Subject code	NAME OF THE SUBJECT	CO	CO STATEMENT
C201	ELECTROMAGNETIC THEORY	C201.1	Demonstrate the different configurations in electrostatics and magnetostatics.
		C201.2	Summarise the concepts of waveguides in transmission line, lossy capacitor.
		C201.3	Understand the basic principles of electrical engineering like Gauss Law, Ampere's law, KCL etc .
		C201.4	Apply the Maxwell equations in different forms to understand the different concepts of electromagnetic fields.
		C201.5	Apply the knowledge of Vector calculus to solve different engineering problems.
C202	NETWORK THEORY	C202.1	Summarize the significance of Poles & Zeros and restriction on location of poles & zeros
		C202.2	Apply different network theorems to obtain response of electric networks and magnetically coupled circuits and represent networks using two port network parameters (Z, Y, h & t)
		C202.3	Solve network synthesis for one port network using Foster &Cauer Method.
		C202.4	Analyze non sinusoidal periodic/aperiodic signals using Fourier series & Fourier transform.
		C202.5	Evaluate transient and steady state response of electrical network by using Laplace transform approach.
		C202.6	Estimate the parameters of Constant K- type and m-derived passive filters.
C203	ELECTRICAL AND ELECTRONICS MEASUREMENT	C203.1	Measure various electrical parameters with accuracy and precision and will also be able to identify the error in measurement.
		C203.2	Understand the working and construction of existing measurement instruments and use this knowledge to develop more sophisticated measurement devices.
		C203.3	Perform calibration and testing of new measurement instruments.
		C203.4	Use DC and AC bridges to measure relevant electrical parameters.
		C203.5	Use digital meters, CROs and Signal generators appropriately.
		C203.6	Understand the use of CTs and PTs for high current and high voltage measurement.

C204	ANALOG ELECTRONCIS CIRCUIT	C204.1	Explain the principle of operation of electronic devices like BJT, FET, MOSFET, OPAMP.
		C204.2	Identify the appropriate biasing methodology for BJT, FET to check for their stability.
		C204.3	Analyse BJT/FET amplifier circuit using small signal equivalent model to find gain, input and output impedance.
		C204.4	Analyze the frequency response of common amplifier circuit.
		C204.5	Classify different types of feedback amplifiers and oscillators.
		C204.6	Discuss different applications of OPAMP.
C205	ELECTRICAL MACHINE-I	C205.1	Explain the construction, basic principle of operation and application single phase and three phase transformer.
		C205.2	Classify the single phase and three phase Induction Machines.
		C205.3	Analyze the operating Characteristic of single phase and three phase Induction Motors.
		C205.4	Identify the different starting and speed control methods suitable for three Induction motor.
		C205.5	To determine various performance indexes of single phase transformer and three phase induction motor through different testing method.
C206	ENGINEERING ECONIMICS AND COSTING	C206.1	Define the basic concept of micro and macro economics, engineering economics and their application in engineering economy.
		C206.2	Evaluate numerically the effects of changes in demand and supply on price determination of products and services.
		C206.3	Analyze the macroeconomic environment and financial systems of the country and its impact on business, society and enterprise.
		C206.4	Develop the ability to account for time value of money using engineering economy factors and formulas.
		C206.5	Apply knowledge of mathematics, economics and engineering principles to solve engineering problems and to analyze decision alternatives in engineering projects considering upon depreciation, taxes and inflation.

C207	ANALOG ELECTRONCIS CIRCUIT LABORATORY	C207.1	Design, assemble and testing of BJT common-emitter and BJT emitter follower, JFET biasing circuits.
		C207.2	Apply the concept of frequency response of a common-emitter amplifier under low frequency, high frequency and mid frequency values and compare the result with square wave testing of an amplifier.
		C207.3	Study the differential amplifier circuits under D.C bias and A.C operation without and with current source.
		C207.4	Study the OP-Amp frequency response and compensation and its application as differentiator, integrator, square wave generator and Design the R.C phase shift oscillator/Wien-Bridge Oscillator using OP-Amp/Crystal Oscillator.
		C207.5	Study the Class A and Class B power amplifier, Darlington connection and current mirror circuits.
C208	NETWORK DEVICE LABORATORY	C208.1	Verification of Network Theorems and study of DC and AC Transients.
		C208.2	Determination of circuit parameters: open circuit and short circuit parameters, hybrid and transmission parameters
		C208.3	Determination of self inductance, mutual inductance and coupling coefficient of a single phase two winding transformer representing a coupled circuit
		C208.4	Study of resonance in R-L-C series and parallel circuit.
C209	ELECTRICAL MACHINE-I LABORATORY	C219.1	Determine the Efficiency and Voltage Regulation by Open Circuit and Short Circuit test on single phase transformer.
		C219.2	Determine the Parameter, Efficiency, Plotting of Torque-Slip Characteristics of Three Phase Induction motor.
		C219.3	Predict the Performance of grid connected induction generator.
		C219.4	Explain the starting principle of different types of 1-ph IM.

