DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SUBJECT WISE COURSE OUTCOMES (2022 – 2023)

I – SEMESTER

T101 - Mathematics - I	**Yr/Sem: I/I**
CO 1	Apply knowledge of mathematics to solve functions of several variables.
CO 2	Identify, formulate and solve engineering problems like multiple integrals and their usage.
CO 3	To solve differential equations that model physical processes using effective mathematical tools
CO 4	Able to find equation of straight line of shortest distance, equation of plane, angle between straight lines.
CO 5	Gain the knowledge to solve first order differential equation arising in engineering.

T102 - Physics	**Yr/Sem: I/I**
CO 1	Apply knowledge of science and engineering to understand physics and its significant contribution in the advancement of technology and invention of new products that dramatically transform modern day society.
CO 2	Identify different areas of physics which have direct relevance and applications to different engineering disciplines
CO 3	Apply fundamental knowledge to understand applications of ultrasonics, optics and some optical devices, lasers and fiber optics, nuclear energy sources and wave mechanics.
CO 4	Understand the basic operating principles of laser, its applications, optical fiber, and its types, transmission characteristics, applications of optical fibers.
CO 5	Understand the basic operating principles of laser, its applications, optical fiber, and its types, transmission characteristics, applications of optical fibers.

T103 - Chemistry	**Yr/Sem: I/I**
CO 1	Apply knowledge of science and engineering to understand the importance of chemistry in engineering domain.
CO 2	Identify different electrochemical cells and their usage for industrial process.
CO 3	Apply fundamental knowledge of chemistry and build an interface of theoretical concepts with industrial applications/engineering applications.
CO 4	Guide the students to gain the knowledge about the cooling curves , phase diagrams, alloys and their practical importance.
CO 5	Strengthen the fundamentals of chemistry and then build an interface of theoretical

	concepts with their industrial/engineering applications.

T110 - Basic Civil and Mechanical Engineering	**Yr/Sem: I/I**
CO 1	Understand the building classification as per National building code.
CO 2	Get the idea about construction procedure for various components of the building.
CO 3	Students understand the principles of surveying, construction procedure for roads, bridges and dams.
CO 4	Student will be able know about the working of Internal and external combustion systems
CO 5	Student will be able know about Non-Conventional Energy Systems
CO 6	Student will be able to know about manufacturing process.

T111- Engineering Mechanics	**Yr/Sem: I/I**
CO 1	Understand the basic laws of mechanics and resolution of forces using different methods.
CO 2	Learn and apply the knowledge on analysis of forces acting on the trusses and effect of friction force on bodies.
CO 3	Learn about the centroid and moment of inertia for plane and solid figures.
CO 4	Understand the three laws of motion, principles of dynamics for particles.
CO 5	The student will able to analyse the laws of motion for rigid bodies.

T112- Communicative English	**Yr/Sem: I/I**
CO 1	Learnt about the definition of communication, importance, concept. Sender, Ideation, the levels in communication, channels, oral and written way of communication, body language and non verbal communication, Accuracy, Brevity and Clarity, different barriers for Communication, techniques in making effective communication, listening importance and types of listening.
CO 2	Students learnt about the types of letters, report writing, notices and memo and also developed their skill in writing.
CO 3	Understands the comprehension, identifies the difference between Skimming and scanning, guess the meaning of the words, Identify to make notes.
CO 4	Students learnt the writing skills, how to write a paragraph in a proper manner, four modes of writing and how to make bibliographical entries.
CO 5	Students were able to develop their spoken skills by making them to involve in many activities related to it.

P 104 – Physics Lab	**Yr/Sem: I/I**
CO 1	Able to understand how to find the thickness of the specimen and also to find the radius of curvature of glass using the phenomenon of interference of light
CO 2	Able to understand the specific rotatory power of an optical active solution using the principle of polarization.
CO 3	To understand about the thermal conductivity of bad conductor and rubber tube.
CO 4	Ability to understand about the optical properties like dispersive power, Resolving power by applying the knowledge of optics
CO 5	To acquire knowledge about the magnetometer due to current coil and jolly method of

	determining the pressure coefficient of air at constant volume.
CO 6	Ability to understand the basic knowledge of inference ,polarization ,Magnetic materials ,thermal conductivity that correlates the theory and practical

P 105 – Chemistry Lab	**Yr/Sem: I/I**
CO 1	Students will become well acquainted to test amount of hardness present in sample of water for their engineering needs.
CO 2	Students will be efficient in estimating acidity/alkalinity in given samples.
CO 3	Students will have knowledge about estimating amount of dissolved oxygen in water.
CO 4	Students will become well acquainted to estimate copper in brass.
CO 5	Students will have knowledge about determination of viscosity of sucrose using Ostwald‟s viscometer.
CO 6	To develop an understanding of basic titration setup and methodologies for determining strength, hardness and alkalinity of various unknown solutions

P 106 – Workshop Practice	**Yr/Sem: I/I**
CO 1	Understand and comply with workshop safety regulations.
CO 2	Student will be able to make various joints in the given object with the available work material.
CO 3	Student will be able to know how much a joint will take for the assessment of time.
CO 4	Students can able to Identify the hand tools and instruments.
CO 5	Students can able to gain knowledge about various operations carried out in sheet metal.
CO 6	Students can able to gain skills about various tools used in welding to make simple joints.

