



## Course Outcome (CO)-

First Year CO's-

Course Code	Course Name	CO's
SH 1033	Engineering Chemistry	Explain basic concepts of chemistry.
		Select the correct instrumental techniques for the examination of materials.
		Demonstrate knowledge of science behind normal polluting influences in water and strategies to treat them.
		Utilize the electrochemical principle for selection of proper batteries.
		Apply the science for understanding corrosion and its prevention.
		Compare types and quality of fuels by different instruments and select the proper lubricant and lubrication method.
SH 1053	Engineering Mathematics I	Sketch the curve with full justification.
		Apply the properties of special functions to evaluate integral.
		Evaluate double integral and change the order of the integration.
		Evaluate area bounded between two curves, mass of Lamina, moment of inertia.
		Prove the results of partial differentiation.
SH129	Electrical Engineering	Apply partial differentiation for evaluating and proving the results based on Errors approximations ,minima and maxima
		Solve magnetic circuits, d.c. and a.c. electric circuits.
		Describe construction, working and application of transformers.
		Describe construction, working and application of different types of commonly used rotating machines.
		Classify power converters on the basis of their applications.
SH1271	Computer Programming	Suggest suitable capacity of wires, cables switchgear and illumination system for low voltage electrical installations.
		Explain the basic terminology and concepts of C programming language.
		Design Algorithm and Flow Chart for the given problem.
		Write, Compile and execute 'C' programs for a given problem.
SH1532	Engineering Chemistry Lab	Analyze the given C Program to predict the output
		Evaluate the C program to resolve the errors
		Examine the materials by using analytical instruments.
		Identify the quality of water for industrial and domestic purposes.
		Apply the knowledge of electrochemistry for design of various cells and batteries.
SH1771	Computer Programming Lab	Select proper Lubricant for different machines according to working condition.
		Inspect the quality of fuel.
		Describe orally the basic terminology and concepts of C programming language.
		Develop algorithm and flow chart for the given problem.
		Write, compile and execute 'c' programs for a given problem.
SH 1831	English Proficiency Lab. I	Evaluate the C program to resolve the errors.
		Debug the program to predict the correct output.
SH 1831	English Proficiency Lab. I	Demonstrate reception skills of language
		Communicate using oral and written mode.



		Make use of English language with grammatical accuracy.
		Articulate correctly the frequently used words using phonemic transcriptions
SH185	Engineering Practice Lab. I	Acquire skills in basic engineering practice.
		Use of hand tools and power tools.
		Develop sheet metal model for specific application.
		Understand the various operations performed in machine shop.
		Perform different joining operations
		Perform pipe fittings operations.
SH 106	Engineering Physics	Apply the knowledge of architectural acoustics for acoustically good halls and the principle of magnetostriction and piezoelectric methods for the production of ultrasounds
		Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles
		Understand working principle of laser and optical fiber
		Use knowledge of basics of semiconductors.
		Use characteristics of semiconducting materials in semiconducting devices
		Select appropriate magnetic materials depending on its properties for various applications
SH1023	Engineering Mathematics II	Use the concepts of matrices that serve as an essential basis for several computational techniques.
		Solve the differential equations by choosing proper method of solution.
		Solve the problems on orthogonal trajectories, simple electrical circuits, and heat flow by applying the methods of ordinary differential equations.
		Use the relevant method for solving simultaneous algebraic linear equations.
		Apply the relevant numerical method for interpolating the polynomial.
		Apply appropriate numerical method to compute the solution of ordinary differential equations.
SH1132	Engineering Graphics Engineering Graphics	Determine the location of the location and orientation of point, line, and plane with respect to reference planes to draw their projection.
		Develop the projection of various types of solids in various conditions.
		Develop section views and true shape section of various types of solids
		Identify the need of development of lateral surfaces and apply the same in engineering drawing.
		Develop orthographic views of an object to convert pictorial view into two-dimension (2D) view.
		Develop isometric view to convert two-dimension (2D) view to pictorial view.
Elective I SE1011	Basics of Electronics Engineering	Recognize basic semiconductor components and devices used for different electronic applications.
		Explain working principle of diode, transistor and their applications.
		Describe the number system, basic structure of computer and processor architecture.
		Analyze the analog and digital electronic circuits using discrete components.
SE1051	Basics of Civil Engineering	Apply fundamental knowledge of civil engineering.
		Identify building components and materials used in construction along with concepts of suitability and safety of buildings.
		Use basic principles of planning in the building design and processes involved in the property transactions.
		Determine horizontal and vertical distances using modern surveying instruments.
		Illustrate the infrastructural facilities.
Elective I		Understand the principles of green chemistry and engineering



