B. Tech (Electrical and Electronics Engineering)

Program Outcomes (POs)

PO 1	Apply the knowledge of mathematics, science, engineering, fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	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.
PO 3	Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 4	Conduct investigations of complex problems including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
PO 5	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.
PO 6	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.
PO 7	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 9	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 10	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.
PO 11	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.
PO 12	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)

PSO 1	Graduates will be able to provide acceptable solutions to complex electrical engineering problems with the application of modern and appropriate techniques for sustainable development of the society.
PSO 2	Graduates will be able to apply the knowledge to improve and control the conventional and non-conventional energy systems for specific applications ethically and ecofriendly.

Course Outcomes (COs)

Batch; 2017-2021

Semester	Course Code	Course Name	Course Outcomes (COs)
III	17EE31	ELECTRIC CIRCUIT ANALYSIS	CO 1: Apply the basic laws and network theorems for the analysis of electrical circuits. CO 2: Obtain the transient and steady-state response of electrical circuits. CO 3: Analyze sinusoidal circuits to evaluate the complex power in single phase and three phase circuits CO 4: Understand the mutual coupling of inductive circuits and apply dot convention CO 5: Analyze transient circuits using Laplace and inverse Laplace transform CO 6: Evaluate the parameters of two port networks
	17EE34	Analog Electronic Circuits	CO 1: Able to bias a diode; use its characteristics to develop a rectifier and voltage regulator. CO 2: Obtain the transient and steady-state response of electrical circuits. CO 3: Use the operational amplifiers to perform some basic application based on its performance characteristics CO 4: Develop operational amplifier circuit for a particular application along with a suitable filter CO 5: Construct advanced circuits using operational amplifiers, particularly Voltage regulator CO 6: apply the knowledge obtained for design of amplifiers, opamps, voltage regulators

Semester	Course Code	Course Name	Course Outcomes (COs)
III	17EE32	Digital System Design using Verilog	CO 1: Understand digital logic gates, combinational and sequential logic circuits. CO 2: Analyze the different design methodologies in writing the Verilog program. CO 3: Apply basic concepts of the design in writing the Verilog program CO 4: Demonstrate the module definition, port declaration with hierarchical name referencing CO 5: Categorize gate level and dataflow modeling way of writing the flow of Verilog programs CO 6: Develop behavioral modeling style of writing the programs in Verilog
	17EE33	Signals and Systems	CO 1: Characterize and analyze the properties of CT and DT signals and systems. CO 2: Analyze CT and DT systems in Frequency domain and Time domain using convolution CO 3: Represent CT and DT systems in the Frequency domain using Fourier analysis tools like CTFS, CTFT, DTFS and DTFT. CO 4: Analyze CT and DT systems using Laplace transforms and Z Transforms.

Semester	Course Code	Course Name	Course Outcomes (COs)
III	17EE35	Electrical Machines I	CO 1: Understand the construction and principle of operation of transformers and DC machines. CO 2: Analyze the equivalent circuits of Transformer and DC machines. CO 3: Evaluate, assess and compare the operation of machines at different loadings. CO 4: Analyze the working of dc machines as generators and motors. CO 5: Conduct various tests to evaluate the performance and efficiency of transformers and DC motors. CO 6: By using available resources the students will be able to do mini projects on building of prototype of machines models
	17EE34L	Analog Electronic Circuits Lab	CO 1: To analyze the various electronic devices, like diode, BJT and FET. CO 2: To Examine the various circuits like rectifiers, regulators, clipper and clamping circuits. CO 3: To design various biasing circuits of BJT circuits and also the frequency response of the BJT amplifier circuits. CO 4: To design various biasing circuits of FET circuits and also the FET amplifier circuits. CO 5: To estimate the feedback and Oscillators circuit using electronic device like BJT CO 6: To Demonstrate and analyze operations of circuit through P-Sim
	17EE32L	Digital System Design Lab	CO 1: Develop and Test combinational logic circuits such as multiplexers and encoders CO 2: Develop and Test combinational logic circuits to implement adders, subtractors and ALU. CO 3: Develop and Test sequential logic circuits to implement flip flops. CO 4: Develop and Test counters, random sequence generators and shift registers. CO 5: Develop HDL code to interface LED, switches and demonstrate waveform generation using FPGA kit. CO 6: Develop HDL code to interface stepper motor and dc motor with FPGA kit.

