and damping torques – Ammeters and Voltmeters – PMMC, moving iron type, dynamometer and electrostatic instruments – Errors and compensations – Extension of range using shunt and series resistances.

UNIT- II:

Measurement of Power:

Single phase and three phase dynamometer wattmeter, expression for deflecting and control torques – wattmeter errors – LPF and UPF wattmeter – Measurement of active and reactive powers in balanced and unbalanced systems – Extension of range of wattmeter using instrument transformers.

UNIT-III:

Measurement of Energy and Instrument Transformers:

Power factor meters, Single phase induction type energy meter – driving and braking torques – errors and compensations –Testing of energy meter by direct and phantom Loading.

Current transformer (CT) and potential transformer (PT): Ratio and phase angle errors – Numerical problems.

UNIT- IV:

Potentiometer: Principle and operation of D.C Crompton's potentiometer – Standardization –

Measurement of unknown resistance – Current – Voltage, AC Potentiometers: polar and coordinate types – Standardization – Applications.

UNIT- V:

Measurement of Resistance, Inductance and Capacitance: Measurement of unknown resistance by using Wheatstone's bridge, Kelvin's double bridge, Megger – Measurement of earth resistance, Measurement of inductance by using Maxwell's bridge – Hays bridge – Anderson bridge, Measurement of capacitance by using Schering Bridge – Desauty bridge – Wien's bridge.

UNIT -VI:

Electronic Instruments: Digital voltmeters (DVM) – Ramp type DVM – Integrating DVM – Continuous balance DVM – Successive approximation DVM, Phase, Time and Frequency measurement, Cathode ray Oscilloscope (CRO) – construction – Electrostatic focusing – Deflection sensitivity – Lissajous Patterns – Digital Multimeter.

Course Outcomes:

At the end of this course the student will be:

- Able to choose right type of instrument for the measurement of voltage and current for ac and dc
- Able to choose right type of instrument for the measurement of single and three phase power
- Able to measure energy using energy meters and understand the working of instrument transformers
- Able to calibrate ammeter, voltmeter using potentiometer
- Able to select suitable bridge for the measurement of electrical parameters
- Able to understand the operation and application of CRO, DVM and digital multimeter

Text Books:

1. A course in Electrical & Electronic Measurements & Instrumentation by A. K. Sawhney, Dhanpat Rai & Co. Publications, 10th edition, 2016.
2. Electronic Instrumentation by H. S. Kalsi, Tata McGraw-Hill, 4th Edition, 2019.

Reference Books:

1. Electrical Measurements and measuring Instruments by E. W. Golding and F. C. Widdis, Wheeler Publishing , 6th Edition, 2019.
2. Electrical and Electronic Measurements and instrumentation by R. K. Rajput, S. Chand, 4th edition, 2015.
3. Electrical Measurements by Buckingham and Price, Prentice Hall, 1st edition, 2000.
4. Electrical and Electronic Measurements by G. K. Banerjee, PHI Learning Private Ltd, New Delhi–2012.

Year/Semester	III B. Tech/I Sem	L	T	P	C
Regulation Year	2019-20	2	1	0	3
Subject	ELECTRICAL MACHINES - II				
Branch	EEE				

Course Objectives:

- To understand the principle of operation and performance of single phase transformers.
- To understand the methods of testing of single phasetransformer.
- To understand the connections and harmonics in three-phasetransformers.
- To understand the principle of operation and performance of 3-phase induction motor.
- To understand the relation between torque and slip and performance of induction motor
- To understand the basic concepts of linear induction motors.

UNIT- I:

Single-phase Transformers:

Types and constructional details, principle of operation – emf equation –operation on no load and on load – lagging, leading and unity power factor loads and phasor diagrams– equivalent circuit of single phase transformer and auto transformer.

UNIT–II:

Testing of Single-phase Transformers:

OC & SC tests – Sumpner's test – regulation, losses, efficiency and all day efficiency – separation of losses – parallel operation with equal voltage ratios –Numerical problems.

UNIT–III:

3-Phase Transformers:

Polyphase connections – Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ –harmonics– third harmonics in phase voltages – Three winding transformers: determination of Z_p, Z_s and Z_t– transients in switching – off load and on load tap changers – Scott connection.

UNIT – IV:

3-Phase Induction Motors:

Construction, principle & operation of cage and woundrotormachine– production of a rotating magnetic field – rotor emf and rotor frequency – rotor current and p.f at standstill and during running conditions –

rotor power input, rotor copper loss and mechanicalpower developed and their inter relationship – equivalent circuit – Numerical Problems.

