Electrical Engineering Department: PSO, PO & CO

PROGRAMME SPECIFIC OUTCOMES (PSO):	**PSO1:** An ability to specify, design and analyze systems that efficiently generate, transmit, distribute and utilize electrical power.
	PSO2: An ability to analyze and design electrical machinery, electrical/electronic circuits, electrical/solid state drive systems, lighting systems and deliver technological solution by assimilating advances in allied disciplines.
	PSO3: An ability to specify, design, implement and test analog and embedded signal processing electronic systems using the state of the art components and software tools.
	PSO4: An ability to analyze, design and implement the learning in electrical instrumentation, control and automation applications.

PROGRAM OUTCOMES (POs)	**PO1:** Ability to apply the knowledge of mathematics, science and engineering principles for modeling, analyzing and solving electrical and electronics engineering problems.
	PO2: Ability to identify, formulate and analyze real-life electrical and electronics engineering problems.
	PO3: Ability to design and develop solutions for real-life electrical and electronics engineering problems.
	PO4: Ability to design and develop sophisticated equipment and experimental systems for carrying out detailed investigation to multifaceted electrical and electronics engineering problems
	PO5: Ability to develop and utilize modern tools for modelling, analyzing and solving electrical and electronics engineering problems.
	PO6: Dedication to work as an electrical or electronics engineer who is capable of identifying solutions to various local and global problems faced by the society.

	PO7: Ability to design and develop modern systems for the upkeep of pollution free environment.
	PO8: Willingness and ability to upkeep professional ethics and social values.
	PO9: Willingness and ability to think independently, take initiative and lead a team of engineers or researchers.
	PO10: Ability to express ideas clearly and communicate orally as well as in writing with others.
	PO11: Willingness and ability to maintain lifelong learning process by way of participating in various professional activities.
	PO12: Willingness and ability to take up administrative responsibilities involving both project and financial management confidently.

COURSE OUTCOMES (COs)

SE ELECTRICAL ENGINEERING	
Subject name (Subject code)	**207006: Engineering Mathematics-III**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Solve higher order linear differential equation using appropriate techniques to model and analyze electrical circuits
CO2	Apply Integral transforms such as Laplace transform, Fourier transform and Z-Transform to solve problems related to signal processing and control systems.
CO3	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.
CO4	Perform Vector differentiation and integration, analyze the vector fields and apply to wave theory and electro-magnetic fields.
CO5	Analyze Complex functions, conformal mappings, and perform contour integration in the study of electrostatics, signaland image processing.

Subject name (Subject code)	**203141: Power Generation Technologies**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**

CO 1	Identify components and elaborate working principle of conventional power plants.
CO 2	Recognize the importance and opportunities of renewable energies.
CO 3	Calculate and control power output of wind solar, and hydro power plant.
CO 4	Describe process of grid interconnection of distributed generation and requirements
CO 5	Interpret the environmental and social impact of various generation technologies

Subject name (Subject code)	**203142: Material Science**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Discuss classification, properties and characteristics of different electrical engineering materials.
CO 2	State various applications measuring methods for parameters of different classes of electrical engineering materials.
CO3	Solve simple problems based on dielectric, magnetic and conducting materials
CO4	Apply knowledge of Nano-technology to electrical engineering
C05	Execute tests on dielectric, insulating, magnetic, conducting, resistive materials as per IS to decide the quality ofthe materials
C06	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

Subject name (Subject code)	**203143: Analog And Digital Electronics**

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

Course Outcome	Course Outcome
CO 1	Design logical, sequential and combinational digital circuit using K-Map.
CO 2	Demonstrate different digital memories and programmable logic families
CO 3	Apply and analyze applications of OPAMP in open and closed loop con
CO 4	Design uncontrolled rectifier with given specifications
Subject name (Subject code)	**203144: Electrical Measurements and Instrumentation**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Define various characteristic and classify measuring instruments along with range extension techniques.
CO 2	
CO 3	Apply measurement techniques for measurement of resistance, inductance and capacitance
CO 4	Demonstrate construction, working principle of electrodynamo type and induction type instruments for measurement of power and energy
CO5	Make use of CRO for measurement of voltage, current and frequency

CO6	Classify transducer and apply it for measurement of physical
	parameters in real time
Subject name (Subject code)	**203145: Power System-I**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Recognize different patterns of load curve and calculate associated different factors with it and tariff.
CO 2	Draft specifications of electrical equipment in power station.
CO 3	Design electrical and mechanical aspects in overheadtransmission and underground cables
CO4	Evaluate the inductance and capacitance of different transmission line configurations
CO5	Analyse the performance of short and medium transmissionline

Subject name (Subject code)	**203146: Electrical Machines-I**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Evaluate performance parameters of transformer with experimentation and demonstrate construction along with specifications as per standards
CO 2	Distinguish between various types of transformer connections as per vector groups with application and to perform parallel operation of single/three phase transformers
CO 3	Select and draft specifications of DC machines and Induction motors for various applications along with speed controlmethods.
CO4	Justify the need of starters in electrical machines with merits and demerits