II – SEMESTER

T 107 – Mathematics - II	**Yr/Sem: I/II**
CO 1	Apply knowledge of mathematics to solve matrix algebra technique for practical applications and Curl, divergence and integration of vectors in vector calculus.
CO 2	Identify, formulate and solve engineering problems like Laplace transform and to solve differential and integral equations.
CO 3	Apply formulae and analyze problems of Fourier transform techniques.
CO 4	Determine the Fourier transform , Fourier cosine and sine transform of elementary functions, properties of transforms and its application in engineering
CO 5	Acquire knowledge of matrix algebra technique, vector calculus, Laplace and Fourier Transform.

T108 – Material Science	**Yr/Sem: I/II**
CO 1	Apply core concepts in material science to solve engineering problems.
CO 2	Knowledgeable of contemporary issues relevant to material science and engineering
CO 3	Understand about the ferrites and its application to magnetic materials.
CO 4	Select materials for design and construction.
CO 5	Understand the importance and properties of materials.

T109 – Environmental Science	**Yr/Sem: I/II**
CO 1	Apply fundamental knowledge to understand about the environment.
CO 2	Identify environmental pollution through science.
CO 3	Apply basic knowledge to solve various environmental issues and problems.
CO 4	Ability to consider issues of environment and sustainable development in his personal and professional undertakings.
CO 5	Provides a comprehensive knowledge in environmental science, environmental issues and the management from an interdisciplinary perspective.

T104 – Basic Electrical and Electronics Engineering	**Yr/Sem: I/II**
CO 1	Will learn the fundamentals of rotational and stationary machine operation, single-phase and three-phase power measurement, magnetic and electrical circuits, and these topics.
CO 2	Will learn the fundamentals of measuring devices, communication systems, and network models.
CO 3	Knowledge about non-conventional energy systems will be available to students.
CO 4	The varieties of metal joining will be known by the students.
CO 5	Students will learn about numerous engines, energies, and joints as well as construction and building components offered with diverse principles.

T105 – Engineering Thermodynamics	**Yr/Sem: I/II**
CO 1	Apply knowledge of mathematics, science and engineering to understand the basics of thermodynamics.
CO 2	Understand the importance of laws of thermodynamics applied to energy systems.
CO 3	Understanding refrigeration, heat pump and their physical mechanism.
CO 4	Understand the laws of motion for rigid bodies.
CO 5	Understand the effects of forces acting on the bodies in practical situation.

T106 – Computer Programming	**Yr/Sem: I/II**
CO 1	Know concepts in problem solving.
CO 2	To do programming in C language.
CO 3	To write diversified solutions using the C language.
CO 4	To know about structures, pointers and its manipulation.
CO 5	To know about the evaluation of computers, components and its applications. Basic knowledge on the internet, information technology, word processing and worksheets.

P101 - Computer Programming Laboratory	**Yr/Sem: I/II**
CO 1	Students can work with command line interface OS's, like MS-DOS.
CO 2	Students can solve most of the real time problems with C program.
CO 3	Students can interact with computer using C program, through various input and output functions.
CO 4	Students can make a use of various keywords, constants, variables, data types, operators, type conversion in C program.
CO 5	Students will have knowledge about arrays, functions, structures and pointers in C

	program.

P102 – Engineering Graphics	**Yr/Sem: I/II**
CO 1	Perform freehand sketching of basic geometrical constructions and multiple views of objects.
CO 2	Project orthographic projections of lines and plane surfaces.
CO 3	Draw projections and solids and development of surfaces.
CO 4	visualize and to project isometric and perspective sections of simple solids.
CO 5	Students will be able to draw orthographic projections and isometric projections.

P103 - Basic Electrical and Electronics Laboratory	**Yr/Sem: I/II**
CO 1	Know about basic electrical tools, applications and precautions
CO 2	Perform different types of wiring used in domestic and industrial applications.
CO 3	Measurements of voltage and phase using CRO, basic operation and applications of devices such as PN junction diode and transistors.
CO 4	Understand the function and applications of basic logic gates and flip flops.
CO 5	Gain knowledge in domestic wiring and application of electronics device in the field of electrical engineering.

P107 – NSS/NCC	**Yr/Sem: I/II**
CO 1	to create awareness in social and environmental issues.
CO 2	to participate in relief and rehabilitation work during natural calamities.
CO 3	to develop some proposals for local slum area development and waste disposal.
CO 4	to create team works among students and produce efficient results.
CO 5	to operate scientific instruments or advanced software.

III – SEMESTER

MA T31 – Mathematics – III	**Yr/Sem: II/III**
CO 1	Identify complex variable function, apply CR equations for testing of analyticity of the complex function.
CO 2	Construct conformal mappings between regions. Solve problems on bilinear transformation and find the Taylor's and Laurent's series.
CO 3	Analyze the complex functions with reference to their analyticity, integration using Cauchy's integral theorem and Cauchy's residue theorem.
CO 4	Express any periodic function as fourier series, fourier sine and cosine series.
CO 5	Finding fourier series for numerical values of any function. Interpret and use the basic concepts of analytic function, Taylor and Laurent series, singularities, residues, conformal mapping, fourier series an harmonic analysis.