UNIT – V:

Characteristics, starting and testing methods of Induction Motors:

Torque equation – expressions for maximum torque and starting torque – torque-slip characteristics– double cage and deep bar rotors –crawling and cogging – no load and blocked rotor tests – circle diagram–Starters – starting current and torque calculations – induction generator operation(Qualitative Analysis only).

UNIT – VI:

Linear Induction Motors (LIM):

Construction, principle & operation–double sided LIM from rotating type induction motor – schematic of LIM drive for traction – development of one sided LIM with back iron- equivalent circuit of LIM – Applications of LIM.

CourseOutcomes:

At the end of this course the students are

- Able to explain the operation and analyze the performance parameters of single phase transformer.
- Able to investigate the regulation, losses and efficiency of single phase transformer.
- Able to explain the types of three phase transformer connection, tap changing methods and 3-phase to 2-phase transformation.
- Able to explain the operation and analyze the performance of three phase induction motor.
- Able to analyze the torque-speed relation and analyze the performance of induction motor
- Able to explain the construction and operation of linear induction motors.

TEXT BOOKS

1. The Performance and Design of Alternating Current Machines by M. G. Say, CBS Publishers, 3rd Edition, 2002.
2. Special Electrical Machines by K.Venkata Ratnam, University Press, 2019, New Delhi.

REFERENCE BOOKS

1. Electric Machines by P. S. Bhimbhra, Khanna Publishers, 2nd Edition, 2017.
2. Electrical Machines by D. P.Kothari, I. J. Nagarth, Mc Graw Hill Publications, 5th edition, 2017.
3. Electrical Machines by R.K.Rajput, Lakshmi Publications, 6th edition, 2016.
4. Special Electrical Machines by E.G. Janardhanan, PHI learning Private Limited, 2014.

PROFESSIONAL ELECTIVE					
Course Name	**PULSE AND DIGITAL CIRCUITS**				
Year/Semester	III B.Tech/I Sem EEE	L	T	P	C
Regulation Year	2019-2020	3	0	0	3

OBJECTIVES

The student will be made

- To understand the concept of wave shaping circuits, Switching Characteristics of diode and transistor.
- To study the design and analysis of various Multivibrators.
- To understand the functioning of different types of time-base Generators.
- To learn the working of logic families & Sampling Gates.

UNIT I LINEAR WAVESHAPING: High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square, ramp inputs. RC network as differentiator and integrator; Attenuators, its applications in CRO probe.

UNIT II NON-LINEAR WAVE SHAPING : Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper; Clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, Transfer characteristics of clampers.

UNIT III SWITCHING CHARACTERISTICS OF DEVICES: Diode as a switch, piecewise linear diode characteristics, Design and analysis of Transistor as a switch, Design of transistor switch.
Bistable Multivibrator: Analysis And Design of Fixed Bias, Self Bias Bistable Multi Vibrator, Commutating Capacitors, Triggering of Binary Circuits, Emitter Coupled Bistable Multivibrator (Schmitt Trigger).

UNIT IV Monostable Multivibrator: Analysis and Design of Collector Coupled Monostable Multi vibrator, Triggering of Monostable Multivibrator, Applications of Monostable Multivibrator. **Astable Multivibrator:** Analysis and Design of Collector Coupled Astable Multivibrator, Application of Astable Multivibrator as a Voltage to Frequency Converter.

UNIT V VOLTAGE TIME BASE GENERATORS: General features of a time base signal, Methods of generating time base waveform Exponential Sweep Circuits, Negative Resistance Switches, basic principles in Miller and Bootstrap time base generators, Transistor Miller time base generator, Transistor Bootstrap time base generator.

UNIT VI LOGIC FAMILIES & SAMPLING GATES: LOGIC FAMILIES: Diode Logic, Transistor Logic, Diode-Transistor Logic, Transistor-Transistor Logic, Emitter Coupled Logic, AOI Logic. SAMPLING GATES: Basic Operating Principles of Sampling Gates, Diode Unidirectional Sampling Gate and Two-Diode Bi-Directional Sampling Gate, Four-Diode gates, Applications of Sampling Gates.

