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CO STATEMENT FOR THE SCHEME 2021 (BATCH 2021-2024)

SL.NO	SUB NAME	COs	CO Statement
		III SEM	
1	Transform Calculus, Fourier Series And Numerical Techniques	21MAT31.1	To solve ordinary differential equations using Laplace transform.
		21MAT31.2	Demonstrate the Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory.
		21MAT31.3	To use Fourier transforms to analyze problems involving continuous-time signals and to apply Z-Transform techniques to solve difference equations
		21MAT31.4	To solve mathematical models represented by initial or boundary value problems involving partial differential equations
		21MAT31.5	Determine the extremals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.
2	Analog Electronic Circuits and Op - Amps	21EE32.1	Obtain the output characteristics of clipper and clamper circuits.
		21EE32.2	Design and compare biasing circuits for transistor amplifiers & explain the transistor switching.
		21EE32.3	Explain the concept of feedback, its types and design of feedback circuits
		21EE32.4	Design and analyse the power amplifier circuits and oscillators for different frequencies.
		21EE32.5	Design and analysis of FET and MOSFET amplifiers.
		21EE32.6	Demonstrate the application of Op-amps
3	Electric Circuit Analysis	21EE33.1	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.
		21EE33.2	Solve complex electric circuits using network theorems.
		21EE33.3	Discuss resonance in series and parallel circuits and also the importance of initial conditions and their

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			also the importance of initial conditions and their evaluation.
		21EE33.4	Synthesize typical waveforms using Laplace transformation.
		21EE33.5	Solve unbalanced three phase systems and also evaluate the performance of two port networks
4	Transformers and Generators	21EE34.1	Understand the construction and operation of 1-phase, 3-Phase transformers, and Autotransformer.
		21EE34.2	Analyze the performance of transformers by polarity test, Sumpner's Test, phase conversion, 3-phase connection, and parallel operation.
		21EE34.3	Understand the construction and working of AC and DC Generators.
		21EE34.4	Analyze the performance of the AC Generators on infinite bus and parallel operation.
		21EE34.5	Determine the regulation of AC Generator by Slip test, EMF, MMF, and ZPF Methods.
5	Electrical Machines Laboratory - 1	21EEL35.1	Evaluate the performance of transformers from the test data obtained.
		21EEL35.2	Connect and operate two single phase transformers of different KVA rating in parallel.
		21EEL35.3	Connect single phase transformers for three phase operation and phase conversion.
		21EEL35.4	Compute the voltage regulation of synchronous generator using the test data obtained in the laboratory.
		21EEL35.5	Evaluate the performance of synchronous generators from the test data and assess the performance of synchronous generator connected to infinite bus
6	Scilab for Transformers & Generators	21EEL381.1	Analyse in an intelligent manner, think better, and perform better.
7	Constitution of India and Professional Ethics	21CIP37.1	Analyse the basic structure of Indian Constitution.
		21CIP37.2	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
		21CIP37.3	know about our Union Government, political structure & codes, procedures.

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		21CIP37.4	Understand our State Executive & Elections system of India.
		21CIP37.5	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution
		IV	
9	**Complex Analysi, Probability and Statistical Methods**	**21MAT41.1**	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.
		21MAT41.2	Obtain Series Solutions of Ordinary Differential Equation.
		21MAT41.3	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.
		21MAT41.4	Apply discrete and continuous probability distributions in analysing the probability models arising in the engineering field.
		21MAT41.5	Construct joint probability distributions and demonstrate the validity of testing the hypothesis.
10	**Digital System Design**	**21EE42.1**	Develop simplified switching equation using Karnaugh Maps and QuineMcClusky techniques.
		21EE42.2	Design Multiplexer, Encoder, Decoder, Adder, Subtractors and Comparator as digital combinational control circuits.
		21EE42.3	Design flip flops, counters, shift registers as sequential control circuits.
		21EE42.4	Develop Mealy/Moore Models and state diagrams for the given clocked sequential circuits.
		21EE42.5	Explain the functioning of Read only and Read/Write Memories, Programmable ROM, EPROM and Flash memory.
		21EE42.6	Realize Boolean expressions, adders and subtractors using gates.