SE1131	Green Technology	Design processes that are benign and environmentally viable
		Design processes and products that are safe and hazard free
		Learn to modify processes and products to make them green safe and economically acceptable
SE145	Creativity, Design Thinking and Entrepreneurial Mindset	Learn structured approach to creativity, problem identification and problem solving in a new venture context
		Apply design thinking approach to identify innovation opportunities and develop solutions
		Identify, validate and define specific innovation opportunities through Jobs-to-be-Done methodology
		Develop mindset of a successful entrepreneur
SE143	Basics of Mechanical Engineering	Explain different power generation systems.
		Select appropriate energy conversion device for the given application.
		Classify vehicles on the basis of different parameters.
		Compare two stroke and four stroke IC engines. Describe different transmission devices in a given system.
		Describe different transmission devices in a given system.
SH1512	Engineering Physics Lab	Choose suitable materials and manufacturing processes for a given application
		Apply the theory of semiconductors to calculate band gap energy and carrier concentration.
		Apply theory of interference and grating to calculate radius of curvature of plano convex lens and wavelength of light
		Compare BH curve for different ferromagnetic materials and measure hysteresis loss in it.
		Determine resolving power of telescope and numerical aperture of optical fiber
		Use ultrasonic interferometer to calculate velocity of ultrasound in given liquid.
SH1552	Engineering Graphics Lab	Use laurents half shade polarimeter to calculate specific rotation of optically active solution.
		Determine the location and orientation of point, line, and plane with respect to reference planes to draw their projection.
		Develop the projection of various types of solids in various conditions.
		Develop section views and true shape section of various types of solids
		Identify the need of development of lateral surfaces and apply the same in engineering drawing.
		Develop orthographic views of an object to convert pictorial view into two-dimension (2D) view.
SE151	Basics of Electronics Engineering Lab	Develop isometric view to convert two-dimension (2D) view to pictorial view.
		Demonstrate use of various electronic components & equipment's for building applications.
		Build the circuits using Diode, Transistor Electronics Devices.
		Construct various applications using Operational Amplifier like Amplifiers.
		Test the basic logic gates, adders & subtractors.



SE1551	Basics of Civil Engineering Lab	Draw dimensioned sketch/plan of building
		Plan building using principles and bye laws.
		Perform horizontal and vertical measurement.
		Use modern surveying techniques.
SE1631	Green Technology Lab	Illustrate the concept of green technology in energy and building sector.
		Prepare energy and water budget for a building.
		Design rainwater harvesting for a small catchment area.
SE167	Creativity, Design Thinking and Entrepreneurial Mindset Lab	Analyze air quality by using HC/CO analyzer.
		Learn structured approach to creativity, problem identification and problem solving in a new venture context.
		Apply design thinking approach to identify innovation opportunities and develop solutions.
SH 162	English Proficiency Lab. II	Develop mindset of a successful entrepreneur
		Demonstrate writing skills through letters, circulars, notices, memos, and emails
		Apply report writing skills.
		Organize message in appropriate structures.
SH164	Engineering Practice Lab II	Prepare job application addressing requirements of the post.
		Explain & demonstrate facts, concept & techniques of manufacturing of various items in technology area.
		Develop quality & safety consciousness while working in workshop.
		Develop respect towards effort, skill & labour work in manufacturing.
SE165	Basics of Mechanical Engineering Lab	Demonstrate ability to read drawing & carry out Smithy, Tin smithy, Welding & plumbing operations.
		Explain the different components of power generation systems.
		Identify the systems and components of vehicle.
		Distinguish between two stroke and four stroke engines.
		Carry out day to day life maintenance of machines.
SH189	Engineering Exploration and Design Project	Explain the different components of power generation systems.
		Explain the role of an engineer as a problem solver
		Design engineering solutions to complex problems utilizing multi-disciplinary systems approach.
		Examine a given problem using process of engineering problem analysis.
		Build simple systems/prototypes using engineering design and development process.
		Analyze engineering solutions from ethical and sustainability perspectives.
Apply basics of engineering project management skills in project development.		



