

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

2021 SCHEME COURSE OUTCOME

Upon the completion of the course, the students will be able to

COURSE CODE	COURSE NAME	CO	CO STATEMENT
	TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNICS	CO231.1	To solve ordinary differential equations using Laplace transform.
21MAT31		CO231.2	Demonstrate the Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory.
		CO231.3	To use Fourier transforms to analyze problems involving continuous-time signals and to apply Z Transform techniques to solve difference equations
		CO231.4	To solve mathematical models represented by initial or boundary value problems involving partial differential equations
		CO231.5	Determine the extremals of functional using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.
	ANALOG ELECTRONIC CIRCUITS AND OP - AMPS	CO232.1	Obtain the output characteristics of clipper and clamper circuits.
		CO232.2	Design and compare biasing circuits for transistor amplifiers & explain the transistor switching.
21EE32		CO232.3	Explain the concept of feedback, its types and design of feedback circuits
		CO232.4	Design and analyse the power amplifier circuits and oscillators for different frequencies.
		CO232.5	Design and analysis of FET and MOSFET amplifiers.
		CO233.1	Understand the basic concepts, basic laws and methods of analysis of DC and AC networks and reduce the complexity of network using source shifting, source transformation and network reduction using transformations.
045500	ELECTRIC CIRCUIT	CO233.2	Solve complex electric circuits using network theorems.
21EE33	ANALYSIS	CO233.3	Discuss resonance in series and parallel circuits and also the importance of initial conditions and their evaluation.
		CO233.4	Synthesize typical waveforms using Laplace transformation.
		CO233.5	Solve unbalanced three phase systems and also evaluate the performance of two port networks.
21EE34	TRANSFORMERS AND GENERATORS	CO234.1	Understand the construction and operation of 1- phase, 3-Phase transformers, and



			Autotransformer.
		CO234.2	Analyze the performance of transformers by polarity test, Sumpner's Test, phase conversion, 3-phase connection, and parallel operation.
		CO234.3	Understand the construction and working of AC and DC Generators.
		CO234.4	Analyze the performance of the AC Generators on infinite bus and parallel operation
		CO234.5	Determine the regulation of AC Generator by Slip test, EMF, MMF, and ZPF Methods.
		CO235.1	Evaluate the performance of transformers from the test data obtained.
		CO235.2	Connect and operate two single phase transformers of different KVA rating in parallel.
	ELECTRICAL MACHINES	CO235.3	Connect single phase transformers for three phase operation and phase conversion.
21EEL35	LABORATORY - I	CO235.4	Compute the voltage regulation of synchronous generator using the test data obtained in the laboratory
		CO235.5	Evaluate the performance of synchronous generators from the test data and assess the performance of synchronous generator connected to infinite bus.
		CO236.1	Explain the social responsibility
		CO236.2	Show the significance of sustainable development.
21UH36	RESPONSIBILITY	CO236.3	Summarize sustainability and creativity.
		CO236.4	Outline the organizational skill.
		CO236.5	Organize planning and organizational skills.
		CO237.1	Outline the basic structure of Indian Constitution.
	CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS	CO237.2	Explain the Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
2101037		CO237.3	Describe about our Union Government, political structures, codes and procedures.
21011 57		CO237.4	Outline our State Executive & Elections system of India.
		CO237.5	Identify Amendments and Emergency provisions, other important provisions given by the constitution.
		CO2381.1	Evaluate the performance of transformers from the test data obtained.
21EEL381	SCILAB FOR TRANSFORMERS AND GENERATORS	CO2381.2	Connect & operate two single phase transformers of different KVA rating in parallel
		CO2381.3	Connect single phase transformers for three phase operation and phase conversion.
		CO2381.4	Compute the voltage regulation of synchronous generator using the test data obtained in the laboratory.



		CO2381.5	Evaluate the performance of synchronous generators from the test data and assess the performance of synchronous generator connected to infinite bus
		CO2382.1	Simulate & verify the basic concepts, basic laws and methods of analysis of DC and AC networks and reduce the complexity of network using source shifting, source transformation and network reduction using transformations.
24551202	CIRCUIT LABORATORY	CO2382.2	Simulate & verify Kirchhoff's Current Law & Kirchhoff's Voltage Law
21EEL382	USING PSPICE	CO2382.3	Simulate using PSPICE and verify complex electric circuits using network theorems.
		CO2382.4	Use PSPICE to simulate series and parallel resonance circuits to verify the importance of initial conditions and their evaluation.
		CO2382.5	Solve unbalanced three phase systems and also evaluate the performance of two port networks
		CO2383.1	Design and analyse multivibrator circuits using IC 555 Timer
21EEL383	555 IC LABORATORY	CO2383.2	Design and analyse the various application of 555 timer.
		CO2383.3	Design & analyze Sequential timer using IC-555
	COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS	CO241.1	Use the concepts of an analytic function and complex potentials to solve the problems arising in electromagnetic field theory. Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing
		CO241.2	Obtain Series Solutions of Ordinary Differential Equation.
21MAT41		CO241.3	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.
		CO241.4	Apply discrete and continuous probability distributions in analysing the probability models arising in the engineering field.
		CO241.5	Construct joint probability distributions and demonstrate the validity of testing the hypothesis.
21EE42		CO242.1	Explain the concept of combinational logic circuits and develop simplified switching equation using Karnaugh Maps and QuineMcClusky techniques.
	DIGITAL SYSTEM DESIGN	CO242.2	Analyse and design combinational circuits as Multiplexer, Encoder, Decoder, Adder, Subtractors and Comparator
		CO242.3	Describe and characterize flip flops
		CO242.4	Employ the digital circuits for design applications of flip flops, counters, shift registers as sequential