C210	ELECTRICAL AND ELECTRONICS MEASUREMENT LABORATORY	C210.1	Acquire knowledge about measurement of different types of resistances by different methods.
		C210.2	Able to measure self-inductance by using Anderson Bridge, capacitance by using Schering Bridge and value of R, L and C using Q-meter.
		C210.3	Determine the iron loss from B-H curve by using CRO.
		C210.4	Determine the testing of all single-phase type energy meters, measurement of power by using CTs and PTs and measurement of power and power factor in a three phase A.C. circuit by two wattmeter method.
		C210.5	Acquire knowledge about spectrum analyzers.
		C210.6	Able to calibrate voltmeters and ammeters using potentiometers.
C212	APPLIED MATHS	C212.1	Demonstrate various physical models through discreet and continuous distributions.
		C212.2	Apply the knowledge of complex analysis and numerical methods for analyzing engineering problems.
		C212.3	Simplify numerically the functional value at any point using different interpolating formulae for given tabulated values.
		C212.4	Estimate solution of ordinary differential equation and numerical integration using different methods and rules.
		C212.5	Develop interpretation of the results of bivariate data using Correlation Analysis, Regression Analysis, Estimation of Parameter and Statistical Hypothesis.
C213	ELECTRICAL MACHINE-II	C213.1	Explain the construction and basic principle of operation of D.C Generator, D.C motor, Synchronous Generator, Synchronous motor, universal motor.
		C213.2	Analyze the different operating Characteristic of D.C Generator, D.C motor, Synchronous Generator, Synchronous motor, three phase transformer, single phase Induction motor.
		C213.3	Identify the different starting and speed control methods suitable for Synchronous motor and D.C D.C motor.

		C213.4	To understand the necessity and procedure of parallel operation of D.C Generator, Synchronous Generator.
		C213.5	To determine various performance index and application of Synchronous Generator, Synchronous motor, D.C Generator, D.C motor.
C214	CONTROL SYSTEM ENGINEERING -I	C214.1	Classify different types of Control Systems.
		C214.2	Compare different configuration of analog PID controllers.
		C214.3	Develop Transfer Function model of physical systems (Electrical, Mechanical, Electro-mechanical, Thermal, Fluid Systems etc).
		C214.4	Analyse LTI system's performance (static& dynamic) using time domain and frequency domain specifications.
		C214.5	Determine the stability of LTI systems using various time and frequency domain techniques.
C215	DIGITAL ELECTRONICS CIRCUIT	C215.1	Relate different number systems such as Decimal, Binary, Octal, Hexadecimal etc.
		C215.2	Use K-Map to simplify given Boolean expression to minimum number of literals.
		C215.3	Explain the operation of different combinational logic components such as Multiplexer, Demultiplexer, Encoder, Decoder etc.
		C215.4	Analyze sequential circuits with different types of Flip- Flops such as SR Flip- Flop, JK Flip-Flop, D Flip- Flop and T Flip- Flop.
		C215.5	Classify different types of memories.
C216	ELECTRICAL POWER TRANSMISSION & DISTRIBUTION	C216.1	Explain p.u. system in the power system ,fundamental of electrical power transmission & distribution system .
		C216.2	Model short, long and medium transmission line considering different parameters.
		C216.3	Distinguish various towers, overhead line insulators, Overhead line conductors and underground cables.
		C216.4	Compare various distribution systems.
		C216.5	Judge the suitability of installing overhead and underground power transmission strategies considering electrical, mechanical, environmental, performance, safety and economic constraints.
		C216.6	Determine permissible sag and tension for any transmission line.