Second Year to Last Year CO's

Semester	Course Code	Course Name	Course Outcome
III	EE2031	DC Machines & Transformer	Explain the working principle and operation of single phase and three phase transformer.
			Identify various industrial application for single phase and three phase transformer.
			Describe behavior of dc machines.
			Interpret characteristics of dc machines.
			Identify the importance of testing and control of dc machines with suitable industrial applications.
III	EE2051	Electrical Circuit Analysis	Apply knowledge of mathematics, science, and engineering to the analysis and design of electrical circuits
			Identify, formulate, and solve engineering problems in the area circuits and systems
			Coordinate various components and process of electrical system to meet desired needs within realistic constraints
			Explain importance of various network topology methods for computer analysis of large networks
			Implement network reduction techniques to solve power system networks
			Construct and organize various filter for specific circuits
III	EE2071	Analog Electronics	Explain the fundamentals of solid state electronics including diode, BJT, JFET & MOSFET.
			Apply DC & AC (small signal) analysis to solid state electronic circuits.
			Design solid state electronic circuits.
			Analyze operational amplifier application circuits.
III	EE2091	Power System Economics	Classify power amplifier circuits.
			Distinguish conventional and non-conventional energy sources
			Identify variable load on power stations and factors associated for per unit cost of energy generation.
			Choose various factors for cost of energy in terms different tariff.
			Determine different methods of power factor improvement
III	EE2511	DC Machines & Transformers Lab	Compare different supply systems used in power system
			Perform various experiments on DC machines
			Perform various experiments on Transformer.
			Find out the characteristics of various machines along with their efficiencies
			Analyze various parameters and predict the durability of the machines
III	EE2531	Electrical Circuits & Simulation Lab	Compare the performances of the machines by referring relevant standards
			Analyze responses of electrical circuits in real time
			Design electrical networks using MATLAB/PSPICE etc.
			Compare responses of real-time electrical networks with simulations.
			Explain the importance of the virtual environment to analyze electrical networks
III	EE2551	Analog Electronics Lab	Implement various network reduction techniques for power system analysis and modeling
			Build and analyze electronic circuits as per requirement
			Observe input and output waveform at various test points
			Plot the input & output response of electronic circuits.
			Interpret results of experiment and compare with theoretical values
III	SH2091	Engineering Mathematics -III	Improve the ability to communicate effectively through written lab journals
			Solve linear differential equations & problems related to application by using various methods
			Determine expansion of functions by using Fourier series.



			Solve problems on probability distribution by using different formula. Determine Laplace transform & inverse Laplace transform of various functions by using properties. Laplace transform & apply Laplace transform to solve linear differential equations Calculate z- transform & inverse z- transform by using properties of z- transform
IV	EE2021	Alternating Current Rotating Electrical Machines	Explain different types, construction, working principle & characteristics of three phase induction motors Apply the knowledge gained through characteristics of three phase induction motor. Explain various types, construction, principle of operation, & application of single phase induction motor Describe construction, working principle along with winding details of synchronous generator. Analyze performance, characteristics and testing of synchronous machine.
IV	EE2041	Power Transmission & Distribution System(	Explain structure of power systems Analyze various transmission line parameters and its mathematical modelling Discover various design aspects of overhead transmission lines Explain construction & classification of various underground cables Classify various types of A.C and D.C. distribution systems
IV	EE2101	Signals and Systems	Classify various signals and systems. Analyze linear time invariant systems using different tools. Apply time and frequency domain analysis techniques to different signals and systems. Evaluate discrete time Fourier transform of a set of well-defined signals. Explain the need of signal processing techniques for various engineering fields.
IV	EE2061	Electrical and Electronic Measurements	Demonstrate basic concept of calibration, statistical evaluation of measurement data. Explain construction & working of various electrical measuring instruments. Identify and demonstrate both electrical and electronic measuring instruments. Determine R, L, C parameters using AC and DC bridges. Explain construction and working of digital instruments
IV	EE2081	Digital Electronics	Describe the fundamental concepts and techniques used in digital electronics. Formulate the logic expressions using Boolean laws & K-map. Design and verify combinational logic circuits Design and verify sequential logic circuits.
IV	EE2521	A.C. Rotating Electrical Machines Lab	Perform various experiments on AC rotating machines. Analyze the characteristics of various ac machines along with their efficiencies. Analyze various parameters and predict the durability of the machine. Compare the performances of the machines by referring relevant standards. Identify proper machine for particular application. Study the constructional details of various electrical motors.
IV	EE2541	Electrical and Electronic Measurements Lab	Demonstrate calibration of various measuring instruments using statistical evaluation of measurement data. Determine power and energy for the given system using various measurement techniques. Explain construction and working of various instruments Calculate R, L, C parameters using AC and DC bridges..
IV	EE2561	Digital	Verify the truth table of digital electronic components