			control circuits.
		CO242.5	Design the sequential circuits using SR, JK, D and T flip-flops and Melay and Moore applications. Explain the functioning of Memories
		CO243.1	Outline the 8051 architecture, registers, internal memory organization, addressing modes.
		CO243.2	Discuss 8051 addressing modes, instruction set of 8051, accessing data and I/O port programming.
21EE43	MICROCONTROLLER	CO243.3	Develop 8051C programs for time delay, I/O operations, I/O bit manipulation, logic and arithmetic operations, data conversion and timer/counter programming
		CO243.4	Summarize the basics of serial communication and interrupts, also develop 8051 programs for serial data communication and interrupt programming.
		CO243.5	Program 8051to work with external devices for ADC, DAC, Stepper motor control, DC motor control
	ELECTRIC MOTORS	CO244.1	Explain the construction, operation and classification of DC Motor, AC motor and special purpose motors
		CO244.2	Describe the performance characteristics and applications of Electric motors.
21EE44		CO244.3	Demonstrate and explain the methods of testing of DC machines and determine losses and efficiency.
		CO244.4	Control the speed of DC motor and induction motor.
		CO244.5	Explain the starting methods, equivalent circuit and phasor diagrams, torque angle, effect of change in excitation and change in load, hunting and damping of synchronous motors.
	BIOLOGY FOR ENGINEERS	CO245.1	Outline the basic biological concepts like biomolecules and their applications.
		CO245.2	Explain human organ systems and bio designs.
21BE45		CO245.3	Relate the concepts of biomimetic for specific requirements.
		CO245.4	Compare the nature-bio inspired materials and mechanisms.
		CO245.5	Interpret the trends in Bio engineering.
21EEL46		CO246.1	Test DC machines to determine their characteristics and also to control the speed of DC motor.
	ELECTRICAL MACHINES	CO246.2	Pre-determine the performance characteristics of DC machines by conducting suitable tests.
	LABORATORY - II	CO246.3	Perform load test on single phase and three phase induction motor to assess its performance
		CO246.4	Conduct test on induction motor to pre-determine the performance characteristics



		CO246.5	Conduct test on synchronous motor to draw the performance curves
	SAMSKRIITIKA	CO247.1	Explain the necessity of learning of local language for comfortable life.
		CO247.2	Speak, read and write Kannada language as per requirement.
21KSK4721KBK47	KANNADA/BALAKE KANNADA	CO247.3	Communicate (converse) in Kannada language in their daily life with kannada speakers.
		CO247.4	Listen and understand the Kannada language properly.
		CO247.5	Speak in polite conversation.
		CO2481.1	Perform interfacing of 7 Segment Display, external ADC for temperature control.
		CO2481.2	Perform interfacing of stepper motor and dc motor for controlling the speed, display running message in LCD.
21EEP481	PROJECTS	CO2481.3	Perform interfacing elevator cum automatic control and traffic light controller interface.
		CO2481.4	Generate different waveforms using DAC interface.
		CO2481.5	Work with a small team to carryout experiments using microcontroller concepts and prepare reports that present lab work.
	SCILAB FOR ELECTRIC MOTORS	CO2482.1	Perform tests on DC Machines using SCILAB to determine their characteristics.
		CO2482.2	Use SCILAB to Control the DC Motors using different methods. Pre-determination the performance characteristics of DC Machines.
21EEL482		CO2482.3	Conduct load test on single-phase and three-phase Induction Motor and draw performance characteristics using SCILAB.
		CO2482.4	Use SCILAB Conduct test on Induction Motor to determine performance characteristics.
		CO2482.5	Conduct load test on Induction Motor using SCILAB to draw performance curves.
	SCILAB FOR ELECTRICAL AND ELECTRONIC MEASUREMENTS	CO2483.1	Use SCILAB / MATLAB to design & Analyze different bridge circuits to for the measurement of resistance and inductance.
21EEL483		CO2483.2	Use SCILAB / MATLAB to design & Analyze single phase and three phase circuits for the measurement of frequency.
		CO2483.3	Simulate three phase circuits for measurement of Power, Energy to understand the adjustments, calibration & errors in energy meters.
		CO2483.4	Understand methods of extending the range of instruments & instrument transformers using Silsbee's Deflection Method.
		CO2483.5	Design & analyse Q Meter and different electronic digital instruments for true value measurement.