Semester	Course Code	Course Name	Course Outcomes (COs)
III	**17EE35L**	**Electrical Machines Lab I**	CO 1: Acquire hands on experience of conducting various tests on transformers and obtaining their performance indices using standard analytical as well as graphical methods CO 2: Acquire hands on experience of conducting various tests on DC machines and obtaining their performance indices using standard analytical as well as graphical methods. CO 3: understand and demonstrate the fundamental speed control practices associated with DC motors. CO 4 understand and demonstrate load test on transformers and DC motors to assess its performance CO 5: understand and demonstrate load test on transformers and DC motors to assess its performance CO 6: use transformers and DC motors in different applications
IV	**17EE41**	Probability & Statistics	CO 1: apply the basic concepts of probability and Baye's Theorem in engineering problems CO 2: analyze random variables and its distributions CO 3: analyze sampling distributions and test for its Hypothesis CO 4 apply stochastic processes and Markov Chains on application problems CO 5: analyze index numbers and Time series

Semester	Course Code	Course Name	Course Outcomes (COs)
IV	**17EE42**	Electrical Machines II	CO 1: Understand the construction and principle of operation of Induction machines and Synchronous machines CO 2: Analyze the equivalent circuits of Induction machines and Synchronous machines CO 3: Evaluate, assess and compare the operation of machines at different loadings. CO 4 Analyze the working of synchronous machines as generators and motors. CO 5: Conduct various tests to evaluate the performance, efficiency and voltage regulation of Induction machines and Synchronous machines CO 6: do mini projects on building of prototype of machines models
	17EE43	Electromagnetic Fields	CO 1: Apply different coordinate systems to explicate the concept of gradient, divergence and curl of a vector CO 2: Understand the basic laws of electromagnetism and evaluate the electric fields produced by different configurations CO 3: Compute the energy and potential due to a system of charges and analyze the behavior of electric field across a boundary between a conductor and dielectric and between two different dielectrics. CO 4 Obtain the magnetic fields for simple configurations under static conditions and analyze the behavior of magnetic field across boundaries CO 5: Understand Maxwell's equation and analyze time varying electric and magnetic fields. CO 6: Apply Maxwell's equation and propagation of EM waves in various medium
IV	**17EE42L**	Electrical Machines Lab II	CO 1: Acquire hands on experience of conducting various tests on induction machines and obtaining their performance indices using standard analytical as well as graphical CO 2: Acquire hands on experience of conducting various tests on alternators and obtaining their performance indices using standard analytical as well as graphical methods. CO 3: understand and demonstrate the fundamental control practices associated with induction motors and synchronous machines. CO 4 conduct experiments and verify the characteristics and losses with respect to given Machines. CO 5: understand and demonstrate load test on single phase and three phase induction motor to assess its performance. CO 6: use synchronous and asynchronous machines in different applications.

Semester	Course Code	Course Name	Course Outcomes (COs)
V	**17EE51**	Power Systems I	CO 1: Outline the concepts of power systems. CO 2: Summarize the working of generating stations. CO 3: Examine the performance of distribution system. CO 4 Assess fault currents for different types of faults in power systems. CO 5: Discriminate the types of circuit breakers and isolating switches. CO 6: Distinguish various protection schemes.
	17EE53	Power Electronics	CO 1: Understand the operation of power semiconductor devices and power transistors, its switching characteristics. CO 2: Analyze and synthesize the detailed operation of thyristors. CO 3: Assess the working of various types phase controlled rectifiers and ac voltage controllers CO 4 Design suitable firing circuits and commutation circuits for thyristors CO 5 Interpret the working principles of different types of choppers and inverters, and its operation under different load conditions
	17HS52	Economics for Engineers	CO 1: To demonstrate the knowledge of the fundamental and technical concepts of economics. CO 2: To identify and use economics terminologies in oral and written communications. CO 3: To make decisions wisely using cost-benefit analysis. CO 4 To demonstrate a sense of responsibility and a capacity for service. CO 5: To recognize when change is appropriate, to adapt change as it occurs, and to take the lead in creating change as the country's economic environment changes. CO 6: To Analyze cost and Revenue data and carry out decision making process to justify or reject Economic Basis
	17EE52	Electrical Machine Design	CO 1: Understand the basic principles of machine design CO 2: Determine the heat dissipation of various electrical engineering materials.. CO 3: Evaluate core, yoke, winding and cooling system of transformers. CO 4 Analyze main dimensions and winding details of DC machines. CO 5: Develop output equation of AC machines, design stator and rotor of induction machines. CO 6: Design stator and rotor of synchronous machines to analyze their thermal behavior, design field systems for turbo alternators.