TEXT BOOKS:

1. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005
2. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill

REFERENCES:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, Mothiki S Prakash Rao McGraw-Hill, Second Edition, 2007.
2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn., 2002
3. Pulse & Digital Circuits by Venkata Rao,K,Ramasudha K, Manmadha Rao,G., Pearson, 2010

OUTCOMES

- Design linear wave shaping circuits such as RC, RL and RLC and apply the fundamental concepts of wave shaping for various switching and signal generating circuits.
- Design non-linear wave shaping circuits such as clippers and clampers and apply the fundamental concepts of wave shaping for various switching and signal generating circuit.
- Analyze the switching characteristics of transistors and Design Bistable Multi Vibrator
- Design and Analyze the Mpnostable and Astable Multivibrators and apply the fundamental concepts to various digital circuits.
- Design different time base generators and can be used in different display devices
- Analyze the different logic families and sampling gates

Year/Semester	III B. Tech/ I Sem	L	T	P	C
Regulation Year	2019-20	2	1	0	3
Subject	ENERGY AUDIT AND CONSERVATION & MANAGEMENT (PROFESSIONAL ELECTIVE – I)				
Branch	EEE				

Course Objectives:

- To understand energy efficiency, scope, conservation and technologies.
- To understand the concept of energy efficient lighting systems.
- To study about power factor of systems and propose suitable compensation techniques.
- To understand energy conservation in HVAC systems.
- To learn life cycle costing analysis and return on investment on energy efficient technologies.

Unit–I:

Introduction to Energy Conservation:

Energy needs of growing economy - long term energy scenario, energy pricing, and energy sector reforms - energy and environment: air pollution, climate change, energy security, energy conservation and its importance - energy strategy for the future, energy conservation act-2001 and its features.

Unit–II:

Basic Principles of Energy Audit:

Energy audit- definition, need, types of audit, energy index, cost index, energy consumption – production relationship, pie charts- Sankey diagram- Cusum technique, least square method – numerical problems.

Energy conservation schemes- energy audit of industries- energy saving potential - energy audit of process industry - thermal power station - building energy audit.

Unit–III:

Energy Management:

Definition and Objective of Energy Management, Principles of Energy management, Energy Management Strategy, Energy Manager Skills, key elements in energy management, force field analysis, energy policy, format and statement of energy policy, Organization setup and energy management. Responsibilities and duties of energy manager under act 2001.

Unit–IV:

Energy Conservation in Electrical Systems:

Electricity tariff, load management and maximum demand control, power factor improvement- capacitors- harmonics, distribution and transformer losses. Losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy efficient motors, light source, choice of lighting, luminance requirements and energy conservation avenues.

Unit–V:

Energy Conservation in Thermal Systems:

Heat – heat content – rate of heat transfer – heat transfer coefficient - conduction – convention and radiation. thermal insulation & its importance - space heating – hvac system – heating of buildings – district heating – factors & affecting the choice of district heating.

Unit–VI:

Economic Aspects and Financial Analysis:

Depreciation Cost-Payback period –Time value of Money-Depreciation Methods simple payback period –Return on investment - Internal rate of return – net present value method, Life cycle costing analysis.

Course Outcomes:

After the completion of course, the Student will be able to

- Explain energy efficiency, conservation and various technologies.
- Design energy efficient lighting systems.
- Calculate power factor of systems and propose suitable compensation techniques.
- Explain energy conservation in HVAC systems.
- Calculate life cycle costing analysis and return on investment on energy efficient technologies.

Text Books:

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications 2012.
2. Energy management hand book by Steve Doty, W.C.Turner, Fairmont Press; 8th edition, 2012.

Reference Books:

1. Hand Book of Energy Audit by Sonal Desai, Tata McGraw hill, 2017.
2. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi, 1991.
3. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.
4. Energy management and conservation –k v Sharma and p venkata seshaiah-I K International Publishing House pvt.ltd,2011.
5. Industrial Energy Management Systems by Arry C. White, Philip S. Schmidt, David R. Brown, Hemisphere Publishing Corporation, New York, 1994.
6. Economic Analysis of Demand Side Programs and Projects - California Standard Practice Manual, June 2002 – Free download available online.

Year/Semester	III B. Tech/ I Sem	L	T	P	C
Regulation Year	2019-20	2	1	0	3
Subject	MODERN CONTROL THEORY (Professional Elective –I)				
Branch	EEE				

Course Objectives:

- To facilitate the evolution of state variable approach for the analysis of control systems.
- To examine the importance of controllability and observability in modern control engineering.
- To enable students to analyze various types of nonlinearities & construction of trajectories using describing functions and phase plane analysis.
- To study the analysis of stability and instability of continuous time invariant system

UNIT – I:
State Variable Analysis

Concept of State – Derivation of State Space models for Linear Continuous time Systems from Schematic models, Differential equations, non-uniqueness of state model – State diagrams for continuous time state models – Controllable canonical form – Observable canonical form – Diagonal Canonical Form - Jordan Canonical Form .