		Electronics LAB	Implement desired Boolean functions using digital electronic components Design and verify combinational logic circuits. Design and verify sequential logic circuits
IV	EE2581	Mini Project Environmental Science	Utilize scientific methods to solve environmental problems Examine technologies for restoration of degraded environment Develop presentation and report writing skills Develop as an individual and in group leadership quality.
V	EE3031	Power Electronics	Understand the behavior of semiconductor devices operated as power switches. Explain operation, waveform and performance parameters of phase controlled converters, uncontrolled rectifiers. Analyze and design ac-dc converters Explain the basic topologies of dc-dc converters analyze and design dc-dc converters. Explain different modulation techniques of pulse width modulated inverters and to understand the harmonic reduction methods. Analyze and design dc-ac inverters. Apply the electronic devices for conversion, control and conditioning of power.
V	EE3051	Power System Stability and Control	Analyze symmetrical faults in power systems Apply symmetrical components method for fault analysis Interpret the necessity of automatic generation control and excitation control. Analyze the optimal operation of power system. Analyze power system stability.
V	EE3071	Feedback Control System	Identify the basic elements and structures and demonstrate an understanding of the fundamentals of feedback control systems. Develop the mathematical models of any physical systems such as: state space, transfer function Determine the response of different order systems for various standard signals. Interpret and analyze time domain systems using virtual environment. Interpret and analyze frequency domain systems using virtual environment.
V	EE3091	Microprocessors and Micro controller	Describe the architecture of microprocessor and micro-controller. Write assembly language programs for 8085. Explain a typical input-output interface. Identify instruction addressing modes and syntax for 8051. Create an assembly language or C program for 8051 that performs a prescribed task. Design and implement a micro-controller-based embedded system.
V	EE3011	Electromagnetic Field Theory	Define electric and magnetic fields according to their force effect. Understand the physical meanings of the differential equations for electrostatic and magneto static fields Calculate the electric field from the stationary charge distributions and magnetic fields from steady current distributions Describe and use simple models of electric and magnetic field interactions with materials Explain the concept of electromotive force, Maxwell's equations and their physical meanings Analyze energy transportation and wave propagation in an electromagnetic field.
V	EE3511	Power Electronics Lab	Understand the behavior, turn on & turn off schemes of semiconductor devices operated as power switches. Analyze, sketch, examine waveforms, and calculate, measure performance factors of output of ac-to-dc converters. Analyze, sketch, examine waveforms, and calculate, measure