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		21EE42.7	Design and test Ring counter/Johnson counter, Sequence generator and 3 bit counters.
11	Microcontroller	21EE43.1	Outline the 8051 architecture, registers, internal memory organization, addressing modes.
		21EE43.2	Discuss 8051 addressing modes, instruction set of 8051, accessing data and I/O port programming.
		21EE43.3	Develop 8051C programs for time delay, I/O operations, I/O bit manipulation, logic and arithmetic operations, data conversion and timer/counter programming.
		21EE43.4	Summarize the basics of serial communication and interrupts, also develop 8051 programs for serial data
		21EE43.5	Program 8051to work with external devices for ADC, DAC, Stepper motor control, DC motor control.
12	Electric Motors	21EE43.1	Explain the construction, operation and classification of DC Motor, AC motor and special purpose motors.
		21EE43.2	Describe the performance characteristics and applications of Electric motors.
		21EE43.3	Demonstrate and explain the methods of testing of DC machines and determine losses and efficiency.
		21EE43.4	Control the speed of DC motor and induction motor.
		21EE43.5	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
13	Electrical Machines Laboratory - 2	21EEL46.1	Test DC machines to determine their characteristics and also to control the speed of DC motor.
		21EEL46.2	Pre-determine the performance characteristics of DC machines by conducting suitable tests.
		21EEL46.3	Perform load test on single phase and three phase induction motor to assess its performance.
		21EEL46.4	Conduct test on induction motor to pre-determine the performance characteristics.
		21EEL46.5	Conduct test on synchronous motor to draw the performance curves
14	Scilab for Electric	21EEL482	Analyse in a systematic way, think better, and

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	Motors		perform better.
		V SEM	
15	**Transmission and Distribution**	**21EE51.1**	Explain transmission and distribution scheme, identify the importance of different transmission systems and types of insulators.
		21EE51.1	Analyze and compute the parameters of the transmission line for different configurations.
		21EE51.1	Assess the performance of overhead lines.
		21EE51.1	Interpret corona, explain the use of underground cables.
		21EE51.1	Classify different types of distribution systems; examine its quality & reliability.
16	**Control Systems**	**21EE52.1**	Analyze and model electrical and mechanical system using analogous.
		21EE52.2	Formulate transfer functions using block diagram and signal flow graphs.
		21EE52.3	Analyze the stability of control system, ability to determine transient and steady state time response.
		21EE52.4	Illustrate the performance of a given system in time and frequency domains, stability analysis using Root locus and Bode plots.
		21EE52.5	Discuss stability analysis using Nyquist plots, Design controller and compensator for a given specification.
		21EE52.6	Utilize software package and discrete components in assessing the time and frequency domain response of a given second order system.
		21EE52.7	Design, analyze and simulate Lead, Lag and Lag – Lead compensators for given specifications.
		21EE52.8	Determine the performance characteristics of ac and DC servomotors and synchro-transmitter receiver pair used in control systems.
		21EE52.9	Simulate the DC position and feedback control system to study the effect of P, PI, PD and PID controller and Lead compensator on the step response of the system.