EE T32 – Electric Circuit Analysis	**Yr/Sem: II/III**
CO 1	To introduce the fundamental principles of electric circuit theory and to make them applied in circuit theorems to find out solutions at DC circuits.
CO 2	To introduce the fundamental principles of electric circuit theory and to make them applied in circuit theorems to find out solutions at AC circuits.

CO 3	To analysis the three phase circuits and to introduce the fundamental of graph theory.
CO 4	To study and analysis the response of transient in the electric's circuits.
CO 5	To analysis the concept of resonance circuits and the coupled circuits.

EE T33 – Electrical Machines – I	**Yr/Sem: II/III**
CO 1	Analyze the simple magnetic circuit calculations. Understand AC operation of magnetic circuits.
CO 2	Understand the DC generator, dynamics and applications and Analyze emf equation.
CO 3	Understand the functioning of DC motor, Analyze the performance characteristics.
CO 4	Explain single phase transformers, Principle and Construction. Analyze their characteristics
CO 5	Understand working principles of auto-transformer and three phase transformers. Understand the operations of special transformers

EE T34 - Electronic Devices and Circuits	**Yr/Sem: II/III**
CO 1	Classify semiconductor materials and discuss the construction and operation of PN junction diodes with their properties. Analyze the current equations and switching characteristics of a diode.
CO 2	Discuss the construction, operation, and characteristics of transistors. Analyze the transistor biasing circuits using the stability factor.
CO 3	Discuss the creation and operation of field effect transistor devices, as well as their V-I Characteristics curves. Analyze the FET biasing circuits using the stability factor.
CO 4	Discuss the construction and functioning principles of several electronic switching devices such as SCS, SCR, TRIAC, DIAC, GTO, and Schokkelly diode, as well as their properties. Examine the performance of rectifiers and voltage regulator circuits.
CO 5	Discuss the construction and operation principles of special purpose diodes and photo and OPTO electronics devices, as well as their properties.

EE T35 – Electromagnetic Theory	**Yr/Sem: II/III**
CO 1	Understand the electric field distribution, application of Gauss law, force calculation on charge from coulomb's law and charge density calculation.
CO 2	Employ the dielectric characteristics of dipole charges and solve the capacitance of parallel plate, Spherical and cylindrical capacitors with the knowledge of Laplace and Poisson's boundary condition and continuity equation.
CO 3	Apply the Biot savart law for the straight and circular conductors to examine the Magnetic flux, flux density and field intensity.Demonstrate the effect of magnetic field intensity on the torque of closed coil, and to find force between the two conductors.
CO 4	Design of inductor calculation, magnetic field in induction heating, Magnetic plane, Force on magnetic field, application of solenoid, toroid will be studied. This unit forms as base for all electromagnetic induction, Faraday law principle applications.
CO 5	Understand the concept of Maxwell equation, wave propagation in different medium, application in radar system, microwave heating and telecommunication system.

EE T36 – Fluid and Thermal Machines	**Yr/Sem: II/III**
CO 1	Students will be able to apply Euler's, Bernoulli's equations and the conservation of mass to determine velocities, pressures and accelerations for incompressible and in

	viscid fluids.
CO 2	Provide information about the different types of pump and hydraulic turbine and its efficiency.
CO 3	Providing knowledge about the working of steam turbine, efficiency and its working cycle.
CO 4	Students can understand the concepts of engine and air conditioning system.
CO 5	Providing knowledge about the various gas cycles and its efficiency and can able to know the working principles of air compressor and its selections process.

EE P31 – Electrical Machines Lab – I	**Yr/Sem: II/III**
CO 1	Determine the performance characteristics of DC machine by conducting direct and indirect tests by DC motor and DC generators and implement the speed control techniques for a separately excited DC motor.
CO 2	Determine the performance characteristics of single phase transformer, parallel operations of single phase transformer and three phase transformer by conducting load tests and also conduct indirect test in AC machines.

EE P32 – Electronics Lab - I	**Yr/Sem: II/III**
CO 1	Demonstrate the characteristics of PN junction diode, Zener diode, BJT in CE configuration, BJT in CB configuration, FET, UJT, SCR, and TRIAC.
CO 2	Demonstrate the characteristics of clippers and clampers, half wave and full wave rectifiers using CRO and designing the series and shunt regulators using zener diodes, transistor biasing circuits.

EE P33 – Fluid and Thermal Machines Lab	**Yr/Sem: II/III**
CO 1	Design, organize and conduct an experiment to collect field data, calculate, interpret and analyze the results.
CO 2	Demonstrate the performance characteristics of prime movers and thermal machines which are coupled with electrical machines.

