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Electrical Engineering

Course Outcomes

Second Year Engineering(Sem-I)	
Course code and Name: 207006: Engineering Mathematics-III	
207006.1	Solve higher order linear differential equation using appropriate techniques to model and analyze electrical circuits.
207006.2	Apply Integral transforms such as Laplace transform, Fourier transform and Z-Transform to solve problems related to signal processing and control systems.
207006.3	Apply Statistical methods like correlation, regression and Probability theory as applicable to analyze and interpret experimental data related to energy management, power systems, testing and quality control.
207006.4	Perform Vector differentiation and integration, analyze the vector fields and apply to wave theory and electro-magnetic fields.
207006.5	Analyze Complex functions, conformal mappings, and perform contour integration in the study of electrostatics, signal and image processing.
207006.6	Discuss the qualities of a good leader and road map to Entrepreneurship.
Course code and Name: 203141: Power Generation Technologies	
203141.1	Identify components and elaborate working principle of conventional power plants.
203141.2	Recognize the importance and opportunities of renewable energies.
203141.3	Calculate and control power output of wind solar, and hydro power plant.
203141.4	Describe process of grid interconnection of distributed generation and requirements.

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203141.5	Interpret the environmental and social impact of various generation technologies.
Course Code and Name: 203142: Material Science	
203142.1	Discuss classification,properties and characteristics of different electrical engineering materials.
203142.2	State various applicationsmeasuring methods for parameters of different classes of electrical engineering materials.
203142.3	Solve simple problems based on dielectric, magnetic and conducting materials.
203142.4	Apply knowledge of Nano-technology to electrical engineering.
203142.5	Execute tests ondielectric, insulating, magnetic, conducting, resistive materials as per IS to decide the quality of thematerials.
203142.6	Create learning resource material ethically to demonstrate self learning leading to lifelong learning skills and usage of ICT/ online technology through collaborative/active learning activities
Course code and Name: 203143: Analog And Digital Electronics	
203143.1	Design logical, sequential and combinational digital circuit using K-Map.
203143.2	Demonstrate different digital memories and programmable logic families.
203143.3	Apply and analyze applications of OPAMP in open and closed loop condition.
203143.4	Design uncontrolled rectifier with given specifications.
Course Code and Name: 203144: Electrical Measurements and Instrumentation	
203144.1	Define various characteristic and classify measuring instruments along with range extension techniques.
203144.2	Apply measurement techniques for measurement of resistance, inductance and capacitance.
203144.3	Demonstrate construction, working principle of electrodynamo type and induction type instruments for measurement of power and energy.
203144.4	Make use of CRO for measurement of voltage, current and frequency.
203144.5	Classify transducer and apply it for measurement of physical parameters in real time.
Course Code and Name : 203150: Applications of Mathematics in Electrical Engineering	
203150.1	Apply fundamentals of mathematics in solving electrical engineering problem.

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203150.2	Analyze complex electrical engineering problem using mathematical techniques.
203150.3	Implement program and simulation for problems in electrical engineering.
203150.4	Demonstrate self lifelong learning skills with applications of mathematics in electrical engineering through software.
Course code and Name: 203151: Soft Skill	
203151.1	Do SWOC analysis.
203151.2	Develop presentation and take part in group discussion.
203151.3	Understand and implement etiquette in workplace and in society at large.
203151.4	Work in team with team spirit.
203151.5	Utilize the techniques for time management and stress management.
Course Code and Name: 203152(A) : Audit Course-III(Solar Thermal System)	
203152(A).1	Differentiate between types of solar Concentrators.
203152(A).2	Apply software tool for solar concentrators.
203152(A).3	Design different types of Solar collectors and balance of plant.
Second Year Engineering(Sem-II)	
Course Code and Name: 203145: Power System-I	
203145.1	Recognize different patterns of load curve and calculate associated different factors with it and tariff.
203145.2	Draft specifications of electrical equipment in power station.
203145.3	Design electrical and mechanical aspects in overhead transmission and underground cables.
203145.4	Evaluate the inductance and capacitance of different transmission line configurations.
203145.5	Analyse the performance of short and medium transmission lines.
Course Code and Name: 203146: Electrical Machines-I	
203146.1	Evaluate performance parameters of transformer with experimentation and demonstrate construction along with specifications as per standards.