Solution for state equations – State transition matrix and its properties, Methods of determining state transition matrix. Complete response of continuous time systems.

UNIT – II:
State Variable Techniques

General concept of controllability – controllability tests for continuous time invariant systems, General concept of observability – observability tests for continuous time invariant Systems – Duality- effect of state feedback on controllability and observability.

UNIT – III:

Design of State Feedback Controllers and State Observers

Design of state feedback control through pole placement using Ackerman's formula – Design of state observers (Full order & reduced order), State estimation through Kalman filters.

UNIT – IV:
Non-Linear Systems

Introduction – Non Linear Systems, types of Non-Linearities – saturation – friction-dead-Zone – relay-backlash. Singular Points – Introduction to Linearization of nonlinear systems, Properties of Non-Linear systems – describing function–describing function analysis of nonlinear systems.

UNIT – V:

Phase Plane Analysis and Stability

Stability analysis of Non-Linear systems through describing functions. Introduction to phase plane analysis, method of Isoclines for constructing trajectories, singular points, phase-plane analysis of nonlinear control systems.

UNIT – VI:

Lyapunov Stability Analysis

Stability in the sense of Lyapunov – Lyapunov's stability and Lypanov's instability theorems – Direct method of Lyapunov for the linear and nonlinear continuous time autonomous systems. Generation of Lyapunov functions – Variable gradient method – Krasooviski'smethod.

Course Outcomes:

After completion of this course the students will be able to:

- Understand the state variable approach.
- To analyze the concepts of controllability and observability.
- To analyze the various non-linearities through describing functions and phase plane analysis.
- Know the typical issues of stability and instability of continuous time variant and invariant systems.

Text Books:

1. Modern Control Engineering by Ogata. K – Prentice Hall – 5th edition, 2010.
2. Nonlinear systems, Hassan K. Klalil, Prentice Hall, 3rd edition 2003

Reference Books :

1. Modern Control System Theory by M. Gopal – New Age International – 3rd edition, 2014.
2. Modern control systems, Richard C. Dorf and Robert H. Bishop, 11th Edition, Pearson Edu, India, 2009.
3. Chi-Tsong Chen, "Linear System Theory and Design", Oxford University Press, 4th Edition, 2012.

Year/Semester	III B. Tech/ I Sem	L	T	P	C
Regulation Year	2019-2020	2	1	0	3
Subject	PROGRAMMABLE LOGIC CONTROLLERS (Professional Elective-I)				
Branch	EEE				

Course Objectives:

- To have knowledge on PLC basics.
- To acquire the knowledge on programming of PLC.
- To understand the ladder diagrams and registers in PLC.
- To gain the knowledge on PLC timers and counters
- To acquire knowledge on data handling instructions of PLC.
- To have knowledge on PID control, PID modules, PID tuning and PID functions.

UNIT – I:

Introduction to PLC Basics: PLC system, I/O modules and interfacing, CPU processor, programming equipment, programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT–II:

PLC Programming: Input instructions, outputs, operational procedures, programming examples using contacts and coils, Digital logic gates, programming in the Boolean algebra system, conversion examples.

UNIT – III:

Ladder Diagrams and Registers: Ladder diagrams for process control, Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system. PLC Registers: Characteristics of Registers, module addressing, holding registers, input registers, output registers.

UNIT –IV:

Programmable Timers and Counters: Timer instructions – On delay time instruction – Off delay timer instruction – Retentive timer – Counter instructions – Up counter – Down counter - Cascading counters - Incremental encoder – Counter applications – Combining counter and timer functions.

UNIT–V:

PLC Instructions: Master control reset instruction – Jump instructions and subroutines – Immediate input and output instructions. Data manipulation – Data transfer operation – Data compare instruction –

Data manipulation programs – Numerical data I/O interfaces – Math instructions – Sequential instructions – Sequence programs – Shift registers – Word shift registers.

UNIT – VI:

Analog Operations and PID Tuning: Analog PLC operation: Analog modules and systems, Analog signal processing, multi bit data processing, analog output application examples, PID principles, position indicator with PID control, PID modules, PID tuning, PID functions.

Course Outcomes:

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

- Understand the basics of PLC and their I/O modules.
- Develop control algorithms to PLC using ladder logic.
- Manage PLC registers for effective utilization in different applications.
- Design PID controller with PLC.

Text Books:

1. Programmable logic controllers by Frank D. Petruzella- McGraw Hill – 4th Edition, 2010.
2. Programmable Logic Controllers – Principle and Applications by John W. Webb and Ronald A. Reiss, Fifth Edition, PHI, 2009.