IV – SEMESTER

MA T41 – Mathematics – IV	**Yr/Sem: II/IV**
CO 1	Formulate and solve partial differential equation.
CO 2	Derive and obtain the solution of wave equation and boundary value problems.
CO 3	Derive and obtain the solution of heat equation and boundary value problems.
CO 4	Apply least square method to fit various curves for the given data investigate the validity of hypothesis by Z-distribution techniques.
CO 5	Calculation of analysis of variance and explain the use of the Chi-squared test and its calculation.

EE T42 – Electrical Machines - II	**Yr/Sem: II/IV**
CO 1	Define AC windings and its magnetic field. Explain the principle and operation of three phase induction motor and analyze its characteristics.
CO 2	Understand the operational features and dynamics of three phase induction motor.

	Explain the operation of a Induction Generator.
CO 3	Explain principle and operations of Synchronous generator. Analyze Voltage regulation and characteristics.
CO 4	Explain the principle and operations of Synchronous motor, Analyze phasor diagrams and characteristics.
CO 5	Describe single phase induction motor and its field theory and analyze its characteristics. Identify its types along with other special machines.

EE T43 – Electronic Circuits	**Yr/Sem: II/IV**
CO 1	Evaluate the various biasing circuits for BJT and JFET, and use the hybrid parameter and pi model to solve an amplifier's low frequency and high frequency response.
CO 2	Analyze the gain and output characteristics of tuned amplifiers, Darlington amplifiers, cascade amplifiers, and cascode amplifiers
CO 3	Compute the effectiveness of various power amplifier circuits based on their usage in electronic and communication circuits.
CO 4	Demonstrate the various topologies for negative feedback and how it affects amplifier settings.
CO 5	Conduct BJTS and frequency response calculations with the use of mathematical formulas to illustrate the impact of positive feedback on the design of various oscillators' operation.

EE T44 – Linear Control System	**Yr/Sem: II/IV**
CO 1	Examine the mathematical modeling of control system and also Determine the Transfer Function for the block diagrams and signal flow graph
CO 2	Explore the transient response analysis of First and Second order systems using different Standard test signals, Evaluate the steady state errors and error criterion.
CO 3	Explain the concept of Root locuswith the root locus plot; examine the frequency response analysis for Polar blot and Bode plot. Evaluate All pass minimum phase and non-minimum phase systems
CO 4	Evaluate the stability of the system using Routh Hurwitz stability criteria. Asses the gain and phase margin for the Nyquist stability criterion, Constant M circles Constant N circles for Nichol's chart.
CO 5	Discuss the modeling of dynamic system using variable approaches; analyze the state space model for the TF model. Obtain the state equation solution for the homogeneous system and forced system. Understand the concept of controllability and observability.

EE T45 – Pulse and Digital Circuits	**Yr/Sem: II/IV**
CO 1	Understand RL, RC, RLC circuits with four different types of input waveforms such as sinusoidal, step, square and ramp and able to perform clipping of signals
CO 2	Learn different methods of generating square waveforms which are used for generating firing pulses such as bistable, monostable, astable multivibrator and Schmitt trigger.
CO 3	Understand the different numbering systems used in Digital electronics, different code conversion techniques and basic of logic gates. Students able to perform minimization technique using K-map.
CO 4	Design any type of counters such as synchronous, synchronous, ring, Johnson, decade, etc using flip flops.

CO 5	Design and analyze any types of synchronous and asynchronous sequential circuits.

EE T46 – Object Oriented Programming	**Yr/Sem: II/IV**
CO 1	Discuss about programming principles, create and analyzing the program. Explain about array and types of arrays and implement the array in sorting and searching problems.
CO 2	Discuss about linear data structure, representation of stack, operations of stack and its application and discuss about queue, circular queue, double ended queue and its application.
CO 3	Describe the concept of data structures, discuss graphs and terminologies.
CO 4	Understand the difference between structures oriented programming and object oriented programming. Explain about C++, Apply concepts of operator.
CO 5	Explain about templates and demonstrate the use of exception handling mechanism. Apply object oriented features: inheritance, data abstraction, encapsulation and polymorphism.

EE P41 – Electrical Machines Lab - II	**Yr/Sem: II/IV**
CO 1	Analyze the performance of different induction motors under no load and load conditions.
CO 2	Demonstrate the predetermination methods of finding the losses and efficiency of synchronous machines.

EE P42 – Electronics Lab - II	**Yr/Sem: II/IV**
CO 1	With the help of design principles practice different configuration of amplifiers and demonstrate low and high frequency oscillators and multivibrators.
CO 2	Discuss the combinational circuit as Adder, subtractor, and magnitude comparator, multiplexers, encoders, decoders and demultiplexer using logic gates, counters using ICs

EE P43 – Object Oriented Programming Lab	**Yr/Sem: II/IV**
CO 1	Implement the linear and non linear data structure concept in C language.
CO 2	Implement and understand the object oriented programming concept in C++.