C217	ORGANISATIONAL BEHAVIOR	C217.1	Remember the concept of Organizational Behaviour to understand the behaviour of people in the organization.
		C217.2	Understand the complexities of behaviour in the organization.
		C217.3	Analyze the complications in managing individuals and groups in the organization.
		C217.4	Interpret how the organizational behaviour can integrate in better functioning of the organization.
C219	ELECTRICAL POWER TRANSMISSION AND DISTRIBUTION LABORATORY	C220.1	Determine ABCD parameters and predict the string efficiency of a transmission line.
		C220.2	Determine the earth resistances.
		C220.3	Computation of series and shunt capacitance of a transmission line.
		C220.4	Understand the importance of ferranti effect, corona effect and lightening arrestors.
		C220.5	Determine the Capacitance Kvar for power factor improvement.
C221	CONTROL SYSTEM LABORATORY	C221.1	Study of a dc motor driven position control system.
		C221.2	Observe the time response of a second order process with P, PI and PID control and apply PID control to servomotor.
		C221.3	Measurement of unknown resistance, inductance and capacitance using bridges.
		C221.4	Validation of a controller for a temperature controller.
		C221.5	Study the position control system using Synchroscope.
		C221.6	Understand the concept of energy meter.
C222	ELECTRICAL MACHINE-II LABORATORY	C222.1	Determination of the voltage regulation of an alternator by zero power factor (zpf) method .
		C222.2	Determination of the V and inverted V curves of a synchronous motor.
		C222.3	Determination of parameters of synchronous machine (a) Positive sequence reactance (b) Negative sequence reactance (c) Zero sequence reactance
		C222.4	Study of parallel operation of two alternators.
		C222.5	Measurement of direct and quadrature axis reactance of a salient pole synchronous machine.

C223	DIGITAL ELECTRONICS CIRCUIT LABORATORY	C223.1	Design, implement and testing of different digital logic gates, Inverter and buffer gates and the use of universal NAND Gate.
		C223.2	Design, assemble and testing of combinational circuits like adders, subtractors, code converters, gray code to binary and 7 segment display, multiplexers and de-multiplexers; SR, D and J-K flipflops, shift registers with parallel load and various counters.
		C223.3	Simulation and implementation of various combinational and sequential circuits using Verilog/VHDL.
		C223.4	Investigate the behaviour of RAM unit and its storage capacity (16 X 4 RAM) and memory expansion concepts.
		C223.5	Design of a circuit that multiplies 4-bit unsigned numbers to produce a 8-bit product.
		C223.6	Design, implement and testing of parallel adder and accumulator.
C301	POWER ELECTRONICS	C301.1	Illustrate the constructional features and characteristics of the different semiconductor devices .
		C301.2	Explain the operation of driving circuits of different semiconductor devices.
		C301.3	Explain the operation of different types of converter.
		C301.4	Make use of converters for different applications such as UPS, SMPS, Battery Chargers, Electronic Ballast, Static VAR Compensator.
		C301.5	Analyze the protection schemes of SCR and Power Transistor.
C302	MICROPROCESSOR & MICROCONTROLLER	C302.1	List the basic elements and functions of Microprocessors and Microcontrollers.
		C302.2	Explain the architecture and addressing modes of Microprocessors and microcontrollers.
		C302.3	Illustrate simple programming using assembly language of 8085, 86 Microprocessor and 8051 Microcontroller.
		C302.4	Classify different data transfer schemes to communicate between Microprocessor / Microcontroller and various peripherals

		C302.5	Interface 8085 Microprocessor and 8051 Microcontroller with I/O, Memory and different peripheral devices like 8255 PPI, 8259 PIC, 8279 Key board controller, Stepper Motor etc.
C303	DIGITAL SIGNAL PROCESSING	C303.1	Classify the signals and systems.
		C303.2	Apply the principles and properties of Fourier transform and Z transform in the discrete-time signal.
		C303.3	Importance the advantages of FFT over DFT.
		C303.4	Explain adaptive algorithms and their application in designing different adaptive systems such as filters, channel equalization, line enhancer, etc.
		C303.5	Design digital FIR and IIR filter by applying different transformation method.
C304	RENEWABLE ENERGY SYSTEM	C304.1	Illustrate the constructional features and characteristics of the different semiconductor devices .
		C304.2	Explain the operation of driving circuits of different semiconductor devices.
		C304.3	Explain the operation of different types of converter.
		C304.4	Make use of converters for different applications such as UPS, SMPS, Battery Chargers, Electronic Ballast, Static VAR Compensator.
		C304.5	Analyze the protection schemes of SCR and Power Transistor.
C305	OPTIMISATION ENGINEERING	C305.1	Understand the vocabulary associated with optimization methods and applications and the relevant mathematical problem by using graphical method and simplex method.
		C305.2	Formulate a mathematical model (LPP) for practical problems under managerial decision and optimization of models with a spreadsheet optimizer.
		C305.3	Analyze the profit margin of a investor on point of interest in investment as well as consumer to use the product by duality techniques.
		C305.4	Know the differences between the various types of optimization tools, techniques, and algorithms and assess the effectiveness of optimization techniques used in engineering applications.