Reference Books:

1. Programmable Logic Controllers – Programming Method and Applications by JR. Hackworth and F.D Hackworth Jr. – Pearson, 2004.
2. Digital Design by Morris Mano, PHI, 3rd Edition 2006.
3. Introduction to Programmable Logic Controllers- Gary Dunning-Cengage Learning, 3rd edition, 2005.
4. Programmable Logic Controllers –W. Bolton-Elsevier publisher limited,5th edition, 2014.

Year/Semester	III B.Tech/ I Sem	L	T	P	C
Regulation Year	2019-20	3	0	-	3
Subject	DATA STRUCTURES				
Branch	EEE, CE				

Course Objectives:
The objective of the course is to
- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms.

UNIT I
Data Structures: Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity. Searching - Linear search, Binary search. Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

UNIT II
Linked Lists: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal,Reversing Single Linked list, Applications and Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III
Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linkedlist Representation of Stacks, Operations on Linked Stack,Applications-Reversing list, Infix to Postfix Conversion, Evaluating Postfix Expressions.

UNIT IV
Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list,Application of Queues-Circular Queues, Dequeues.

UNIT V
Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications.

UNIT VI

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims &Kruskals Algorithm, Dijkstra's shortest path.

Text Books:

1) Data Structures Using C. 2nd Edition.ReemaThareja, Oxford.
2) Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:

1) Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
2) Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.
3) Data Structures with C, Seymour Lipschutz TMH

Course Outcomes:

By the end of the course, the students should be able to:

- Understand basic concepts of data structures and apply algorithm analysis for various searching and soring techniques
- Understand the concept of linked lists and be use it in various applications
- Be able to use Stacks and Queues in various applications
- Understand the concept of Trees & Graphs and perform various operations on it

OPEN ELECTIVE I					
Course Name	**EMBEDDED SYSTEMS**				
Year/Semester	**III B.Tech/I Sem EEE**	**L**	**T**	**P**	**C**
Regulation Year	**2019-2020**	**3**	**0**	**0**	**3**

OBJECTIVES:

The main objectives of this course are given below:

- The basic concepts of an embedded system are introduced.
- The various elements of embedded hardware and their design principles are explained.
- Different steps involved in the design and development of firmware for embedded systems is elaborated.
- Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed.
- Fundamental issues in hardware software co-design were presented and explained.
- Embedded system implementation and testing tools are introduced and discussed.

Outcomes: At the end of this course the student can able to:

- Understand the basic concepts of an embedded system and able to know an embedded system
- design approach to perform a specific function.
- The hardware components required for an embedded system and the design approach of an embedded hardware.
- The various embedded firmware design approaches on embedded environment.
- Understand how to integrate hardware and firmware of an embedded system using real time operating system.

UNIT-I INTRODUCTION: Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems,the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware,

UNIT-II CHARACTERISTICS&EMBEDDED HARDWARE DESIGN: Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system. Analog and digital electronic components, I/O types and examples, Serial &Parallel communication device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT-III EMBEDDED FIRMWARE DESIGN: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT-IV REAL TIME OPERATING SYSTEM: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling,Task communication, Task synchronisation, Device Drivers.

HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs.

UNIT-V EMBEDDED SYSTEM DEVELOPMENT: The integrated development environment, Types of files generated on cross-compilation, Deassembler/Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan.

UNIT-VI EMBEDDED SYSTEM IMPLEMENTATION AND TESTING: The main software utility tool, CAD and the hardware, Translation tools-Pre-processors, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on host machine, Simulators, Laboratory Tools.

Text Books:

1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications, 2013.
2. Embedded Systems-By Shibu.K.V-Tata McGraw Hill Education Private Limited, 2013.

References:

1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications, 2013.
2. Embedded Systems-Lyla B.Das-Pearson Publications, 2013.

Year/Semester	III B. Tech/ I Sem	L	T	P	C
Regulation Year	2019-2020	3	0	0	3
Subject	ROBOTICS OPEN ELECTIVE I				
Branch	EEE, CSE & IT (III B.Tech I Semester),				

COURSE OBJECTIVES:

The general objectives of the course are to enable the students to

- Understand the components and their working principles of a robotic system.
- Expand this knowledge into the vast area of robotics.
- The students will be exposed to the concepts of robot kinematics, Dynamics, Trajectory planning.
- Mathematical approach to explain how the robotic arm motion can be described.
- The students will understand the functioning of sensors and actuators.

UNIT-I

Robot Fundamentals : Definitions, History of robots, Laws of Robotics, Robot Specification, Anatomy of a Robot, An over view of Robotics, present and future applications, classification by coordinate system and control system.