21661494	SIMULATION OF OP-AMP	CO2484.1	Simulate the non-inverting and inverting op-amp configuration to analyze its characteristic parameters of OP-Amp
		CO2484.2	Simulate to design and test the OP-Amp as Voltage Follower, Comparator, Schimitt Trigger, Zero Crossing detector, Adder, Subtractor, Integrator & Differentiator.
	CIRCUITS	CO2484.3	Simulate to design and test the OP-Amp as oscillators and filters.
		CO2484.4	Design the simulation circuit to analyse full wave rectifier for its performance parameters.
		CO2484.5	Design the simulation circuit to analyse Op-Amp as DAC & ADC, Instrumentation amplifier.
	INTER/INTRA INSTITUTIONAL INTERNSHIP	CO2492.1	Gain exposure to the professional work environment within the institution. Apply academic knowledge to real-world situations within the specific industry or sector the institution operates in.
		CO2492.2	Apply problem-solving skills to overcome challenges encountered during internship activities.
21INT49		CO2492.3	Develop interpersonal and teamwork skills within the institutional setting. Communicate effectively with colleagues, superiors, and other stakeholders.
		CO2492.4	Apply project management skills to plan, organize, and execute projects or tasks. Demonstrate flexibility in tasks and responsibilities.
		CO2492.5	Build professional networks within the institution. Demonstrate an ability to incorporate constructive feedback for personal and professional development.
	TRANSMISSION AND	CO351.1	Explain transmission and distribution scheme, identify the importance of different transmission systems and types of insulators.
045554		CO351.2	Analyze and compute the parameters of the transmission line for different configurations.
21EE51	DISTRIBUTION	CO351.3	Assess the performance of overhead lines.
		CO351.4	Interpret corona, explain the use of underground cables.
		CO351.5	Classify different types of distribution systems; examine its quality & reliability.
21EE52		CO352.1	Analyze and model electrical and mechanical system using analogous.
	CONTROL SYSTEMS	CO352.2	Formulate transfer functions using block diagram and signal flow graphs.
		CO352.3	Analyze the stability of control system, ability to determine transient and steady state time response.



		CO352.4	Illustrate the performance of a given system in time and frequency domains, stability analysis using Root locus and Bode plots.
		CO352.5	Discuss stability analysis using Nyquist plots, Design controller and compensator for a given specification.
		CO253.1	Model the power system components & construct per unit impedance diagram of power system.
		CO253.2	Analyze three phase symmetrical faults on power system.
21EE53	POWER SYSTEM ANALYSIS - 1	CO253.3	Compute unbalanced phasors in terms of sequence components and vice versa, also develop sequence networks.
		CO253.4	Analyze various unsymmetrical faults on power system.
		CO253.5	Examine dynamics of synchronous machine and determine the power system stability.
		CO354.1	To give an overview of applications power electronics, different types of power semiconductor devices, their switching characteristics, power diode characteristics, types, their operation and the effects of power diodes on RL circuits.
	POWER ELECTRONICS	CO354.2	To explain the techniques for design and analysis of single phase diode rectifier circuits.
21EE54		CO354.3	To explain different power transistors, their steady state and switching characteristics and limitations.
		CO354.4	To explain different types of Thyristors, their gate characteristics and gate control requirements.
		CO354.5	To explain the design, analysis techniques, performance parameters and characteristics of controlled rectifiers, DC- DC, DC -AC converters and Voltage controllers.
	POWER ELECTRONICS LABORATORY	CO355.1	Obtain static characteristics of semiconductor devices to discuss their performance.
		CO355.2	Trigger the SCR by different methods
21EEL55		CO355.3	Verify the performance of single phase controlled full wave rectifier and AC voltage controller with R and RL loads.
		CO355.4	Control the speed of a DC motor, universal motor and stepper motors.
		CO355.5	Verify the performance of single phase full bridge inverter connected to resistive load.
	DESEADCU ΜΕΤΠΟΡΟΙ ΟΟΥ	CO356.1	To know the meaning of engineering research.
21RMI56	& INTELLECTUAL	CO356.2	To know the procedure of Literature Review and Technical Reading.
		CO356.3	To know the fundamentals of patent laws and