		C305.5	Emphasize managerial decision on to assign task to capable resources through Assignment problem.
		C305.6	Get a brief idea how to schedule different job through different machine and complete a life cycle assessment.
C306	ADVANCE LABORATORY	C306.1	Understand the operation of bridge rectifier circuit.
		C306.2	Make use of knowledge in practical applications.
		C306.3	Use mathematical tools that are essential for system analysis and design
		C306.4	Analyze the performance of R-L-C Circuit.
C307	POWER ELECTRONICS LABORATORY	C308.1	Understand the V-I characteristics of different switching devices.
		C308.2	Explain the functionalities of 1-ph Full wave and Half wave controlled and uncontrolled rectifiers for different loading condition.
		C308.3	Generate signals from synchronized UJT triggering circuit.
		C308.4	Generate signals from cosine controlled triggering circuit.
C309	MICROPROCESSOR & MICROCONTROLLER LABORATORY	C309.1	Get the idea about programming of addition, subtraction, multiplication & division using 8085 instructions.
		C309.2	Understand to write an ALP to find out largest or smallest number using 8085 instructions.
		C309.3	Get the idea about programming of converting binary to gray code and hexadecimal to decimal no using 8085 instructions.
		C309.4	Interfacing motor and DAC with the 8085 microprocessor using 8085 instructions.
		C309.5	Get the idea about programming of addition, subtraction, multiplication & division using 8086 instructions, programming of transferring block of data from one location to another in sequential and reverse order using 8086 instructions.
		C309.6	Get the idea about programming of searching the existing no among set of data using 8086 instructions, finding out positive, negative and zeros in a set of data and addition of a series of decimal numbers, even/Odd no among set of data using 8086 instructions.

C310	DIGITAL SIGNAL PROCESSING LABORATORY	C310.1	Familiarization with the architecture of a standard DSP kit (Preferably TMS 320C6XXX DSP kit of Texas Instruments)
		C310.2	Generation of various types of waveforms (sine, cosine, square, triangular etc.) using MATLAB and DSP kit.
		C310.3	Computation of autocorrelation, cross correlation, convolution (linear convolution and circular convolution) and power spectral density of sequences using MATLAB and DSP kit.
		C310.4	Implementation of FFT algorithm by decimation in time, decimation in frequency, FFT of a given 1-D signal and computation of convolution of a periodic sequence using DFT and IDFT using MATLAB and DSP kit.
		C310.5	Design and implementation of FIR and IIR filters in MATLAB and DSP kit and implementation of noise cancellation using adaptive filters using DSP kit.
C311	ELECTRICAL DRIVES	C311.1	Explain the operation of fundamental drive system.
		C311.2	Select the speed control method for a given drive to meet the industrial application.
		C311.3	Analyze the operation of traction Drive.
		C311.4	Choose required Drive for different industrial applications.
C312	POWER SYSTEM OPERATION & CONTROL	C312.1	Define p.u. system and represent the power system components in single line diagram.
		C312.2	Explain how to find the bus admittance matrix and the network incidence matrix.
		C312.3	Choose the best method for load flow analysis for power system operation.
		C312.4	Develop mathematical models for dynamic and stability analysis of power systems.
		C312.5	Solve the unit commitment problems and understand the economic operation of power system.
		C312.6	Analyze operation of single area and two area load frequency control
C313	HIGH VOLTAGE DC TRANSMISSION	C313.1	Explain the function and working of different parts of HVDC system.