Semester	Course Code	Course Name	Course Outcomes (COs)
V	17EE51L	Power Systems Lab I	CO 1: Analyze the working principle and characteristics of different relays. CO 2: Conduct experiments and verify the current time characteristics of a fuse CO 3: Examine the transmission line model. CO 4 Test the insulation level of transformer oil. CO 5: Understand how to draw single line diagram for a power system circuit. CO 6: Assess the generation of solar PV system by visiting the solar power station.
	17EE52L	Power Electronics Lab	CO 1: Obtain static characteristics of semiconductor devices to discuss their performance. CO 2: Analyze the triggering and commutation circuits of SCR by different methods CO 3: Verify the performance of single phase controlled full wave rectifier and AC voltage controller with R and RL loads. CO 4 Control the speed of a dc motor, universal motor and stepper motors CO 5: Design a voltage controller circuit using semiconductors CO 6: Interpret the working principles of different types of inverters, and its operation under different load conditions
VI	17EE61	Power Systems II	CO 1: Conclude load flow computation results CO 2: Examine steady state and transient stability of power systems CO 3: Compare numerical methods to analyze a power system in steady state CO 4 Illustrate methods to control the voltage, frequency and power flow CO 5: Develop methods to monitor and control of a power system CO 6: Describe economic operations of power system
VI	**17DEEE611**	Energy Storage Systems	CO 1: Understand the principles of energy storage systems CO 2: Categorize the performance of primary batteries and their design aspects CO 3: Infer the concepts of secondary batteries CO 4 Summarize the fundamental concepts of ultra capacitors CO 5: Understand the basic working and operation of flywheels CO 6: Integrate the importance of fuel cell system in replacing fossil fuel based energy generation

Semester	Course Code	Course Name	Course Outcomes (COs)
VI	17DEEE612	Industrial Electrical Systems	CO 1: Understand the fundamentals of electric heating, welding, illumination and components of traction system. CO 2: Compare the different methods of electric heating CO 3: Analyze the characteristics of various welding techniques CO 4 Categorize different light sources and design various illumination systems CO 5: Evaluate different process of utilizing electric energy for electrolytic process in industries purposes mostly in commercial along with few house hold applications CO 6: Develop proper traction systems depending upon application considering economic and technology up-gradation.
	17EE63L	Power Systems Lab II	CO 1: Describe the role of computer simulations in power system studies. CO 2: Understand the importance of computer based simulations to address the needs of current day power systems CO 3: Demonstrate program based experiments to simulate power system problems CO 4 Focus on modern tools (MATLAB / MiPower) to conduct power system based experiments CO 5: Evaluate the coding for economic dispatch problems and load frequency dynamics problems using MATLAB/MiPower CO 6: Formulate fault in a single transmission line system at a specified location for different faults in a power system
	17EE61L	Measurements and Instrumentation Lab	CO 1: Analyze construction and operational aspects of different electro-mechanical measuring instruments along with their application domains. CO 2: Categorize the fundamental measurement method of resistance, capacitance, inductance, frequency etc. by using various a.c bridges and other techniques CO 3: Impart with the basic concepts of CRO and its usage for the measurement of various parameters. CO 4 Assess the impact of electrical measurement methods not only to measure and analysis of the modern sophisticated instruments/systems for human utilities and industrial application but also in higher studies and R&D CO 5: Demonstrate variety of practical electrical circuits and conduct experiments to analyze and interpret data. CO 6: Interact effectively on a social and interpersonal level with peer students, divide up and share task responsibilities to complete experiment based learning and assignments.