EE P44 – Physical Education	**Yr/Sem: II/IV**
CO 1	Understanding the opportunities of students' physical, cognitive, social and emotional development.
CO 2	Understanding of individual and group motivation and behavior.
CO 3	To create teamwork among students and produce efficient results.
CO 4	The students were taught to operate advanced playing kits.
CO 5	to motivate the students to prepare the professional and scientific reports

V – SEMESTER

EE T51 – Communication Engineering	**Yr/Sem: III/V**
CO 1	To understand the concept of analog and digital modulation techniques and to study various analog modems.
CO 2	To study (i) the pulse code modulation system and understand the concept of ASK, PSK, FSK. (ii) to calculate the bit error rate performance of ASK, PSK, FSK.
CO 3	to get in depth knowledge of basics of spread spectrum systems and compare the multiple access techniques.
CO 4	Ability to understand the wireless networks and protocol architecture in practical manner.
CO 5	To understand the design the communication network of smart grid technology and uses of power lines for communication.

EE T52 – Analog and Digital Integrated Circuits	**Yr/Sem: III/V**
CO 1	Evaluate the functionality of integrated circuits and pinpoint their numerous classes and applications. Apply the fundamental planar IC production process knowledge to BJT, FET, MOSFET, and CMOS.To understand the distinctions between linear and digital integrated ICs, discuss the different Logic digital families and their comparison.
CO 2	Determine the operational amplifiers' DC and AC characteristics, their impact on the output, and their methods for compensating. using OP Amp as a Summer or Subtractor. Integrator and Differentiator. Create the V-I converter and I-V converter concepts Analyze the Instrument Amplifier, Log, and Antilog
CO 3	Demonstrate how application-specific ICs serve as voltage regulators. Create and analyze analog to digital converters. Analyzing and designing V/F & F/V converters, which convert digital to analog,
CO 4	Assemble analog filter circuits. State variable and switched capacitor active filters are designed and analyzed. To create sine waves, analyze and develop oscillators. Triangle-shaped waves, square waves
CO 5	Discuss about the PLL's function- and application-specific ICs. Examine how the 555 timer IC's circuit operates.Design and analysis of a multivibrator utilizing the IC 555, instruction on the Schmitt trigger and missing pulse detector

EE T53 – Transmission and Distribution	**Yr/Sem: III/V**
CO 1	Understand the fundamentals of designing and installing transmission and distribution systems. They can determine the most cost-effective transmission voltage for a given distance and area by calculating the economic size of conductors.
CO 2	Recognize the positive aspects of overhead and underground transmission lines, such as the various conductor kinds and the supporting structures that take weather and geographic factors into account. They can compute faults and comprehend issues with overhead power lines.
CO 3	Analyze and compute various single-phase and three-phase line parameters to determine how to increase the efficiency of transmission lines. Students will be able to analyze the equations and constants associated with various transmission lines and describe them in the form of circuits.
CO 4	Demonstrate understanding of the many types of insulators used in transmission lines and the voltage distribution in insulators, which is crucial for preserving string efficiency and stress in insulators and lines. Additionally, understand how to calculate UG cable capacitance and dielectric stress

CO 5	Discuss examples of the current state of Indian transmission systems and the improvements made to the STATCOM, DVR, UPFC, and other equipment utilized in transmission lines. Additionally, it provides you with an overview of HVDC systems, as well as comparisons between them and EHVAC systems and the economic elements of transmission systems

EE T54 – Power Electronics	**Yr/Sem: III/V**
CO 1	Enumerate the different types of semiconductor devices such as power diode, BJT, SCR, TRIAC, MOSFET, GTO, IGBT with their specifications, working principleV-I characteristics ON-OFF methods, Protections, over current, over voltage, losses
CO 2	Examine of single and three phase rectifiers for half and fully controlled converters with different loads and freewheeling diodes with various waveforms. Evaluate Power factor and harmonic improvement methods for controllers with symmetrical angle controller with various modes.
CO 3	Analyze the operation, principle of high power chopper circuits, voltage commutated chopper, current commutated chopper, buck, boost and buck boost regulators and multi-phase choppers with waveforms.
CO 4	Explore the Principles of high power VSI and CSI inverters, Modified McMurray, auto sequential inverter with waveforms at load and commutating elements, analysis of three phase inverter circuits with star and delta loads.
CO 5	Explore the Principle of single phase, three-phase AC voltage controllers, single phase and three phase cycloconverters circuits with different control techniques and firing pulse generation. Illustrate the various power electronics applications.

EE T55 – Measurements and Instrumentations	**Yr/Sem: III/V**
CO 1	Acquire understanding of measuring equipment characteristics and classification, as well as how to explain various measurement errors and how to eliminate them.
CO 2	Explain the construction, operation, and proper usage of alternating current/direct current meters. Learn about bridge comparison methods for measuring R, L, and C.
CO 3	Describe the various magnetic measurement methods.
CO 4	Learn about the construction and operation of many types of display devices and recorders.
CO 5	Show the numerous sorts of transducers that are used for physical measurements.