UNIT – II

Robot Components: Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom, Requirements and challenges of end effectors, determination of the end effectors, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices.

UNIT – III

Motion Analysis: Homogeneous transformations as applicable to rotation and translation, problems.

Manipulator Kinematics: Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics, problems.

UNIT – IV

Manipulator Dynamics:

Differential transformation and manipulators, Jacobians, problems

Dynamics: Lagrange – Euler and Newton – Euler formulations, Problems.

UNIT V

Trajectory Planning:

General considerations in path description and generation: Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion, straight line motion, Robot

programming,

Robot Programming: Languages and software packages, description of paths with a robot programming language.

UNIT VI

Robot Actuators And Feed Back Components:

Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors.

Feedback components: position sensors, potentiometers, resolvers, encoders, Velocity sensors.

Robot Applications In Manufacturing: Material Transfer, Material handling, loading and unloading, Processing, spot and continuous arc welding & spray painting, Assembly and Inspection.

COURSE OUTCOMES:

Upon successful completion of this course you should be able to:

1. To learn about knowledge for the design of robotics.
2. Identify various robot configuration and components.
3. Carry out kinematic and dynamic analysis for simple serial kinematic chains
4. Calculate the Jacobian for serial and parallel robot.
5. Perform trajectory planning for a manipulator by avoiding obstacles and develop programming principles, languages for a robot control system
6. Select appropriate actuators and sensors for a robot based on specific application

TEXT BOOKS:

1. Groover M P, Industrial Robotics, Pearson Edu Special Indian Edition, 2012.
2. Mittal R K &Nagrath I J, Robotics and Control, Tata McGraw-Hill, 11th Reprint 2008.

REFERENCES BOOKS:

1. K S Fu,RalphGonzalez,C S G Lee, Robotics, McGraw Hill, 1987.
2. Richard D. Klafter, Robotic Engineering, Prentice Hall, 1st Edition, 1989.
3. John J Craig, Introduction to Robotics, Pearson, 3rd Edition, 2004.

OPEN ELECTIVE I					
Course Name	**PRINCIPLES OF COMMUNICATION SYSTEMS**				
Year/Semester	**III B.Tech/I Sem EEE**	**L**	**T**	**P**	**C**
Regulation Year	**2019-2020**	**3**	**0**	**0**	**3**

Course objectives:

This course will enable students to
• Understand and analyze concepts of Analog Modulation schemes:AM, FM.
• Understand and analyze concepts digitization of signals: sampling, quantizing and encoding.
• Evolve the concept of SNR in the presence of channel induced noise and study Demodulation of analog modulated signals.
• Evolve the concept of quantization noise for sampled and encoded signals and study the concepts of reconstruction from these samples at a receiver.

UNIT– 1 AMPLITUDE MODULATION:

Amplitude Modulation: Introduction, Amplitude Modulation: Time & Frequency – Domain description, switching modulator, Envelop detector.
DSBSC Modulation: Time and Frequency – Domain description, Ring modulator, Coherent detection, Costas Receiver.
SSB and VSB Methods of Modulation: SSB Modulation, VSB Modulation, Time and Frequency – Domain description, Frequency- Division Multiplexing.

UNIT – 2 ANGLE MODULATION:

Angle Modulation: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals,
Generation of FM Signals, Demodulation of FM Signals, Phase–Locked Loop

UNIT – 3 NOISE IN ANALOG MODULATION:

Noise - Shot Noise, Thermal noise, White Noise.
Noise in Analog Modulation: Introduction, Receiver Model, Noise in DSB-SC receivers. Noise in AM receivers, Threshold effect, Noise in FM receivers, FM threshold effect, Pre-emphasis and De-emphasis in FM.

UNIT – 4 TRANSMITTERS & RECEIVERS:

Radio Transmitter - Classification of Transmitter, AM Transmitter, FM Transmitter – Variable reactance type and phase modulated FM Transmitter, frequency stability in FM Transmitter.
Radio Receiver - Receiver Types - Tuned radio frequency receiver, Superheterodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting.

UNIT– 5 PULSE ANALOG MODULATION:

Introduction,The Low pass Sampling process, Pulse Amplitude Modulation,PWM, Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves, Comparison of FDM and TDM.

UNIT – 6 SAMPLING AND QUANTIZATION:

Why Digitize Analog Sources?
Pulse– Code Modulation: Sampling, Quantization, Encoding, Quantization Noise,Differential pulse code modulation Delta Modulation, Adaptive delta modulation, Comparison between PCM, DM, ADM and DPCM.