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203146.2	Distinguish between various types of transformer connections as per vector groups with application and to perform parallel operation of single/three phase transformers.
203146.3	Select and draft specifications of DC machines and Induction motors for various applications along with speed control methods.
203146.4	Justify the need of starters in electrical machines with merits and demerits.
203146.5	Test and evaluate performance of DC machines and Induction motors as per IS standard
Course code and Name: 203147: Network Analysis	
203147.1	Calculate current/voltage in electrical circuits using simplification techniques, Mesh, Nodal analysis and network theorems.
203147.2	Analyze the response of RLC circuit with electrical supply in transient and stead state.
203147.3	Derive formula and solve numerical of two port network and Design of filters
203147.4	Applyknowledge of network theory to find transfer function, poles and zeroes location to perform stability analysis and parallel resonance.
203147.5	Apply Laplace transform to analyze behaviour of an electrical circuit.
Course code and Name: 203148: Numerical Methods and Computer Programming	
203148.1	Demonstrate types of errors in computation and their causes of occurrence.
203148.2	Calculate root of algebraic and transcendental equations using various methods.
203148.3	Apply numerical methods for various mathematical problems such as interpolation, numerical differentiation, integration and ordinary differential equation.
203148.4	Solve linear simultaneous equation using direct and indirect method.
203148.5	Develop algorithms and write computer programs for various numerical methods.
Course Code and Name: 203149: Fundamental of Microcontroller and Applications	
203149.1	Describe the architecture and features of various types of the microcontroller.
203149.2	Illustrate addressing modes and execute programs in assembly language for the microcontroller.
203149.3	Write programs in C language for microcontroller 8051.

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203149.4	Elaborate interrupt structure of 8051 and program to handle interrupt and ADC809
203149.5	Define the protocol for serial communication and understand the microcontroller development systems.
203149.6	Interface input output devices and measure electrical parameters with 8051 in real time.
Course code and Name: 203152: Project Based Learning	
203152.1	Identify, formulate, and analyze the simple project problem.
203152.2	Apply knowledge of mathematics, basic sciences, and electrical engineering fundamentals to develop solutions for the project.
203152.3	Learn to work in teams, and to plan and carry out different tasks that are required during a project
203152.4	Understand their own and their team-mate's strengths and skills.
203152.5	Draw information from a variety of sources and be able to filter and summarize the relevant points.
203152.6	Communicate to different audiences in oral, visual, and written forms.
Course code and Name: 203153(A): Audit Course-IV(Solar Photovoltaic Systems)	
203153(A).1	design of Solar PV system for small and large installations.
203153(A).2	handle software tools for Solar PV systems.
Third Year Engineering(Sem-I)	
Course code and Name: 303141 Industrial and Technology Management	
303141.1	Differentiate between different types of business organizations and discuss the fundamentals of economics and management.
303141.2	Explain the importance of technology management and quality management
303141.3	Explain the importance of IPR and role of Human Resource Management
303141.4	Understand the importance of Quality and its significance.
303141.5	Describe the characteristics of marketing & its types and overview of financial Management
303141.6	Discuss the qualities of a good leader and road map to Entrepreneurship.
Course code and Name: 303142: Power Electronics	