EE E06 – Special Electrical Machines	**Yr/Sem: III/V**
CO 1	Understand the constructional features, principle of operation, Modes of operation of Stepper motor Classify the Types of motors, Drive system and circuit control of Stepper motor Analyze Static and Dynamic Characteristics Explain its Applications.
CO 2	Understand Constructional details, principles of operation of switched reluctance motor. Analyze its characteristics, torque, drive and its regulation. Explain the control and Applications.
CO 3	Understand Constructional features and principle of synchronous reluctance motor and vernier motor. Classify its Types Reluctance and analyze the Phasor diagram and its Characteristics.
CO 4	Remember the Commutation in DC motors.Differentiate between mechanical and electronic commutatorsUnderstand Principle of operation, Construction and drive circuits.Analyze Torque and emf equation, Torque and Speed characteristicsExplain

	sensors and sensor less systems, controllers and applications.
CO 5	Understand Principles of operation, Constructional features, characteristics and application of permanent magnet synchronous motor and doubly fed induction generator.Analyze Phasor diagram,torque speed characteristics and applications.

EE P51 – Electronics Lab – III	**Yr/Sem: III/V**
CO 1	Demonstrate the analog electronic circuits like voltage regulators, amplifiers, oscillators, filters and multivibrators.
CO 2	Develop digital circuits like counters, code converters, multiplexers, demultiplexers, encoders, decoders and digital to analog converters.

EE P52 – Measurements and Control Lab	**Yr/Sem: III/V**
CO 1	Demonstrate and understand the operation of bridge circuits, verification of theorems and calibration of energy meter.
CO 2	Demonstrate and understand the various applications of operational amplifier, application of transducer, magnetic measurement and extend the range of meters. Time response, frequency response and stability analysis of control system using Matlab/simulink

HS P53 – General Proficiency – I	**Yr/Sem: III/V**
CO 1	To understand and practice the art of communication
CO 2	able to practice and showcase soft skills.
CO 3	To understand the importance of writing.
CO 4	To practice speaking skill.
CO 5	To practice verbal, non verbal and numerical aptitude.

VI – SEMESTER

EE T612 – Power System Analysis	**Yr/Sem: III/VI**
CO 1	Describe the synchronous machines, induction machines, transformers, transmission lines, and loads in the power system using bus admittance, bus impedance, and per unit matrices.
CO 2	Utilize voltage-controlled buses, tap-changing transformers, phase-shift control, line flow analysis, Newton-Raphson, and Jacobian & Fast Decoupled methods to illustrate the load flow equations in a power system.
CO 3	Analysis of the symmetrical parts of the transformation matrices for the power system that are utilized to solve the networks of unbalanced voltages and currents.
CO 4	Establishing sequence networks in a power system using symmetrical (Thevenin's theorem) and unsymmetrical (LG, LL, LLG) fault analysis.
CO 5	Analyses of the equivalent circuit for a power system and stability analysis using the swing equation, equal area criterion, and crucial clearance angle problem techniques (transient voltage dip/ sag criteria, current standards, and voltage stability margin).

EE T62 – Utilization of Electrical Energy	**Yr/Sem: III/VI**
CO 1	To provide basic understanding of illumination and the lighting schemes of lamp.

CO 2	To impart the fundamental knowledge of electric heating and welding.
CO 3	To understand working principle of various electrical drives and its controls.
CO 4	To study the concept of traction and to compared to the recent metro rails.
CO q5	To analysis the electrolytic process, working of the electroplating and various batteries.

EE T63 – Microprocessor and Microcontroller	**Yr/Sem: III/VI**
CO 1	The students will get the basic knowledge about the organization of microprocessor architecture of 8085, Z80, MC6800.
CO 2	Will come to know about the different Instruction sets and can write assembly level language programs for any control applications using 8085 processor
CO 3	Be skillful to design the different memory IC interfacing with 8085 processor and comes to know about the different data transfer schemes.
CO 4	Will understand the different Interfacing IC s such as 8251,8253,8255,8279 which is used for USART, Timer, counter, PPI, Keyboard display Interface using 8085.
CO 5	Learning the basic architecture of 8051 microcontroller with its general & special purpose registers, internal memory storages, Timing and control circuits and Programming techniques.

EE T64 – Electrical Machine Design	**Yr/Sem: III/VI**
CO 1	Analyze the fundamentals of air-gap design, MMF, heating and cooling curves, and electrical machine leakage flux.
CO 2	Evaluate the output equation, primary dimensions, overall designs, armature design, and design of de machines' commutator and brushes.
CO 3	Evaluate the understanding of the output equation, primary dimensions, overall designs, number of turns and length of mean turns of windings, winding resistance, and no load current calculation of single phase and three phase transformers.
CO 4	Evaluate the concepts of the output equation, main dimensions, overall designs, design of squirrel cage rotor, selecting rotor slots of squirrel cage machines, design of rotor bars and slots, design of end rings, and design of wound rotor of an induction motor.
CO 5	Examine your understanding of salient pole machine design, stator design, rotor design, and design of damper winding,designof turbo alternator,benefits of CAD and flow chart representation of synchronous machine.

EE T65 – Digital Signal Processing	**Yr/Sem: III/VI**
CO 1	Discuss the basic elements of signal processing, sampling of analog signals, aliasing. Explore the standard discrete time signals, manipulations and representation of discrete time signals.
CO 2	Analyze the properties of Z transform and inverse Z transform. Application to discrete systems.
CO 3	Analyze the discover fourier transform properties, IDFT, analysis of signal using decimation in time, frequency and computation of IDFT using FFT.
CO 4	Design different filters using different techniques.
CO 5	Derive the structures for FIR and IIR systems.