			drafting procedure.
		CO356.4	Understanding the copyright laws and subject matters of copyrights and designs
		CO356.5	Understanding the basic principles of design rights
		CO357.1	Understand the various fields of civil engineering.
		CO357.2	Compute the resultant of a force system and resolution of a force
21CIV57	ENVIRONMENTAL STUDIES	CO357.3	Comprehend the action for forces, moments, and other types of loads on rigid bodies and compute the reactive forces.
		CO357.4	Locate the centroid and compute the moment of inertia of regular and built-up sections.
		CO357.5	Analyze the bodies in motion.
		CO3581.1	Simulate, analyze and evaluate different transmission lines parameters.
		CO3581.2	Simulate, analyze a network under balanced and unbalanced fault conditions and interpret the results.
21EEL581	SCILAB FOR ANALYSIS OF POWER SYSTEMS	CO3581.3	Simulate and analyze the reactive power requirement of lines, voltage profile along the line and VAR compensation.
		CO3581.4	Simulate and analyze per unit quantities in power system
		CO3581.5	Simulate and analyze various methods of transient stability analysis
		CO3582.1	Simulate & Verify the performance of single phase controlled and uncontrolled half wave & full wave rectifier with R and RL loads.
	SCILAB FOR POWER ELECTRONICS	CO3582.2	Simulate & Verify the performance to study the Class A,B,C,D & E choppers with R and RL loads.
21EEL582		CO3582.3	Simulate & Verify the performance of single phase AC Voltage Controller with R and RL loads.
		CO3582.4	Simulate & Verify the performance of single phase inverter with R and RL loads.
		CO3582.5	Simulate & Verify the performance of Three phase inverter with R loads at various conduction angle.
		CO3583.1	Conduct survey on Building, industry & organization and perform Utility Data Analysis
21EEP583	ENERGY AUDIT PROJECT	CO3583.2	To analyze the data collected for energy audit of a building or industry or organization.
		CO3583.3	To perform comparative analysis with and without energy audit.
		CO3583.4	To analyze the energy saving measures to be considered with economy considerations.
		CO3583.5	Analyse in a systematic way, think better, and perform better.
21EEP584	RENEWABLE ENERGY	CO3584.1	Demonstrate the ability to apply theoretical



	PROJECT		knowledge gained in the course to real-world situations.
		CO3584.2	Identify and define a problem statement to develop effective strategies to solve the identified problem or address the challenge.
		CO3584.3	Evaluate various options and justify the chosen approach or solution. Showcase creativity and innovation in problem-solving or project design.
		CO3584.4	Communicate project findings and results clearly and effectively, both in written and oral formats. Create well-organized and coherent project documentation.
		CO3584.5	Collaborate effectively with team members & and demonstrate an understanding of ethical standards in the field to reflect on the learning experience gained through the project work.
		CO361.1	Explain the field of management, task of the manager, planning and steps in decision making.
21EE61	MANAGEMENT AND ENTREPRENEURSHIP	CO361.2	Discuss the structure of organization, importance of staffing, leadership styles, modes of communication, techniques of coordination and importance of managerial control in business.
		CO361.3	Explain the concepts of entrepreneurship and a businessman's social responsibilities towards different groups.
		CO361.4	Show an understanding of role of SSI's in the development of country and state/central level institutions/ agencies supporting business enterprises.
		CO361.5	Discuss the concepts of project management, capital budgeting, project feasibility studies, need for project report and new control techniques.
	POWER SYSTEM ANALYSIS - 2	CO362.1	Formulate network matrices and models for solving load flow problems.
		CO362.2	Perform steady state power flow analysis of power systems using numerical iterative techniques.
21EE62		CO362.3	Solve issues of economic load dispatch and unit commitment problems.
		CO362.4	Analyze short circuit faults in power system networks using bus impedance matrix.
		CO362.5	Apply Point by Point method and Runge Kutta Method to solve Swing Equation.
21EE63	SIGNALS AND DIGITAL SIGNAL PROCESSING	CO263.1	Discuss classification and basic operations that can be performed on both continuous and discrete time signals.
216603		CO263.2	Evaluate Discrete Fourier Transform of a sequence and the convolution of two sequences to determine the output sequence.