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303142.1	Develop characteristics of different power electronic switching devices.
303142.2	Reproduce working principle of power electronic converters for different types of loads.
303142.3	Choose the appropriate converter for different applications.
Course Code and Name: 303143: Electrical Machines-II	
303143.1	Learn construction, working principle of three phase Synchronous Machines, Induction Motors, A.C. Series Motor and Special Purpose Motors.
303143.2	Understand characteristics of three phase Synchronous Machines, Induction Motors, A.C. Series Motor and Special Purpose Motors. problems of fluid flow
303143.3	Select the above machines in Power System, industrial, household & Military Engineering applications.
303143.4	Testing of machines to evaluate the performance through experimentation.
Course code and Name: 303144: Electrical Installation, Design and Condition Based Maintenance	
303144.1	Classify different types of distribution supply system and determine economics of distribution system. compare and classify various substations, bus-bars and Earthing systems.
303144.2	Demonstrate the importance and necessity of maintenance.
303144.3	Analyse and test different condition monitoring methods.
303144.4	Carry out estimation and costing of internal wiring for residential and commercial installations
303144.5	Apply electrical safety procedures.
Course Code and Name: 303145A: Elective-I: Advanced Microcontroller and Embedded System	
303145A.1	Explain architecture of PIC 18F458 microcontroller, its instructions and the addressing modes.
303145A.2	Use Ports and timers for peripheral interfacing and delay generation.
303145A.3	Interface special and generate events using CCP module..
303145A.4	Effectively use interrupt structure in internal and External interrupt mode.
303145A.5	Effectively use ADC for parameter measurement and also understand LCD interfacing..
303145A.6	Use Serial Communication and various serial communication protocols.

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Course Code and Name : 303146: Seminar	
303146.1	Relate with the current technologies and innovations in Electrical engineering.
303146.2	Improve presentation and documentation skill.
303146.3	Apply theoretical knowledge to actual industrial applications and research activity.
303146.4	Communicate effectively.
Course code and Name: 303147A: Audit Course V: Energy Storage System	
303147A.1	Explain and differentiate various types of energy storage for suitable applications
303147A.2	Understand battery recycling techniques
Third Year Engineering(Sem-II)	
Course Code and Name: 303148: Power System-II	
303148.1	Solve problems involving modelling, design and performance evaluation of HVDC and EHVAC power transmission lines.
303148.2	Calculate per unit values and develop Y bus for solution power flow equations in power transmission networks
303148.3	Calculate currents and voltages in a faulted power system under both symmetrical and asymmetrical faults, and relate fault currents to circuit breaker ratings.
Course Code and Name: 303149: Computer Aided Design of Electrical Machines	
303149.1	Summarize temperature rise, methods of cooling of transformer and consider IS 2026 in transformer design.
303149.2	Design the overall dimensions of the transformer.
303149.3	Analyze the performance parameters of transformer
303149.4	Design overall dimensions of three phase Induction motor
303149.5	Analyze the performance parameters of three phase Induction motor.
303149.6	Implement and develop computer aided design of transformer and induction motor.
Course Code and Name: 303150: Control System Engineering	
303150.1	Construct mathematical model of Electrical and Mechanical system using differential equations

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	and transfer function and develop analogy between Electrical and Mechanical systems.
303150.2	Determine time response of systems for a given input and perform analysis of first and second order systems using time domain specifications.
303150.3	Investigate closed loop stability of system in s-plane using Routh Hurwitz stability criteria and root locus.
303150.4	Analyze the systems in frequency domain and investigate stability using Nyquist plot and Bode plot
303150.5	Design PID controller for a given plant to meet desired time domain specifications.
Course code and Name: 303151D:Elective-II Energy Management	
303151D.1	Describe BEE Energy policies, Energy ACT.
303151D.2	List and apply demand side management measures for managing utility systems.
303151D.3	Explore and use simple data analytic tools.
303151D.4	Use various energy measurement and audit instruments.
303151D.5	Evaluate economic feasibility of energy conservation projects
303151D.6	Identify appropriate energy conservations methods for electric and thermal utilities.
Course code and Name: 303152: Internship	
303152.1	Understand the working culture and environment of the Industry and get familiar with various departments and practices in the industry.
303152.2	Operate various meters, measuring instruments, tools used in industry efficiently and develop technical competence.
303152.3	Apply internship learning in other course completions and final year project management, i.e. topic finalization, project planning, hardware development, result interpretations, report writing, etc.
303152.4	Create a professional network and learn about ethical, safety measures, and legal practices.
303152.5	Appreciate the responsibility of a professional towards society and the environment.
303152.6	Identify career goals and personal aspirations.