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		21EE52.10	Develop a script files to plot Root locus, Bode plot and Nyquist plot to study the stability of a system using software package.
17	**Power System Analysis - 1**	**21EE53.1**	Model the power system components & construct per unit impedance diagram of power system.
		21EE53.2	Analyze three phase symmetrical faults on power system.
		21EE53.3	Compute unbalanced phasors in terms of sequence components and vice versa, also develop sequence networks.
		21EE53.4	Analyze various unsymmetrical faults on power system.
		21EE53.5	Examine dynamics of synchronous machine and determine the power system stability.
18	**Power Electronics**	**21EE54.1**	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.
		21EE54.2	To explain the techniques for design and analysis of single phase diode rectifier circuits.
		21EE54.3	To explain different power transistors, their steady state and switching characteristics and limitations.
		21EE54.4	To explain different types of Thyristors, their gate characteristics and gate control requirements.
		21EE54.5	To explain the design, analysis techniques, performance parameters and characteristics of controlled rectifiers, DC- DC, DC -AC converters and Voltage controllers.
19	**Power Electronics Laboratory**	**21EEL55.1**	Obtain static characteristics of semiconductor devices to discuss their performance.
		21EEL55.2	Trigger the SCR by different methods
		21EEL55.3	Verify the performance of single phase controlled full wave rectifier and AC voltage controller with R and RL loads.

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		21EEL55.4	Control the speed of a DC motor, universal motor and stepper motors.
		21EEL55.5	Verify the performance of single phase full bridge inverter connected to resistive load.
20	**Renewable Energy Projects**	**21EEP584**	Analyse in a systematic way, think better, and perform better
		VI SEM	
21	**Management and Entrepreneurship**	**21EE61.1**	Explain the field of management, task of the manager, planning and steps in decision making.
		21EE61.2	Discuss the structure of organization, importance of staffing, leadership styles, modes of communication, techniques of coordination and importance of managerial control in business.
		21EE61.3	Explain the concepts of entrepreneurship and a businessman's social responsibilities towards different groups.
		21EE61.4	Show an understanding of role of SSI's in the development of country and state/central level institutions/ agencies supporting business enterprises.
		21EE61.5	Discuss the concepts of project management, capital budgeting, project feasibility studies, need for project report and new control techniques
22	**Power System Analysis - 2**	**21EE62.1**	Formulate network matrices and models for solving load flow problems.
		21EE62.2	Perform steady state power flow analysis of power systems using numerical iterative techniques.
		21EE62.3	Solve issues of economic load dispatch and unit commitment problems.
		21EE62.4	Analyze short circuit faults in power system networks using bus impedance matrix.
		21EE62.5	Apply Point by Point method and Runge Kutta Method to solve Swing Equation.
		21EE62.6	Develop a program in suitable package to assess the performance of medium and long transmission lines.
		21EE62.7	Develop a program in suitable package to obtain the power angle characteristics of salient and non-salient pole alternator.
		21EE62.8	Develop a program in suitable package to assess the transient stability under three phase fault at different locations in a of radial power systems.

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		21EE62.9	Develop programs in suitable package to formulate bus admittance and bus impedance matrices of interconnected power systems.
		21EE62.10	Use suitable package to solve power flow problem for simple power systems.
		21EE62.11	Use suitable package to study unsymmetrical faults at different locations in radial power systems
		21EE62.11	Use of suitable package to study optimal generation scheduling problems for thermal power plants.
23	**Signals and Digital Signal Processing**	**21EE63.1**	Discuss classification and basic operations that can be performed on both continuous and discrete time signals
		21EE63.2	Evaluate Discrete Fourier Transform of a sequence and the convolution of two sequences to determine the output sequence.
		21EE63.3	Evaluate Discrete Fourier Transform of a sequence by using fast methods.
		21EE63.4	Design Butterworth and Chebyshev IIR digital filters and FIR filters using different techniques.
		21EE63.5	Develop different structures for IIR and FIR filters
	Electrical Machine Design	**21EE643.1**	Identify and list, limitations, modern trends in design, manufacturing of electrical machines and properties of materials used in the electrical machines.
		21EE643.2	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.
		21EE643.3	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.
		21EE643.4	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.
		21EE643.5	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.
	Digital Signal Processing Laboratory	**21EEL66.1**	Conduct sampling of signals in time and frequency domains
		21EEL66.2	Evaluate the impulse response of a system.