		CO263.3	Evaluate Discrete Fourier Transform of a sequence by using fast methods.
		CO263.4	Design Butterworth and Chebyshev IIR digital filters and FIR filters using different techniques.
		CO263.5	Develop different structures for IIR and FIR filters.
		CO3641.1	Classify the transducers and explain the need of transducers, their classification, advantages and disadvantages.
		CO3641.2	Explain the working of various transducers and sensors. Outline the recent trends in sensor technology and their selection.
21EE641	SENSORS AND TRANSDUCERS	CO3641.3	Analyze the signal conditioning and signal conditioning equipment. Illustrate different configuration of Data Acquisition System and data conversion.
		CO3641.4	Show knowledge of data transmission and telemetry.
		CO3641.5	Explain measurement of non-electrical quantities - temperature, flow, speed, force, torque, power and viscosity.
	ELECTROMAGNETIC FIELD THEORY	CO3642.1	Use different coordinate systems, Coulomb's Law and Gauss Law for the evaluation of electric fields produced by different charge configurations.
2455(42		CO3642.2	Calculate the energy and potential due to a system of charges & Explain the behavior of electric field across a boundary conditions.
21EE642		CO3642.3	Explain the Poisson's, Laplace equations and behavior of steady magnetic fields.
		CO3642.4	Explain the behavior of magnetic fields and magnetic materials.
		CO3642.5	Asses time varying fields and propagation of waves in different media.
21EE643	ELECTRICAL MACHINE DESIGN	CO3643.1	Identify and list, limitations, modern trends in design, manufacturing of electrical machines and properties of materials used in the electrical machines.
		CO3643.2	Derive the output equation of DC machine, discuss selection of specific loadings and magnetic circuits of DC machines, design the field windings of DC machine, and design stator and rotor circuits of a DC machine.
		CO3643.3	Derive the output equations of transformer, discuss selection of specific loadings, estimate the number of cooling tubes, no load current and leakage reactance of core type transformer.
		CO3643.4	Develop the output equation of induction motor, discuss selection of specific loadings and magnetic circuits of induction motor, design stator and rotor circuits of a induction motor.



		CO3643.5	Formulate the output equation of alternator, design the field windings of Synchronous machine, discuss short circuit ratio and its effects on performance of synchronous machines, design salient pole and non-salient pole alternators for given specifications.
		CO3644.1	Discuss electrical and electronics materials, their importance, classification and operational requirement.
		CO3644.2	Discuss conducting & dielectric materials used in engineering, their properties and classification.
21EE644	ELECTRICAL ENGINEERING MATERIALS	CO3644.3	Discuss insulating and magnetic materials used in engineering, their properties and classification.
		CO3644.4	Explain the phenomenon superconductivity, super conducting materials and their application in engineering
		CO3644.5	Explain the plastic and its properties and applications.
	UTILIZATION OF ELECTRICAL POWER	CO3651.1	Discuss different methods of electric heating & welding.
		CO3651.2	Discuss the laws of electrolysis, extraction, refining of metals and electro deposition process.
21EE651		CO3651.3	Discuss the laws of illumination, different types of lamps, lighting schemes and design of lighting systems.
		CO3651.4	Analyze systems of electric traction, speed time curves and mechanics of train movement.
		CO3651.5	Explain the motors used for electric traction, their control & braking and power supply system used for electric traction.
21EE652	RENEWABLE ENERGY RESOURCES	CO3652.1	Discuss causes of energy scarcity and its solution, energy resources and availability of renewable energy. Outline energy from sun, energy reaching the Earth's surface and solar thermal energy applications.
		CO3652.2	Discuss types of solar collectors, their configurations, solar cell system, its characteristics and their applications.
		CO3652.3	Explain generation of energy from hydrogen, wind, geothermal system, solid waste and agriculture refuse.
		CO3652.4	Discuss production of energy from biomass, biogas.
		CO3652.5	Summarize tidal energy resources, sea wave energy and ocean thermal energy.
21EE653	INDUSTRIAL SERVO CONTROL SYSTEMS	CO3653.1	Explain the evolution and classification of servos, with descriptions of servo drive actuators, amplifiers, feedback transducers, performance, and troubleshooting techniques.



		CO3653.2	Discuss system analogs, vectors and transfer functions of differential equations.
		CO3653.3	Discuss mathematical equations for electric servo motors, both DC and brushless DC servo motors.
		CO3653.4	Represent servo drive components by their transfer function, to combine the servo drive building blocks into system block diagrams.
		CO3653.5	To determine the frequency response techniques for proper servo compensation.
		CO3654.1	Discuss state variable approach for linear time invariant systems in both the continuous and discrete time systems. Develop of state models for linear continuous-time and discrete-time systems.
21EE654	ADVANCED CONTROL SYSTEMS	CO3654.2	Apply vector and matrix algebra to find the solution of state equations for linear continuous– time and discrete–time systems. Define controllability and observability of a system and test for controllability and observability of a given system
		CO3654.3	Design pole assignment and state observer using state feedback.
		CO3654.4	Develop the describing function for the nonlinearity present to assess the stability of the system.
		CO3654.5	Develop Lyapunov function for the stability analysis of nonlinear systems.
	DIGITAL SIGNAL PROCESSING LABORATORY	CO366.1	Conduct sampling of signals in time and frequency domains.
		CO366.2	Evaluate the impulse response of a system.
21EEL66		CO366.3	Obtain convolution of given sequences to evaluate the response of a system.
		CO366.4	Compute DFT and IDFT of a given sequence using the basic definition and/or fast methods.
		CO366.5	Provide a solution for a given difference equation. Design and implement IIR and FIR filters.
21EEMP67	MINI PROJECT	CO367.1	Demonstrate the ability to apply theoretical knowledge gained in the course to real-world situations.
		CO367.2	Identify and define a problem statement to develop effective strategies to solve the identified problem or address the challenge.
		CO367.3	Evaluate various options and justify the chosen approach or solution. Showcase creativity and innovation in problem-solving or project design.
		CO367.4	Communicate project findings and results clearly and effectively, both in written and oral formats. Create well-organized and coherent project