CO5	Test and evaluate performance of DC machines and Induction motors as per IS standard

Subject name (Subject code)	**203147: Network Analysis**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Calculate current/voltage in electrical circuits using simplification techniques, Mesh, Nodal analysis and network theorems
CO 2	Analyze the response of RLC circuit with electrical supply in transient and stead state
CO 3	Apply Laplace transform to analyze behaviour of an electrical circuit.
CO4	Derive formula and solve numerical of two port network and Design of filters
CO5	Applyknowledge of network theory to find transfer function, poles and zeroes location to perform stability analysis and parallel resonance

Subject name (Subject code)	**203148: Numerical Methods and Computer Programming**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Demonstrate types of errors in computation and their causes of occurrence
CO 2	Calculate root of algebraic and transcendental equations using various methods

CO3	Apply numerical methods for various mathematical problems such as interpolation, numerical differentiation, integration and ordinary differential equation
CO4	Solve linear simultaneous equation using direct and indirect method.
CO5	Develop algorithms and write computer programs for various numerical methods.
Subject name (Subject code)	**203149: Fundamental of Microcontroller and Applications**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Describe the architecture and features of various types of the microcontroller
CO 2	Illustrate addressing modes and execute programs in assembly language for the microcontroller.
CO 3	Write programs in C language for microcontroller 8051.
CO4	Elaborate interrupt structure of 8051 and program to handle interrupt and ADC809
CO5	Define the protocol for serial communication and understand the microcontroller development systems
CO6	Interface input output devices and measure electrical parameters with 8051 in real time.

TE ELECTRICAL ENGINEERING	
Subject name (Subject code)	**303141: Industrial and Technology Management**

At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Differentiate between different types of business organizations and discuss the fundamentals of economics and management.
CO 2	Explain the importance of technology management and quality management
CO3	Explain the importance of IPR and role of Human Resource Management
CO4	Understand the importance of Quality and its significance
CO5	Describe the characteristics of marketing & its types andoverview of financial Management
CO6	Discuss the qualities of a good leader and road map to Entrepreneurship

Subject name (Subject code)	**303142: Power Electronics**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Develop characteristics of different power electronic switching devices
CO 2	Reproduce working principle of power electronic converters for different types of loads.
CO 3	Choose the appropriate converter for different applications.
CO 4	

CO 5	

Subject name (Subject code)	**303143: Electrical Machines-II**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Learn construction, working principle of three phase Synchronous Machines, Induction Motors, A.C. Series Motorand Special Purpose Motors.
CO 2	Understand characteristics of three phase Synchronous Machines, Induction Motors, A.C. Series Motor and Special Purpose Motors.
CO 3	Select the above machines in Power System, industrial,household & Military Engineering applications.
CO 4	Testing of machines to evaluate the performance through experimentati
CO 5	

Subject name (Subject code)	**303144: Electrical Installation, Design and Condition Based Maintenance**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Classify different types of distribution supply system and determine economics of distribution system. compare and classify various substations, bus-bars and Earthing systems.
CO 2	Demonstrate the importance and necessity of maintenance

CO 3	Analyse and test different condition monitoring methods
CO 4	Carry out estimation and costing of internal wiring for residential and commercial installations
CO 5	Apply electrical safety procedures

Subject name (Subject code)	**303145A: Elective-I: Advanced Microcontroller and Embedded System**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Explain architecture of PIC 18F458 microcontroller, its instructions and the addressing modes
CO 2	Use Ports and timers for peripheral interfacing and delay generation
CO 3	Interface special and generate events using CCP module.
CO4	Effectively use interrupt structure in internal and External interrupt mode
CO5	Effectively use ADC for parameter measurement and also understand LCD interfacing
CO6	Use Serial Communication and various serial communication protocols

Subject name (Subject code)	**303148: Power System-II**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**

CO 1	Solve problems involving modelling, design and performance evaluation of HVDC and EHVAC power transmission lines.
CO 2	Calculate per unit values and develop Y bus for solution power flow equations in power transmission networks
CO 3	Calculate currents and voltages in a faulted power system under both symmetrical and asymmetrical faults, and relate fault currents to circuit breaker ratings.

Subject name (Subject code)	**303149: Computer Aided Design of Electrical Machines**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Summarize temperature rise, methods of cooling of transformer and consider IS 2026 in transformer design.
CO 2	Design the overall dimensions of the transformer
CO3	Analyze the performance parameters of transformer
CO4	Design overall dimensions of three phase Induction motor
CO5	Analyze the performance parameters of three phase Induction motor.
CO6	Implement and develop computer aided design of transformerand induction motor

Subject name (Subject code)	**303150: Control System Engineering**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**

CO 1	Construct mathematical model of Electrical and Mechanical system using differential equations and transfer function and develop analogy between Electrical and Mechanical systems.
CO 2	Determine time response of systems for a given input and perform analysis of first and second order systems using time domain specifications
CO 3	Investigate closed loop stability of system in s-plane using Routh Hurwitz stability criteria and root locus.
CO4	Analyze the systems in frequency domain and investigatestability using Nyquist plot and Bode plot
CO5	Design PID controller for a given plant to meet desired time domain specifications