EE E05 – Electrical Safety	**Yr/Sem: III/VI**

CO 1	Comprehensive of compliance with the standards on electrical safety, rules and responsibilities. Discuss about clearances, standards, first aid and fire fighting facility.
CO 2	Understanding the electrical appliances installation, temporary installations, agricultural pump installations. Discuss Do's and don'ts for domestic electrical appliances.
CO 3	Understand operation and maintenance of power plant installation, testing and commissioning. Documentation and interpretation safety clearance.
CO 4	Distinguish hazardous areas and classify them. Understand spare, flash over, corona discharge and functional requirement in transmission system.
CO 5	Understand total quality control and management for power plants.

EE P61 – Power Electronics Lab	**Yr/Sem: III/VI**
CO 1	Demonstrate and understand the operation of various power converter circuits namely controlled rectifier, choppers, AC voltage regulators and inverters and their applications.
CO 2	Demonstrate and understand the simulation of power converters circuits using MATLAB/simulink and experimentally verify the simulation results in the hardware lab.

EE P62 – Micro Processor and Microcontroller Lab	**Yr/Sem: III/VI**
CO 1	To design and implement programmes on 8085 microprocessor with assembly language of instruction.
CO 2	By understanding the key concepts of 8051 microcontroller architecture, various types of instructions, Design interfacing with 8086 microprocessor with assembly language.

HS P63 – General Proficiency – II	**Yr/Sem: III/VI**
CO 1	Understand the composition analysis.
CO 2	Developing letter and resume writing skills.
CO 3	Understand and practice oral skills through group discussions and negotiation activities.
CO 4	Practice corporate etiquette, grooming and dressing.
CO 5	Practice verbal, non-verbal and numerical aptitude.

VII – SEMESTER

EE T71 – Industrial Management	**Yr/Sem: IV/VII**
CO 1	Understand Economics and Engineering Economics Analyze Break-Even Analysis, P/V ratio, Elementary Economics Analysis Define Structure of Market, Pricing and its related factors.
CO 2	Understand Make or Buy Decision and Value Engineering Discuss Interest formulas and their applications Describe Time Value of Money.
CO 3	Understand Methods of Comparison of Alternatives and Rate of Return Method, Illustrate examples in all the methods.
CO 4	Explain Principles of management Classify Types and functions of management, Organization and ownership.
CO 5	Explain Financial management Classify Types of capital, investment and accounting.

EE T72 – Solid State Drives	**Yr/Sem: IV/VII**
CO 1	Describe the components of an electric drive, the torque equation, drive classification, and the ability to select a suitable drive for a specific use based on power rating.
CO 2	Analyze the performance of single phase/three phase converters and DC chopper circuits that power electrical drives.
CO 3	Analyze the performance of stator-side controlled induction motor drives using variable voltage, variable frequency, and V/F, Stator current control methods.
CO 4	Analyze the performance of rotor resistance control approaches and slip power recovery systems in rotor side controlled induction motor drives.
CO 5	Analyze synchronous motor drive performance using self control, self-sufficient control, and vector control techniques.

EE T73 – Power System Operation and Control	**Yr/Sem: IV/VII**
CO 1	Considering energy control centers and their functions, describe how power system security is maintained under various operational states. Using SCADA, demonstrate how frequency and voltage regulation are necessary for P-F and Q-V control systems.
CO 2	Analysis the power system load forecasting by the method of least square fit under base load and optimum unit commitment for a power system uses priority ordering load dispatching and dynamic programming methods.
CO 3	Describe an explanation of the mathematical model of the speed controlling mechanism given the characteristics of the speed load and how it is used to analyze the power system under uncontrolled static and dynamic situations using a proportional plus integral controller for a single, two, or multiple area system.
CO 4	Analysis of the incremental cost curve using base point and participation factors under an economic dispatch controller added to LFC, as well as solutions to coordination equations with losses, without losses, and B co-efficients.
CO 5	Utilizing a black diagram, analyze the core elements of the excitation system. Explain the voltage control compensating techniques for transmission systems using static shunt capacitor/inductor, VAR compensator, and tap changing transformer.

EE E16 – Power System Restructuring and Deregulation	**Yr/Sem: IV/VII**
CO 1	Explore the fundamentals of restructured power market and explore the deregulation components or its entities in the power market.
CO 2	To provide an Introductory about the architecture of power market and explore the various technical challenges in the restructured power market.
CO 3	Discuss the various concepts of management and also method to reduce congestion in the restructured environment, enumerate ancillary services used in rescheduling the power market.
CO 4	To elucidate the various pricing mechanism available in the transmission lines and also to discuss various tracing methods available to charge the transmission line according to the usage of lines.
CO 5	Enumerate the current scenario of power market in India as well as the regulatory policy development. Explore the structure of Electrical tariff and the impact of depreciation on the power system component.