		C313.2	Outline the control mechanism of HVDC converters and harmonic suppression of HVDC system.
		C313.3	Outline the MTDC system.
		C313.4	Classify the different faults and protection methods adopted for the same.
		C313.5	Choose the type of transmission system for a particular requirement.
C314	CONTROL SYSTEM ENGINEERING-II	C314.1	Compare linear continuous time, linear discrete time and non linear systems.
		C314.2	Relate Laplace transform and Z transform to find pulse transfer function of discrete time control system.
		C314.3	Apply different techniques to find out the stability of Linear discrete time (juries stability criteria, Bilinear Transformation) and nonlinear (Lyapunov stability criteria, phase plane trajectory etc.) system.
		C314.4	Develop various state space models for linear continuous time and discrete time control systems.
		C314.5	Solve state equations by finding State Transition Matrix using different techniques like Cayley Hamilton's theorem, Sylvesters expansion theorem etc.
		C314.6	Test for the controllability and observability of a system to place the poles at desired locations on s-plane by state feedback.
C315	ENVIRONMENTAL SCIENCE & ENGINEERING	C315.1	Apply concepts of ecology like biotic components, eco systems, food chain, environmental gradient, environmental law, noise pollution in industrial safety and application.
		C315.2	Interpret chemistry in environmental engineering, atmospheric chemistry, soil chemistry.
		C315.3	Apply knowledge of waste water treatment, air pollution, hazards waste management.
		C315.4	Apply knowledge of waste minimization technique to minimize and manage hazardous wastes generated in industry such as safety handling and storage of hazardous materials, corrosive substances.
		C315.5	Create a healthy and safety environment inside industry by applying knowledge of different

			types of occupational safety and health Acts, Rules & Regulations.
		C315.6	Make environment impact assessment for a project and implement strategies for minimization of environment impact.
C321	POWER SYSTEM OPERATION & CONTROL LABORATORY	C321.1	Apply knowledge of load flows for planning and future expansion of existing as well as new power systems.
		C321.2	Determine the fault current of an alternator for different types of short circuit faults.
		C321.3	Analyze the characteristics of various relays.
		C321.4	Determine the parameters of equivalent circuit and fault current under fault condition of an alternator
		C321.5	Model the transmission line by using matlab.
C402	SWITCH GEAR & PROTECTION DEVICE	C402.1	Outline main components and attributes of power system protection scheme.
		C402.2	Summarize the working principle, construction and characteristics of different types of circuit breakers and instrumentation transformers.
		C402.3	Apply different numerical protection scheme for the protection of transformer and transmission lines.
		C402.4	Construct different types electromechanical relay using generalized torque equation
		C402.5	Analyze different types of faults with and without considering fault impedance using symmetrical fault analysis.
		C402.6	Select the appropriate relaying scheme to be applied for the protection of generators, transmission lines, busbars, transformers and motors.
C403	COMMUNICATION ENGINEERING	C403.1	Study of different signals and its properties.
		C403.2	Understand the continuous modulation techniques, compare the performance of different communication systems, like AM, DSB-SC, SSB and VSB Systems.
		C403.3	Familiar with the sampling theorem, pulse modulation and TDM, generation of FM and PM and effect of noise in AM, FM and PM.
		C403.4	Understand ESD & PSD function.
		C403.5	Know about Random Variable and Random signals and design typical telecommunication systems that consist of basic and essential building blocks.

		C403.6	Able to excel as a design engineer in any industry/R&D sector, pursue research on the design field or face any competitive examinations in engineering.
C404	SOFT COMPUTING	C404.1	Define basic concept of soft computing.
		C404.2	Understand fuzzy technology.
		C404.3	Determination of error in using Neural network.
		C404.4	Distinguish between GA and traditional Optimization methods.
		C404.5	Design a training algorithm using Radbas Function.
		C404.6	Define defuzzification.
C405	MINOR PROJECT	C405.1	Understand advance Matlab, LabVIEW , Proteus software, Keil compiler and their applications in different fields.
		C405.2	Acquire knowledge about AVR studio and Sinapro software.
		C405.3	Able to know about burning a microcontroller using burner kit.
		C405.4	Able to comprehend projects and put forth effective reports and design proper documentation.
		C405.5	Do the literature survey and prepare the survey report to develop major projects.
		C405.6	Understand advance Matlab, LabVIEW , Proteus software, Keil compiler and their applications in different fields.