			documentation.
		CO367.5	Collaborate effectively with team members & and demonstrate an understanding of ethical standards in the field to reflect on the learning experience gained through the project work.
21INT68	INNOVATION/ENTREPRENE URSHIP /SOCIETAL INTERNSHIP	CO368.1	Demonstrate enhanced innovation and creativity by actively contributing to the development of new ideas, products, or services.
		CO368.2	Develop and cultivate an entrepreneurial mindset, including the ability to identify opportunities, take calculated risks, and think strategically.
		CO368.3	Apply project management skills to plan, execute, and monitor innovative projects or entrepreneurial ventures. Understand the importance of teamwork in the context of innovation and entrepreneurship.
		CO368.4	Assess and evaluate the potential societal impact of innovative solutions or entrepreneurial ventures. Learn to pivot and adjust strategies based on feedback and changing circumstances.
		CO368.5	Create comprehensive documentation of the internship activities, including project plans, progress reports, and impact assessments.
	HIGH VOLTAGE AND POWER SYSTEM PROTECTION	CO471.1	Apply the knowledge of dielectric property for insulation, it's performances as per Standards and High voltage application in power system Equipment's.
		CO471.2	Analyze the circuits of high voltages, high currents in Generation and Measurements.
21EE71		CO471.3	Apply relays to the power system protection.
		CO471.4	Discuss protection of generators, motors, Transformer and Bus Zone Protection.
		CO471.5	Discuss the construction, operating principles and performances of circuit breaker. Describe the causes of over voltages and their remedial measures.
21EE72	POWER SYSTEM OPERATION AND CONTROL	CO472.1	Describe various levels of controls in power systems, architecture and configuration of SCADA.
		CO472.2	Develop and analyze mathematical models of Automatic Load Frequency Control.
		CO472.3	Develop mathematical model of Automatic Generation Control in Interconnected Power system.
		CO472.4	Discuss the Control of Voltage, Reactive Power and Voltage collapse.
		CO472.5	Explain security, contingency analysis, and state estimation of power systems.
21EE721	POWER SYSTEM PLANNING	CO4731.1	Discuss primary components of power system



			planning, planning methodology for optimum power system expansion and load forecasting.
		CO4731.2	Understand economic appraisal to allocate the resources efficiently and appreciate the investment decisions.
		CO4731.3	Discuss expansion of power generation and planning for system energy in the country, evaluation of operating states of transmission system, their associated contingencies and the stability of the system.
		CO4731.4	Discuss principles of distribution planning, supply rules, network development and the system studies. Discuss reliability criteria for generation, transmission, distribution and reliability evaluation and analysis, grid reliability, voltage disturbances and their remedies.
		CO4731.5	Discuss planning and implementation of electric – utility activities, market principles and the norms framed.
21EE722	SMART GRID	CO4732.1	Discuss the progress made by different stakeholders in the design and development of smart grid. Explain measurement techniques using Phasor Measurement Units and smart meters. Discuss tools for the analysis of smart grid and design, operation and performance
		CO4732.2	Discuss classical optimization techniques and computational methods for smart grid design, planning and operation.
		CO4732.3	Discuss classical optimization techniques and computational methods for smart grid design, planning and operation. Discuss the computational techniques, communication, measurement, and monitoring technology tools essential to the design of the smart grid.
		CO4732.4	Explain predictive grid management and control technology for enhancing the smart grid performance. Develop cleaner, more environmentally responsible technologies for the electric system.
		CO4732.5	Explain methods to promote smart grid awareness and making the existing transmission system smarter by investing in new technology.
21EE723	ANN FOR POWER SYSTEMS APPLICATIONS	CO4733.1	Develop Neural Network and apply elementary information processing tasks that neural network can solve.
		CO4733.2	Develop Neural Network and apply powerful, useful learning techniques.
		CO4733.3	Develop and Analyze multilayer feed forward network for mapping provided through the first network layer and error back propagation