			performance factors of output of dc-to-dc converters. Analyze, sketch, examine waveforms, and calculate, measure performance factors of output of dc-to-ac inverters. Simulate, analyze and design power electronic circuits using MATLAB software.
V	EE3531	Feedback Control Systems Lab	Solve the mathematical model of different electromechanical systems Model any given electrical, mechanical system with respect to transfer function and state space domain Classify appropriate feedback signal, synthesis feedback gains and analyze their results and deduce the first and second order responses. Draw the root locus and analyze the system Plot the bode, polar and Nyquist plots and analyze frequency domain
V	EE3551	Microprocessors and Micro controller Lab	Create a template program, compile it, and then build the executable file. Examine the effects of executing many of the 8085 and 8051 instructions by tracing the execution of a program in GNU Simulator and Keil for microprocessor and microcontroller respectively. Write their own program in assembly language for 8085 and 8051. Write the steps they go through to perform their tasks.. Apply their programming knowledge (assembly and C) for real time applications.
V	SH 3191	Scholastic Aptitude I	Develop a thorough conceptual understanding and develop a logical approach towards solving aptitude and reasoning problems Understand usage of basic aptitude terms of percentages, averages, ratios and applications of business aptitude terms of profits and interests Develop a bridge in analogies, series and visualizing directions Apply various short cuts & techniques to manage speed and accuracy to get equipped for various competitive and campus recruitment exams
VI	EE3021	Switch Gear and Protection	Explain different types of protective devices and relay systems. Classify circuit breakers and relays Suggest suitable protection scheme for a particular power system component Discuss under voltage and overvoltage protection scheme Design a protection scheme for power system
VI	EE3041	Control System Design	Design and tune proportional, integral and derivative controllers for given specifications Design a suitable compensator using root-locus technique for the given specifications Design a suitable compensator in frequency domain for the given specifications Design state feedback controller and observer for given system Construct MATLAB models for the implementation of closed-loop systems.
VI	EE3101	Restructured Power System	Explain restructuring of power system and related fundamentals of economics Analyze role of independent system operator in deregulated power system Analyze transmission congestion management and ancillary services in deregulated power system Explain Indian electricity act in context with deregulated power market Compare different organizations in Indian power sector in view of Indian electricity grid.
VI	EE3081	Electrical Drives and Control	Analyze stability, moment of inertia, speed and torque in drive systems Compare various control strategies for electrical drive systems Discuss starting, braking and speed control for AC and DC drives. Explain vector control of induction motor drives. Explain the speed control of synchronous motor and special motor drives.
VI	EE3541	Switchgear	Identify different switches and circuit breakers





		and Protection Lab	Observe and explain MCCB. Plot characteristics of Relays. Assure working of Relays based on their technology and characteristics. Discuss different protection schemes. Demonstrate for Transformer and Generator protection
VI	EE3561	Electrical Drives and Control Lab	Demonstrate AC and DC drives fed from various power electronics converter. Examine closed loop control of electrical drive systems. Analyze performance of electrical drives by plotting speed-torque characteristics. Compare performance of electrical drive systems according to speed-torque characteristics. Simulate AC and DC drives fed from various power electronic converters.
VI	EE3521	Control System Design Lab	Design and implement PID controller for a closed-loop system Design a suitable compensator using root-locus technique. Design a suitable compensator in frequency domain. Develop state feedback controller and observer for SISO system. Demonstrate control of closed-loop systems using MATLAB.
VI	EE3061	Instrumentation Techniques	Describe basic concepts of instrumentation and characteristics of instruments. Explain selection factors and application of transducers and sensors. Discuss different types of signal conditioning devices Explain different data conversion techniques and digital instruments Describe different type of industrial process controllers
VI	SH3222	Scholastic Aptitude	Develop a thorough conceptual understanding and develop a logical approach towards Solving aptitude and reasoning problems Understand usage of aptitude terms of speed, time and distance and permutations, probabilities and applications. Understand blood relations and ways of seating arrangements along with various geometrical figures Apply various short cuts & techniques to manage speed and accuracy to get equipped for various competitive and campus recruitment exams
VII	EE4021	Industrial organization and management	Apply the industrial management concepts, financial management concepts Contribute to the development, implementation, and evaluation of employee recruitment, selection, and retention plans and processes. Explain the importance of materials management function in an organization, and how it can help in integrating various plans and reduce the material related costs Design a marketing research study that will act as a key resource in the development of a marketing plan Explain industrial psychology and solve the industrial problems.
VII	EE4031	Electrical Machine Design	Calculate MMF and thermal rating of various types of electrical machines Design armature and field systems for DC machines Design core, yoke, windings and cooling systems of transformers. Design stator and rotor of induction machines. Design stator and rotor of synchronous machines and study their thermal behavior.
VII	EE4041	Automation and Control	Describe the need of industrial automation and their functions. Make use of standard IEC programming languages. Design relay/RLL based control logic for Boolean expressions. Construct relay logic ladder diagram for the given application. Develop GUI for monitoring system of the given real time applications using SCADA/HML.
VII	EE4051	Computer	Develop mathematical models of various equipment used in power