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Course Code and Name: 303153A: Audit Course IV: Ethical Practices for Engineers	
303153A.1	Understand for their professional responsibilities as Engineers.
303153A.2	Recognize and think through ethically significant problem situations that are common in Engineering.
303153A.3	Evaluate the existing ethical standards for Engineering Practice.

Final Year Engineering(Sem-I)

Course code and Name: 403141 Power System Operation and Control	
403141.1	Identify and analyze the dynamics of power system and suggest means to improve stability of system.
403141.2	Comprehend the effect of reactive power on Power system and suggest the suitable means of reactive power management.
403141.3	Selection of appropriate FACTs devices
403141.4	Analyze the generation-load balance in real time operation and its effect on frequency and develop automatic control strategies with mathematical relations.
403141.5	Formulate objective functions for optimization tasks such as unit commitment and economic load dispatch and get solution using computational techniques.
403141.6	Evaluate reliability indices of Power system
Course code and Name: 403142: PLC and SCADA Applications	
403142.1	Develop block diagram of PLC and explain the working.
403142.2	Classify input and output interfacing devices with PLC.
403142.3	Develop architecture of SCADA and explain the importance of SCADA in critical infrastructure.
403142.4	Execute, debug and test the programs developed for digital and analog operations.
403142.5	Describe various SCADA protocols along with their architecture.
403142.6	Observe development of various industrial applications using PLC and SCADA.
Course Code and Name: Elective I: 403143 (B) : Power Quality	

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403143(B).1	Identify importance of various power quality issues.
403143(B).2	Carry out power quality monitoring
403143(B).3	List and explain various causes and effects of power quality problems
403143(B).4	Analyze power quality parameters and carry out power quality analysis
403143(B).5	Select cost effective mitigation technique for various power quality problems
403143(B).6	Use IEEE 519-2014 power quality standard for harmonic compliance resistant design of structures.
Course code and Name: Elective II : 403144 (D) : Electric and Hybrid Vehicles	
403144(D).1	Review history, Social and environmental importance of Hybrid and Electric vehicles.
403144(D).2	Describe the performance and selection of energy storage systems and Analyze battery management system.
403144(D).3	Distinguish between the performance and architecture of various drive trains.
403144(D).4	Describe the different Instrumentation and Control used for electric vehicles.
403144(D).5	Differentiate between Vehicle to Home, Vehicle to Vehicle and Vehicle to Grid energy systems concepts.
Course code and Name: 403145: Control System II	
403145.1	Recognize the importance of digital control system.
403145.2	Derive pulse transfer function.
403145.3	Analyze digital controllers.
403145.4	Convert system in state space format.
403145.5	Solve state equation
403145.6	Design observer for system.
Course Code and Name: 403146 : Project I	
403146.1	To identify the problems in industry and society.
403146.2	To narrow down the area taking into consideration his/her strength and interest. The nature of

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	project can be analytical, simulation, experimentation, design and validation.
403146.3	Define problem, objectives, scope and its outcomes.
Course code and Name: Audit Course V (A) : 403152: Hydro Energy Systems	
403152.1	Explain and differentiate various types of hydro electric generators; pico, micro and small hydro.
Final Year Engineering(Sem-II)	
Course Code and Name: 403147: Switchgear and Protection	
403147.1	Describe arc interruption methods in circuit breaker
403147.2	Derive expression for restriking voltage and RRRV in circuit breaker
403147.3	Explain construction and working of different high voltage circuit breakers such as ABCB, SF6 CB, and VCB.
403147.4	Classify and Describe different type of relays such as over current relay, Reverse power relay, directional over current relay, Differential relay, Distance relay, Static relay and numerical relay
403147.5	Describe various protection schemes used for transformer, alternator and busbar.
403147.6	Describe transmission line protection schemes.
Course Code and Name: 403148: Power Electronic Controlled Drives	
403148.1	Explain motor load dynamics and multi quadrant operation of drives
403148.2	Analyze operation of converter fed and chopper fed DC drives.
403148.3	Describe braking methods of D.C. and induction motor drive.
403148.4	Explain vector control for induction motor drives.
403148.5	Describe synchronous motor drive.
403148.6	Identify classes and duty cycles of motor and applications of drives in industries.