			algorithm.
		CO4733.4	Analyze and apply algorithmic type problems to tackle problems for which algorithms are not available.
		CO4733.5	Develop and Analyze supervised/unsupervised, learning modes of Neural Network for different applications.
		CO4734.1	Explain the working of electric vehicles and recent trends.
2155724	ELECTRIC VEHICLE TECHNOLOGIES	CO4734.2	Analyze different power converter topology used for electric vehicle application.
2166724		CO4734.3	Develop the electric propulsion unit and its control for application of electric vehicles.
	PLC AND SCADA	CO4734.4	Design converters for battery charging and explain transformer less topology.
		CO4735.1	Discuss history of PLC and describe the hardware components of PLC: I/O modules, CPU, memory devices, other support devices, operating modes and PLC programming.
21EE725		CO4735.2	Describe field devices Relays, Contactors, Motor Starters, Switches, Sensors, Output Control Devices, Seal-In Circuits, and Latching Relays commonly used with I/O module.
		CO4735.3	Analyze PLC timer and counter ladder logic programs and describe the operation of different program control instructions
		CO4735.4	Discuss the execution of data transfer instructions, data compare instructions and the basic operation of PLC closed-loop control system.
21EE731	COMPUTER AIDED ELECTRICAL DRAWING	CO4735.5	Describe the operation of mechanical sequencers, bit and word shift registers, processes and structure of control systems and communication between the processes.
		CO4741.1	Develop armature winding diagram for DC and AC machines.
		CO4741.2	Develop a Single Line Diagram of Generating Stations and substation using the standard symbols.
		CO4741.3	Construct sectional views of core type and shell type transformers using the design data.
		CO4741.4	Construct sectional views of assembled DC machine and their parts using the design data or the sketches.
		CO4741.5	Construct sectional views of assembled AC machine and their parts using the design data or the sketches.
21EE732	MICRO- AND NANO-SCALE SENSORS AND	CO4742.1	Understand and Explain the differences between the sensor and transducer technology based on



	TRANSDUCERS		nanotechnology and nanofabrication for different types of pressure sensor.
		CO4742.2	Understand and Explain the basic concept, structure and experimental results of Motion & Acceleration Sensors, Gas and Smoke Sensors based on nanotechnology and nanofabrication.
		CO4742.3	Understand and Explain the basic concept, structure and experimental results of Moisture Sensors, Optoelectronic and Photonic Sensors based on nanotechnology and nanofabrication.
		CO4742.4	Apply the concept and Make an informed selection of a sensor or transducer for a particular application.
		CO4742.5	Understand and Become knowledgeable in Integrated Sensor/Actuator Units and Special Purpose Sensors about the technologies that are available commercially at the present time.
21EE733	BIG DATA ANALYTICS IN POWER SYSTEMS	CO4743.1	Discuss the concept of Big data analytics & Big Data Application and Analytics in a Large - Scale Power System
		CO4743.2	Discuss role of big data and machine-learning methods applicable to power systems and in particular to Smart Grid communications.
		CO4743.3	Discuss optimization methods which are suitable for big data models in power systems.
		CO4743.4	Discuss various cyber security issues, electricity theft detection and mitigation that exist in IoT- enabled future power systems.
		CO4743.5	Discuss renewable energy planning concerns associated with planned future power systems that have high renewable penetration.
	INDUSTRIAL DRIVES AND APPLICATIONS	CO4744.1	Explain the advantages, choice and control of electric drive
		CO4744.2	Explain the dynamics, generating and motoring modes of operation of electric drives
21EE734		CO4744.3	Explain the selection of motor power rating to suit industry requirements
		CO4744.4	Analyze the performance & control of DC motor drives using controlled rectifiers
		CO4744.5	Analyze the performance & control of converter fed Induction motor, synchronous motor & stepper motor drives.
21EE735	FACTS AND HVDC	CO4745.1	Discuss transmission interconnections, flow of Power in an AC System, limits of the loading capability, dynamic stability considerations of a transmission interconnection and controllable parameters. Explain the basic concepts, definitions of flexible ac transmission systems and benefits from FACTS technology