Semester	Course Code	Course Name	Course Outcomes (COs)
VII	17EE71	COMPUTER TECHNIQUES IN POWER SYSTEMS	CO1: Upon completion of the course the student will get well- grounded understanding about Graph theory and network topology CO2:Design computer aided algorithms for various power system problems that are based on contemporary and modern industry based methods. CO3:Will be able to conduct fault analysis using Y-bus and Z-bus CO4:Will be able to analyze power systems using load flow studies and also analyze transient stability of power system CO5: Apply skills for solving real life power system problems in an optimal and efficient manner
	17EEDE731	Electrical Drives and Applications	CO1: evaluate the performance of D.C. drives CO2: understand the operation and control of AC drives CO3: choose the various control techniques employed for synchronous motor drives CO4: identify the usage of drives in different Industries CO5: illustrate the energy conservation techniques in electrical drives
	17EEDE711	Solar and Wind Energy	CO 1: Explain the importance of non-conventional energy sources like solar and wind energy. CO 2: Identify the various components of solar and wind energy conversion systems CO 3: Examine the characteristics of solar photovoltaic and wind energy systems. CO 4 Recommend the environmental and safety aspects of wind energy systems CO 5: Investigate the various power electronic converters for solar and wind energy systems. CO 6: Interpret the applications of wind energy conversion systems.
	17DEEE712	Industrial Drives	CO 1: Introduction of basic concepts of Electrical Drives as industrial drives CO 2: Study the suitability of DC machines for Electrical drives application CO 3: Understand the suitability of AC machines for Electrical Drives application CO 4 Explore the control methods used for electrical drives CO 5: Expose the industrial application of electrical drives
	17DEEE721	**Power Quality**	CO 1: o define power quality and different terms of power quality CO 2: To study voltage power quality issue – short and long interruption CO 3: To understand the characterization of voltage sag magnitude. CO 4 To understand the fundamentals of harmonics generating by the various equipments and load CO 5: To study the various methods to improve power factor
	17DEEE722	**PLC & SCADA**	CO 1: To know the importance and benefits of automation and to understand how to automate an industrial process using PLC

			CO 2: To understand the instructions of PLC CO 3: Be aware of applications of timers, counters and effective use of program flow control instructions to manage PLC operations CO 4 Appreciate the need for SCADA in Process Control Instrumentation CO 5: To Understand the working of HMI Automation
VIII	17EEOE811	Energy Storage, Audit and Conservation	CO1: Demonstrate problem solving skills in energy storage engineering as a means of resolving the intermittency of renewable energy sources such and solar and wind. CO2: Competency in Energy analysis techniques and methods & Energy conservation planning and practices CO3: Understand the significance and procedure for energy conservation and audit. CO4: Acquire the knowledge of basic principles of energy auditing, types and objectives, instruments used CO5: Analyze, calculate and improve the energy efficiency and performance of electrical utilities.
	17EEDE811	Hybrid Electric Vehicle	CO 1: To Introduce the basic concepts of Hybrid Electric Vehicles CO 2: To study the Concepts of Electric Drive trains and it topologies CO 3: To study the concepts of Electric Propulsion system in Hybrid Electric Vehicle CO 4 To explore the types and usage of Energy Storage devices in HEV CO 5: To Introduce the Energy Management strategies used in HEV
	17EEDE812	Special Electrical Machines	CO 1: To impart knowledge on Construction, principle of operation and performance of synchronous reluctance motors CO 2: To impart knowledge on the Construction, principle of operation, control and performance of stepping motors CO 3: To impart knowledge on the Construction, principle of operation, control and performance of switched reluctance motors. CO 4 To impart knowledge on the Construction, principle of operation, control and performance of permanent magnet brushless D.C. motors CO 5: To impart knowledge on the Construction, principle of operation and performance of permanent magnet synchronous motors

	17DEEE821	Principles of Robotics	CO 1: To introduce the functional elements of Robotics CO 2: To impart knowledge on the direct and inverse kinematics CO 3: To introduce the manipulator differential motion and control CO 4 To educate on various path planning techniques CO 5: To introduce the dynamics and control of manipulators CO 6: To investigate the various control strategies in robotic industries
VIII	17DEEE822	Industrial Electrical Systems	CO1: Understand the fundamentals of electric heating, welding, illumination and components of traction system Learns the basics of electric wiring. CO2:Understand the difference between wires and cables CO3:Have knowledge of smart home wiring concepts CO4: Evaluate different process of utilizing electric energy for electrolytic process in industries purposes mostly in commercial along with few house hold applications CO5: Develop proper traction systems depending upon application considering economic and technology up-gradation.
	17EEO E821	EMERGING TECHNOLOGIES IN POWER GENERATION	CO1:Understand the principles of new power generation technologies CO2:Understand the fundamentals and principles of fuel cells CO3:Analyze the characteristics of Fuel Cells. CO4: Acquire the knowledge of Hydrogen storage, principles and applications. CO5:Discuss the working principle and basic components of the MHD generators and and safety precautions involved with it