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Course Code and Name: Elective –III : 403149 (A): High Voltage Engineering	
403149 (A).1	Identify, describe and analyze the breakdown theories of solid, liquid and gaseous materials.
403149 (A).2	Describe as well as use different methods of generation of high AC, DC, impulse voltage and current.
403149 (A).3	Demonstrate and use different methods of measurement of high AC, DC, impulse voltage and current.
403149 (A).4	Identify the occurrence of overvoltage and to provide remedial solutions
403149 (A).5	Demonstrate an ability to carry out different tests on high voltage equipment and devices as well as ability to design the high voltage laboratory with all safety measures
Course Code and Name: Elective –IV : 403150 (A): Smart Grid	
403150 (A).1	Apply the knowledge to differentiate between Conventional and Smart Grid.
403150 (A).2	Identify the need of Smart Grid, Smart metering, Smart storage, Hybrid Vehicles, Home Automation, Smart Communication, and GIS
403150 (A).3	Comprehend the issues of micro grid
403150 (A).4	Solve the Power Quality problems in smart grid
403150 (A).5	Apply the communication technology in smart grid
Course Code and Name: 403151: Project II	
403151.1	Work in team and ensure satisfactory completion of project in all respect.
403151.2	Handle different tools to complete the given task and to acquire specified knowledge in area of interest.
403151.3	Provide solution to the current issues faced by the society.
403151.4	Practice moral and ethical value while completing the given task.
403151.5	Communicate effectively findings in verbal and written forms.

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Course Code and Name: Audit Course VI : 403153: Energy Storage Systems	
403153.1	Explain and differentiate various types of energy storage systems

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SRES'S

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Electrical Engineering

Program Outcomes:

Program outcomes describe what students are expected to know and would be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire as they progress through the program.

- **PO 1 : Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of **complex engineering**
- **PO 2 : Problem Analysis:** Identify, formulate, research literature, and analyze **complex engineering problems** reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering
- **PO 3 : Design/Development of Solutions :** Design solutions for **complex engineering problems** and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental
- **PO 4 : Conduct Investigations of Complex Problems :** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid
- **PO 5 : Modern Tool Usage :** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
- **PO 6 : The Engineer and Society :** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering
- **PO 7 : Environment and Sustainability :** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable

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- **PO 8 : Ethics :** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering
- **PO 9 : Individual and Team Work :** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary
- **PO 10 : Communication :** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear
- **PO 11 : Project Management and Finance :** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary
- **PO 12 : Life-Long Learning :** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological.

Program Specific Outcome:

PSO 1. Electrical Engineering Skills: Ability to design, analyze and solve problems in the field of Electrical & Electronics Engineering by applying knowledge acquired from Electrical Power Systems, Electrical Machines, Control Systems, Power Electronics and Field theory.

PSO 2. Interdisciplinary Knowledge: To train students with good scientific and engineering breadth fundamentals required to solve electrical engineering problems.

PSO 3. Professional Development: To excel in current technologies, important to electrical engineering, as well as probable future technological advances & contribute actively to the field by participating in professional societies, attending technical events, doing research, pursuing higher education.

PSO 4. Leadership Skills: To develop ethical attitude, communication skills, teamwork skills, entrepreneurial thinking and an ability to relate engineering attitude to societal issues.

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