Course Outcomes:

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

CO 1 - Describe the basic principle of communication system.
CO 2 - Demonstrate and solve communication system parameters for various types of modulation and demodulation techniques.
CO 3 - Describe about Noise in Analog Modulation Apply the concepts to practical applications in telecommunication.
CO 4 - Apply the concepts to practical applications in telecommunication. .
CO5 - Describe the basic principles of different modulation techniques
CO6- Differentiate between various pulse code modulation techniques

Text Book:

"Communication Systems", Simon Haykins & Moher, 5th Edition, John Willey, India Pvt. Ltd, 2010, ISBN 978 – 81 – 265 – 2151 – 7.

Reference Books:

1. Modern Digital and Analog Communication Systems, B. P. Lathi, Oxford University Press., 4th edition.
2. An Introduction to Analog and Digital Communication, Simon Haykins, John Wiley India Pvt. Ltd., 2008, ISBN 978–81–265–3653–5.
3. Principles of Communication Systems, H.Taub&D.L.Schilling, TMH,2011.
4. Communication Systems, Harold P.E, Stern Samy and A.Mahmond, Pearson Edition, 2004.

OPEN ELECTIVE I					
Course Name	**Quantitative Aptitude-II**				
Year/Semester	**III B.Tech/I Sem EEE**	**L**	**T**	**P**	**C**
Regulation Year	**2019-2020**	**2**	**0**	**0**	**0**

Course Objectives:

Enable the students to

1. Know the concepts of partnership and their profit sharing at the end.
2. Understand the concept of sets and relation between sets and Venn diagrams.
3. Apply the concepts of measures of central tendency and dispersion.
4. Know the concepts of Permutations & Combinations and their application in probability.
5. Calculate ages of persons in a family using the given data.
6. Understand the given data and interpret the required values.

UNIT –I: Business & Partnership

Partnership in business- Working and Sleeping Partners -Division of Shares - Partnership Involved Time and Work problems.

UNIT- II:Set Theory &Venn Diagrams

Basic Concepts of Sets-Operations on Sets – Venn Diagrams- Problems.

UNIT –III: Statistics:

Basics of Statistics -Range -Mean- Median-Mode -Standard Deviation-Problems.

UNIT –IV: Permutations & Combinations and Probability

Basic concepts of Permutations & Combinations - Selection with and without repetition- Circular Arrangements.

Concepts of Probability- Various Events of Probability- Related Problems.

UNIT –V: Ages

Ratio Based - Proportion Based - Equation Based – Average Based - Age Problems.

UNIT – VI : Data Interpretation

Line & Bar Graphs- Pie Charts/Graphs-Table –Based Problems.

Text Books:

1. Dr. R.S.Aggarwal ,Quantitative Aptitude for competitive Examinations,Sultan Chand Publications, 2017.

References:

1. Arun Sharma, How to Prepare for Quantitative Aptitude for the CAT, Tata McGrawHillPublishing Company, 2016.
2. Dinesh Khattar,The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Pearson India, 2016.

Course Outcomes:

After completing this course, the students will be able to

1. Calculate the profit or remuneration received at the end using the ratio of investments or workmen ship.
2. Evaluate number of persons/objects belonging to a specified category using the concept of Venn diagram.
3. Measure the range, mean, median and mode of the given data, identify the extent of dispersion and interpret the data.
4. Compute various ways of selection or arrangement of persons /objects and predict the probability of doing so.
5. Deduce the ratios/ equations corresponding to ages of persons of a family and calculate the corresponding ages.
6. Analyze the given chart / table and interpret the results from the given data.

Year/Semester	III B. Tech/I Sem	L	T	P	C
Regulation Year	2019-20	0	0	3	1.5
Subject	ELECTRICAL MACHINES – I LAB				
Branch	EEE				

Course Objectives:

- To understand the magnetizing characteristics of DC shunt generator
- To learn the speed control methods of DC motors.
- To understandthe performance characteristics of DC machines
- To understand the predetermination of efficiency in DC machines
- To understand the various no load losses in DC machines and transformers
- To predetermine the efficiency and regulation of transformers and assess their performance.

Any 10 of the following experiments are to be conducted

1. Magnetization characteristics of DC shunt generator to determine the critical field resistance and critical speed.
2. Load test on DC shunt generator and determination of its characteristics.
3. Predetermination of efficiency of DC shuntmachines using Hopkinson's test.
4. Predetermination of efficiencyof shunt machine by Swinburne's test
5. Speed control of DC shunt motor by field and armature control.
6. Brake test on DC shunt motor and determination of its performance curves.
7. Separation of losses in DC shunt motor.
8. OC & SC test on single phase transformer.
9. Sumpner's test on single phase transformer.
10. Scott connection of transformers.
11. Parallel operation of single phase transformers.
12. Separation of core losses in single phase transformer.
13. Sumpner's test on three phase transformer.