		CO4745.2	Describe shunt controllers, Static Var Compensator and Static Compensator for injecting reactive power in the transmission system in enhancing the controllability and power transfer capability.
		CO4745.3	Describe series Controllers Thyristor-Controlled Series Capacitor (TCSC) and the Static Synchronous Series Compensator (SSSC) for control of the transmission line current.
		CO4745.4	Explain advantages of HVDC power transmission, overview and organization of HVDC system. Describe the basic components of a converter, the methods for compensating the reactive power demanded by the converter.
		CO4745.5	Explain converter control for HVDC systems, commutation failure, control functions.
	CARBON CAPTURE AND STORAGE	CO4751.1	Discuss the impacts of climate change and the measures that can be taken to reduce emissions. Discuss carbon capture and carbon storage.
		CO4751.2	Explain the fundamentals of power generation. Explain methods of carbon capture from power generation and industrial processes.
21EE741		CO4751.3	Explain Adsorption capture systems & Member separation systems.
		CO4751.4	Explain different carbon storage methods: storage in coal seams, depleted gas reservoirs and saline formations.
		CO4751.5	Explain Carbon dioxide compression and pipeline transport.
	ELECTRIC VEHICLES	CO4752.1	Explain the roadway fundamentals, laws of motion, vehicle mechanics and propulsion system design.
		CO4752.2	Explain the working of electric vehicles and hybrid electric vehicles in recent trends.
21EE742		CO4752.3	Model batteries, Fuel cells, PEMFC and super capacitors.
		CO4752.4	Analyze DC and AC drive topologies used for electric vehicle application.
		CO4752.5	Develop the electric propulsion unit and its control for application of electric vehicles.
21EE743	DISASTERS MANAGEMENT	CO4753.1	Discuss disaster management plan, cyclones and their hazard potential.
		CO4753.2	Understand the role of IMD and cyclone prediction and cyclone warning system in India.
		CO4753.3	Understand the role of different institutions defence and other services in natural disaster management.
		CO4753.4	Understand the role of Central Water Commission



			in river water sharing, Draught, its assessment and draught management plan
		CO4753.5	Understand occurrence of earth quake, Tsunamis and thunderstorms.
21EE744	ELECTRICAL POWER QUALITY	CO4754.1	Define Power quality; evaluate power quality procedures and standards.
		CO4754.2	Estimate voltage sag performance; explain principles of protection and Sources of transient over voltages.
		CO4754.3	Identify various sources of harmonics, explain effects of harmonic distortion.
		CO4754.4	Evaluate harmonic distortion, control harmonic distortion.
		CO4754.5	Estimate power quality in distribution planning. Identify power quality issues in utility system.
	ENERGY CONSERVATION AND AUDIT	CO4755.1	Analyze about energy scenario nationwide and worldwide , also outline Energy Conservation Act and its features.
		CO4755.2	Discuss load management techniques and energy efficiency.
21EE745		CO4755.3	Understand the need of energy audit and energy audit methodology.
		CO4755.4	Understand various pillars of electricity market design.
		CO4755.5	Conduct energy audit of electrical systems and buildings. Show an understanding of demand side management and energy conservation.
21EEP75	PROJECT WORK	CO476.1	Demonstrate the ability to apply theoretical knowledge gained in the course to real-world situations.
		CO476.2	Identify and define a problem statement to develop effective strategies to solve the identified problem or address the challenge.
		CO476.3	Evaluate various options and justify the chosen approach or solution. Showcase creativity and innovation in problem-solving or project design.
		CO476.4	Communicate project findings and results clearly and effectively, both in written and oral formats. Create well-organized and coherent project documentation.
		CO476.5	Collaborate effectively with team members & and demonstrate an understanding of ethical standards in the field to reflect on the learning experience gained through the project work.
21EE81	TECHNICAL SEMINAR	CO481.1	Conduct in-depth research on a chosen technical topic. Analyze and synthesize information from various sources to develop a comprehensive understanding of the subject matter.



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		CO481.2	Develop effective oral communication skills for presenting technical content. Demonstrate the ability to organize and deliver a clear, concise, and engaging technical seminar.
		CO481.3	Create visually appealing and informative presentation materials (slides, charts, graphs) to enhance the understanding of the topic.
		CO481.4	Demonstrate the ability to answer questions confidently through interactive elements, discussions, or Q&A sessions to maintain interest and ensure active participation.
		CO481.5	Utilize technology effectively for presentation purposes, including audio-visual aids, multimedia elements, and any relevant software or tools. Prepare comprehensive documentation summarizing the research conducted, including references, methodologies, and findings.
21INT82		CO482.1	Demonstrate improved research skills, including the ability to conduct literature reviews, gather relevant data, and analyze information in a specific field.
		CO482.2	Gain proficiency in using industry-specific tools, equipment, or software relevant to the internship. Develop problem-solving skills by addressing challenges encountered during the internship.
	RESEARCH INTERNSHIP/	challenges encountered durCO482.3Demonstrate the ability to within a team or resear positively to team projects a	Demonstrate the ability to work collaboratively within a team or research group. Contribute positively to team projects and discussions.
	INDUSTRY INTERNSHIP	CO482.4	Gain exposure to the industry or research environment, including an understanding of organizational structures, workflows, and professional etiquette. Develop adaptability and flexibility in handling diverse tasks and adjusting to changing work requirements.
		CO482.5	Reflect on personal and professional growth throughout the internship.Create comprehensive documentation of the research or industry tasks undertaken, including methodologies, findings, and recommendations. Engage in discussions and answer questions related to the internship work.

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