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		21EEL66.3	Obtain convolution of given sequences to evaluate the response of a system
		21EEL66.4	Compute DFT and IDFT of a given sequence using the basic definition and/or fast methods.
		21EEL66.5	Provide a solution for a given difference equation.
		21EEL66.6	Design and implement IIR and FIR filters.
		VII	
24	**High Voltage and Power System Protection**	**21EE71.1**	Apply the knowledge of dielectric property for insulation, it's performances as per Standards and High voltage application in power system Equipment's.
		21EE71.2	Analyze the circuits of high voltages, high currents in Generation and Measurements
		21EE71.3	Apply relays to the power system protection.
		21EE71.4	Discuss the construction, operating principles and performances of circuit breaker
		21EE71.5	Discuss protection of generators, motors, Transformer and Bus Zone Protection.
		21EE71.6	Describe the causes of over voltages and their remedial measures.
		21EE71.7	Analyze the spark over characteristics using High voltages for checking the breakdown phenomenon and dielectric strength of dielectric materials
		21EE71.8	Experimentally verify the characteristics of over current, over voltage, under voltage using electromagnetic, static, distance and impedance relays.
		21EE71.9	Demonstration of protective schemes for motor and feeders.
25	**Power System Operation and Control**	**21EE72.1**	Describe various levels of controls in power systems, architecture and configuration of SCADA.
		21EE72.2	Develop and analyze mathematical models of Automatic Load Frequency Control.
		21EE72.3	Develop mathematical model of Automatic Generation Control in Interconnected Power system.
		21EE72.4	Discuss the Control of Voltage, Reactive Power and Voltage collapse
		21EE72.5	Explain security, contingency analysis, and state estimation of power systems.
26	**Power System Planning**	**21EE721.1**	Discuss primary components of power system planning, planning methodology for optimum power system expansion and load forecasting.
		21EE721.2	Understand economic appraisal to allocate the resources efficiently and appreciate the investment decisions

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		21EE721.2	Understand economic appraisal to allocate the resources efficiently and appreciate the investment decisions
		21EE721.3	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.
		21EE721.4	Discuss principles of distribution planning, supply rules, network development and the system studies
		21EE721.5	Discuss reliability criteria for generation, transmission, distribution and reliability evaluation and analysis, grid reliability, voltage disturbances and their remedies
		21EE721.6	Discuss planning and implementation of electric –utility activities, market principles and the norms framed
27	Micro- and Nano-Scale Sensors and Transducers	21EE732.1	Understand the differences between the sensor and transducer technology based on nanotechnology and nanofabrication and the classical sensor technologies
		21EE732.2	Make an informed selection of a sensor or transducer for a particular application
		21EE732.3	Become knowledgeable about the technologies that are available commercially at the present time.
28	Disasters Management	21EE743.1	Discuss disaster management plan, cyclones and their hazard potential
		21EE743.2	Understand the role of IMD and cyclone prediction and cyclone warning system in India
		21EE743.3	Understand the role of different institutions defence and other services in natural disaster management
		21EE743.4	Understand the role of Central Water Commission in river water sharing, Draught, its assessment and draught management plan
		21EE743.5	Understand occurrence of earth quake, Tsunamis and thunderstorms
		VIII	
29	Technical Seminar	21EE81.1	Identify, understand and discuss current, real-time issues.
		21EE81.2	Improve oral and written communication skills.
		21EE81.3	Explore an appreciation of the self in relation to its larger diverse social and academic contexts.
		21EE81.4	Apply principles of ethics and respect in interaction with others
		21EE81.5	Identify, understand and discuss current, real-time issues.
30	Research Internship/	21INT82.1	Gain practical experience within industry in which the internship is done.

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	Industry Internship	**21INT82 .2**	Acquire knowledge of the industry in which the internship is done.
		21INT82 .3	Apply knowledge and skills learned to classroom work
		21INT82 .4	Develop a greater understanding about career options while more clearly defining personal career goals.
			Gain practical experience within industry in which the internship is done.

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