Subject name (Subject code)	**303151D:Elective-II Energy Management**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Describe BEE Energy policies, Energy ACT.
CO 2	List and apply demand side management measures for managing utility systems
CO 3	Explore and use simple data analytic tools.
CO 4	Use various energy measurement and audit instruments
CO5	Evaluate economic feasibility of energy conservation projects.
CO6	Identify appropriate energy conservations methods for electric and thermal utilities

Subject name (Subject code)	303152: Internship
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Understand the working culture and environment of the Industry and get familiar with various departments and practices in the industry
CO 2	Operate various meters, measuring instruments, tools used in industry efficiently and develop technical competence.
CO3	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.
CO4	Create a professional network and learn about ethical, safety measures, and legal practices
CO5	Appreciate the responsibility of a professional towards society and the environment
CO6	Identify career goals and personal aspirations

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Subject name (Subject code)	**403141: Power System Operation and Control**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Summarize angle, voltage and frequency stability in the power system control (UN).

CO 2	Illustrate various ways of interchange of power between interconnected utilities (AP)
CO 3	Analyze stability and optimal load dispatch using different techniques (AN).
CO4	Select appropriate FACTS devices for stable operation of the system (EV).
CO5	Evaluate the stability of the system and suggest the methods to improve it (EV).

Subject name (Subject code)	**403142: Advanced Control System**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Explain compensation networks, common nonlinearities, the concept of state, sampling and reconstruction, and concepts of advanced controls (Understanding)
CO 2	Determine transfer function from state model (Applying)
CO 3	Test controllability and observability properties of the system (Evaluating)
CO 4	Design compensators, state feedback controls, and observers for the system (Creating)

Subject name (Subject code)	**403143A: PLC and SCADA**
At the end of this course, the student will be able to:	
Course Outcome #	**Course Outcome**
CO 1	Develop and explain the working of a PLC with the help of a block diagram.

CO2	Classify input and output interfacing devices with PLC.
CO3	Design PLC based application by proper selection criteria, developing GUI and ladder program.
CO4	Execute, debug, and test the programs developed for digital and analog operations
CO5	Develop the architecture of SCADA and explain the importance of SCADA in critical infrastructure.
CO6	Describe the SCADA protocols and digital control systems, along with their architecture for automation

Subject name (Subject code)	**403144B: Electric and Hybrid Vehicle**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Analyze the Life Cycle Assessment of Li-ion battery
CO2	Describe the different types of Li-ion charging methods
CO3	Comprehend the knowledge of drivetrain hybridization.
CO4	Evaluate EV motor sizing
CO5	Classify Battery Recycling methods

Subject name (Subject code)	**403146: MOOCs**
At the end of this course, the student will be able to:	

Course Outcome	Course Outcome
CO 1	Enables the students to directly engage and learn from the best faculty in the country in order to strengthen the fundamentals
CO 2	Explore new areas of interest in a relevant field.
CO3	Enable self learning initiative in learners..
CO4	Develop critical thinking to solve complex problems in engineering, science and humanities.
CO5	Improve communication skills by interacting with peers and course teachers

Subject name (Subject code)	403148: Switchgear and Protection
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Understand the fundamentals of protective relaying
CO2	Demonstrate the arc interruption and analyze the RRRV in circuit breakers
CO3	Demonstrate the construction and working principle of air brake circuit breakers, SF6 circuit breakers, and a vacuum circuit breaker.
CO4	Explain the characteristics of static and digital relays and their applications in power systems.
CO5	Apply the differential protection scheme to large transformers, alternators, and induction motors.
CO6	Apply distance protection, three stepped protection for transmission line

Subject name (Subject code)	403149: Advanced Electrical Drives and Control
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Explain motor load dynamics and multi quadrant operation of drives.
CO 2	Analyze operation of converter fed and chopper fed DC drives
CO 3	Apply different braking methods of D.C. and induction motor drive
C04	Elaborate vector control for induction motor and BLDC drives.
CO5	Elaborate synchronous motor, reluctance motor drive.
CO6	Differentiate between classes and duty cycles of motors andselect suitable drives in various industrial applications

Subject name (Subject code)	403150C: Smart Grid
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Apply the knowledge to differentiate between Conventionaland Smart Grid
CO 2	Describe importance of Supercapacitors
CO3	Identify the need of Smart metering.

CO4	Apply the communication technology in smart grid.
CO5	Comprehend the issues of micro grid.

Subject name (Subject code)	**403151B: Illumination Engineering**
At the end of this course, the student will be able to:	
Course Outcome	**Course Outcome**
CO 1	Define and reproduce various terms in illumination
CO 2	Identify various parameters for illumination system design.
CO3	Design indoor and outdoor lighting systems
CO4	Enlist state of the art illumination systems.