		Modelling of Electrical Power System	<p>system to analyses both AC and AC-DC power system network.</p> <p>Model single and three phase power system network components by using linear transformation and compound admittance technique.</p> <p>Formulate AC and AC-DC power system analysis problem.</p> <p>Apply various methods of load flow studies to analyze AC power system network.</p> <p>Analyze AC-DC power system network by using power flow analysis method</p>
VII	EE4061	Energy Audit and Management	<p>Identify and assess the energy conservation/saving opportunities in different electric system</p> <p>Identify and assess energy conservation opportunities in thermal system</p> <p>Demonstrate skills required for energy audit and management</p> <p>Prepare energy flow diagrams and energy audit report</p> <p>Suggest cost-effective measures towards improving energy efficient and energy conservation.</p>
VII	EE4071	FACTS and HVDC	<p>Understand the importance of controllable parameters and benefits of facts controllers.</p> <p>Analyze the functional operation and control of series and shunt compensation.</p> <p>Describe the principles, operation and control of multi-functional facts controller.</p> <p>Identify significance of DC over AC transmission system, types and application of HVDC links in practical power systems.</p> <p>Apply various methods of grid control for HVDC systems.</p>
VII	EE4081	Power System Planning	<p>Explain the need of power system expansion</p> <p>Analyze the given power system for determining optimal values of decision variables.</p> <p>Apply mathematical tools to solve multi-objective optimization problems in expansion planning and reliability studies.</p> <p>Explain long term and short term planning.</p> <p>Discuss various economic analysis methods.</p>
VII	EE4121	Digital Control System	<p>Apply z transform techniques to model systems</p> <p>Realize the digital PID controller</p> <p>Analyze the systems in s-plane and z-plane</p> <p>Determine state-space representation of dynamical systems using linear algebra</p> <p>Design the controller using pole placement technique and optimal control</p>
VII	EE4511	Advanced Power Electronics Laboratory	<p>Evaluate different DC-DC regulators</p> <p>Simulate and analyze resonant converters</p> <p>Select appropriate phase shifting converter for multiphase converter</p> <p>Evaluate various multi-level inverter configuration</p> <p>Compare various facts devices for VAR compensation</p>
VII	EE4521	Automation and Control Lab	<p>Design relay logic control system for given application using relays.</p> <p>Develop RLL for Boolean expressions.</p> <p>Develop RLL using timer and counter instructions.</p> <p>Develop RLL using math instructions.</p> <p>Develop GUI using SCADA/HMI for given application</p>
VII	EE4531	Electrical Machine Design lab	<p>Calculate design parameters of an electric machine</p> <p>Analyze the effect of calculated design parameters electrical machines</p> <p>Design electrical machine using design software</p>
VII	EE4531 N	Computer Modelling of Electrical Power System Lab	<p>Develop admittance matrix for the given power system network by using linear transformation technique and inspection method</p> <p>Analyzing HVDC conversion plant by simulating power electronic conversion system.</p> <p>Apply various power flow analysis method to solve AC and AC-DC power system network.</p> <p>Develop MATLAB program to solve the defined power system problem.</p>



			Use various application software packages to perform power flow study of given power system network.
VIII	EE4571	Industry In-plant Training	To acquire and apply fundamental principles of engineering.
			Become updated with all the latest changes in technological world
			Develop ability to communicate efficiently
			Improve ability to identify, formulate and model problems and find engineering solution based on a systems approach
			Develop awareness of the social, cultural, global and environmental responsibility as an engineer
VIII	RE0407	Research UROP Phase I	Perform literature review and identify research topic.
			Write synopsis of the research work that being done in semester.
			Write technical review paper.
VIII	LL0407	Liberal Learning IIP	Identify the liberal learning online course from the NPTEL platform
			Describe the online course given by the institute
			Apply the concept understand through the course in day to day life
VIII	ED4001	BUSINESS OPPORTUNITY GUIDANCE	Generate & identify different business ideas.
			Make analysis of different ideas.
			Select proper business idea to suit his personality & competencies.
VIII	EE4101	Advanced Power Electronics	Apply knowledge of modern power electronics converters and its application in modern power electronics
			Compute mathematical model of converter
			Solve the state space model for power converters
			Analyze resonant converters and their topologies
			Analyze the operation of power converters, filters, ups systems
VIII	OE432	Wind Energy Engineering	Apply fundamental principles of thermodynamics, fluid mechanics and mechanical systems to wind turbine engineering.
			Calculate various parameters related to wind turbine.
			Design of wind turbine components.
			Design in virtual environment.
			Work on team-based projects.