EE E19 – Smart Grid	**Yr/Sem: IV/VII**

CO 1	Discuss the evolution of electric grid and the need of for smart grid. Acquire knowledge on the enabling technologies in smart grid architecture and the international experience in smart grid deployment effort and also about the smart grid road map of India.
CO 2	Illustrate the fundamentals of synchrophasor technology with concept and benefits of wide area monitoring system. Able to acquire knowledge on the structure of Phasor Measuring Unit (PMU) and Phasor data concentrator (PDC) with road map for synchrophasor application.
CO 3	Describe the components and operation of AMI systems, including smart meters and communication networks. Discuss the benefits of AMI for consumers, utilities, and the overall grid efficiency. Define demand response and its significance in load management. Discuss strategies for implementing demand response programs to optimize energy consumption. Analyze the role of smart appliances and home energy management systems in demand-side management.
CO 4	Explore communication protocols and technologies used in smart grid systems. Explain the role of Supervisory Control and Data Acquisition (SCADA) systems and their integration with the Smart Grid. Analyze the importance of real-time monitoring and control in grid stability and security.
CO 5	Describe different types of energy storage technologies and their applications in the Smart Grid. Present real-world examples and case studies of successful Smart Grid implementations. Discuss strategies for enhancing grid resilience and cyber security.

EE P71 – Power System Simulation Lab	**Yr/Sem: IV/VII**
CO 1	Demonstrate the programming and simulation of power systems using computer package MATLAB
CO 2	Develop MATLAB programmes for computation of power system components in per units, formulation of the bus admittance and impedance matrices, load dispatch, load flow, short circuit and transient stability studies.

EE PW7 – Project Phase – I	**Yr/Sem: IV/VII**
CO 1	On completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.
CO 2	Formulate a real world problem in electrical and electronics sector, identify te requirement and develop project.
CO 3	Identify technical ideas, strategies and methodologies to find solution to the proposed project.
CO 4	Utilize new tools and techniques that contribute to obtain solution to the project.
CO 5	Prepare report and present oral demonstrations.

EE P72 – Seminar	**Yr/Sem: IV/VII**
CO 1	Students must be able to make critical review of literature.
CO 2	Preparation of report on the topic.

EE P73 – Training /Industrial Visit	**Yr/Sem: IV/VII**
CO 1	Students must be able to undertake an industrial visit and training.
CO 2	Understand industrial culture and practical knowledge.

VIII – SEMESTER

EE T81 – Protection and Switchgear	**Yr/Sem: IV/VIII**
CO 1	To acquire the basic knowledge of power system protection and the working of relays.
CO 2	To understand the fundamentals of relay and its characteristics of various relays.
CO 3	To analysis and design the various protection equipments based on the performance like generator capability curves and fault calculation.
CO 4	To study the design aspects of the circuit breakers with its parameters.
CO 5	To understand the knowledge in working of circuit breakers and its various types.

EE E12 – Renewable Energy Sources	**Yr/Sem: IV/VIII**
CO 1	Understanding of the availability and limitations of conventional energy sources in India.
CO 2	The capacity to create, design, and analyze any distribution generation system utilizing sun renewable energy resources.
CO 3	The ability to develop, build, and analyze any distribution generation system based on renewable energy resources such as wind.
CO 4	The ability to develop, build, and analyze any distribution generation system based on renewable energy resources such as ocean and tidal energy.
CO 5	Students will be able to develop, design, and analyze any distribution generation system that uses renewable energy resources such as biogas and geothermal power generation.

EE E15 – HVDC Transmission	**Yr/Sem: IV/VIII**
CO 1	Illustrate the differences between EHV AC and HVDC systems as well as the various types of DC linkages.
CO 2	Evaluation of current and voltage relationships for three-phase bridge converter waveforms with and without overlap.Describe the DC link control principle and its control properties.Discuss constant current, constant ignition angle, and constant extinction angle management.
CO 3	Describe the disruptions produced by axis fire, converter problems, commutation failure, and other issues. by using excessive current and voltage.Demonstrate how to defend against excess current and voltage as well as the function of surge arrestors and smoothing reactors in link protection.
CO 4	Illustrate how to control reactive power during transients from sources of reactive power like the static VAR system, TCR, SVC, and others.Design of various AC and DC filters for harmonic reduction and their effects.
CO 5	Understand the various MTDC system types and contrast serial and parallel MTDC architecture. Describe the characteristics of HVDC insulation, DC line insulators, and DC breakers.

EE PW8 – Project Phase II	**Yr/Sem: IV/VIII**
CO 1	Practice of working harmoniously in a group.
CO 2	Create a project involving analytical, experimental, design combinations related to

	electrical and electronics engineering.
CO 3	Prepare a report consisting of a literature survey, problem statement, methodology, results and conclusions.

EE P81 – Comprehensive Viva	**Yr/Sem: IV/VIII**
CO 1	Remember all areas of electrical and electronics engineering.

EE P82 – Professional Ethical Practice	**Yr/Sem: IV/VIII**
CO 1	Discuss engineering ethics, moral issues, ethical theories and their uses in engineering.
CO 2	Realize code of ethics, engineer's responsibility for safety, rights and responsibilities.