CourseOutcomes:

At the end of the lab the student will be able to,

- Draw the magnetizing characteristics of DC shunt generator
- Control the speed of the DC motors.
- Determine the performance characteristics of DC machines
- Predetermine the efficiency of DC machines
- Separate the no load losses in DC machines and transformers
- To predetermine the efficiency and regulation of transformers

Year/Semester	III B. Tech/ I Sem	L	T	P	C
Regulation Year	2019-20	0	0	3	1.5
Subject	CONTROL SYSTEMS LAB				
Branch	EEE				

Course Objectives:

- To impart hands on experience to understand the performance of basic control system components such as magnetic amplifiers, D.C. servo motors, A.C. Servo motors, Potentiometer as Error detector, Tacho Generator, PLC and Synchros.
- To understand time and frequency responses of control systems with and without controllers and compensators.

Any 10 of the following experiments are to be conducted:

1. Time response of a Second order system.
2. Characteristics of Synchros.
3. Effect of feedback on a DC Servo motor
4. Transfer function of a DC servo motor.
5. Verification of logic gates, Boolean expressions using PLC & Speed control of stepper motor using PLC
6. Characteristics of magnetic amplifiers
7. Characteristics of a AC servo motor
8. Characteristics of a DC servo motor
9. Potentiometer as an error detector.
10. Root locus, Bode Plot, Nyquist Plot for different transfer functions (up to 5th order system) Using MATLAB.
11. Controllability and Observability test using MATLAB.
12. Design of lag and lead compensators (by Bode Plot) using MATLAB
13. Transfer function of a DC tacho generator
14. Effect of P, PI, PD and PID controllers on second order system

Course Outcomes:

After the completion of the course the student should be able to:Analyze the performance and working of magnetic amplifier, DC & AC servo motors and synchros.

- Design of lag, lead and lag–lead compensators
- Determine the transfer function of DC Motor
- Verify the Boolean expressions using PLC
- Test the controllability and observability.
- Judge the stability in both time and frequency domain.

Year/Semester	III B.Tech/I Sem	L	T	P	C
Regulation Year	2019-20	-	-	3	1.5
Name of the Subject	Advanced English Communication Skills Lab				
Branch	EEE, ME & CE				

PROPOSED SYLLABUS

COURSE OBJECTIVES:

- To expose students to different contexts through right vocabulary
- To inculcate the habit of reading and understanding any text
- To enable students to acquire the ability of writing for business purposes
- To enable students to acquire interview skills and group discussion dynamics

COURSE OUTCOMES:

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

CO1: Choose vocabulary contextually.

CO2: Comprehend, analyze and interpret the text in a definite time frame.

CO3: Write resumes cohesively and coherently.

CO4: Construct and elaborate on a given topic.

CO5: Comprehend and practice the dynamics of group discussion.

CO6: Comprehend the concept and process of interview; answering through mock interviews.

UNIT – I

Selected High GRE Words, Idioms & Phrases – Discourse Skills – using visuals – Synonyms and antonyms, word roots, one word substitutes, prefixes and suffixes, study of word origin, analogy, idioms and phrases, collocations. **(2 sessions)**

UNIT – II

Reading Comprehension – General Vs Local Comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning. **(2 sessions)**

UNIT – III

Writing Skills – Structure of Resume writing —Short Report Writing (Business/Technical) - **(2 sessions)**

UNIT – IV
Presentations (Technical)

UNIT – V
Group Discussion – Dynamics of Group Discussion, Intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation**. (2 sessions)**

UNIT – VI
Interview Skills – Concept and process – pre-interview planning, opening strategies, answering strategies, interview through teleconference & video-conference and mock interviews. **(3 sessions)**

SUGGESTED SOFTWARE:

1. K-Van solutions Software with CD
2. Oxford advanced learner's compass, 7th Edition

SUGGESTED READING:

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
2. Business and Professional Communiction: Keys for Workplace Excellence. Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications. 2011.
3. English Vocabulary in Use Series, Cambridge University Press 2008.
4. Communication Skills by Leena Sen, PHI Learning Pvt. Ltd., New Delhi, 2009.
5. A Course Book of Advanced Communication Skills Lab published by University Press, Hyderabad.