

P. 14 Records of course outcomes (COs) of all courses.

The list of courses given in the Table 1 where Course numbers (C101 to C421) representing the courses from the first to final Semester. The first numeric digit indicates the year of study and the remaining digit indicates the course number.

Table 1: List of Courses

Sl No	Course Code	University Code	Course Name (as per BPUT 2018-19 Syllabus)
1	C101	RMA1A001	Mathematics-1
2	C102	RPH1A001	Physics
3	C103	RBE1B001	Basic Electrical Engineering
4	C104	RBM1B001	Basic Mechanical Engineering
5	C105	RCE1E001	Communicative English
6	C106	RIT1F301	Induction Training
7	C107	RPH1A201	Physics Lab
8	C108	RBE1B201	Basic Electrical Engineering Lab
9	C109	RBM1B201	Basic Mechanical Engineering Lab
10	C110	REG1B201	Engineering Graphics & Design Lab
11	C111	RCE1E201	English Language Lab
12	C112	RMA2A001	Mathematics-II
13	C113	REM2B001	Engineering Mechanics
14	C114	RCH2A002	Chemistry
15	C115	RBL2B002	Basic Electronics Engineering
16	C116	RBC2B002	Basic Civil Engineering
17	C117	RPL2B001	Programming for Problem Solving using C
18	C118	RNC2F301	NCC / NSS/Yoga
19	C119	RCH2A202	Chemistry Lab
20	C120	RBL2B202	Basic Electronics Engineering Lab
21	C121	RBC2B202	Basic Civil Engineering Lab
22	C122	RWO2B202	Workshop
23	C123	RPL2B201	Programming for Problem Solving using C Lab
24	C201	RMA3A001	Mathematics - III
25	C202	ROP3B001	Object Oriented Programming Using JAVA
26	C203	REN3E001	Engineering Economics
27	C204	REC3C001	Analog Electronic Circuits
28	C205	REE3C002	Network Theory
29	C206	RES3F001	Environment Science
30	C207	REC3C201	Analog Electronic Circuits Lab
31	C208	REE3C202	Network Theory Lab
32	C209	ROP3B201	OOP Using JAVA Lab
33	C210	RIP3H201	Evaluation of Internship - I
34	C211	REL4C001	Digital Electronics
35	C212	REL4C002	Electrical Machines-I
36	C213	ROB4E002	Organizational Behavior
37	C214	REL4C003	Power Electronics
38	C215	REL4D001	Electromagnetic Theory

39	C216	REL4D002	Signal and Systems
40	C217	REL4D003	Electrical and Electronics Measurement
41	C218	REL4G001	Digital Signal Processing
42	C219	REL4G002	Optoelectronics Device and Instrumentation
43	C220	REL4G003	Embedded System
44	C221	RCN4F001	Constitution of India
45	C222	REL4C201	Digital Electronics Laboratory
46	C223	REL4C202	Electrical Machines-I Laboratory
47	C224	REL4C203	Power Electronics Laboratory
48	C301	REL5C001	Electrical Power Transmission and Distribution
49	C302	REL5C002	Control system
50	C303	REL5C003	Electrical Machine-II
51	C304	REL5D001	Electrical Machine Design
52	C305	REL5D002	Electrical Energy Conservation and Auditing
53	C306	REL5D003	Industrial Process Control and Dynamics
54	C307	REL5D004	Electric Drives
55	C308	REL5D005	Renewable Power Generation System
56	C309	REE5D006	Sensors and Transducers
57	C310	RUH5F001	Universal Human Values
58	C311	REL5C201	Electrical Power Transmission & Distribution Lab
59	C312	REL5C202	Control and Instrumentation Lab
60	C313	REL5C203	Electrical Machine Lab-II
61	C314	RIP5H201	Evaluation of Summer Internship
62	C315	REL6C001	Power System Operation and Control
63	C316	REC5C003	Microprocessors and Microcontrollers
64	C317	ROE6A001	Optimization in Engineering
65	C318	REL6D001	Electric Power System Protection
66	C319	REL6D002	Electric and Hybrid Vehicles
67	C320	REI5D002	Biomedical Instrumentation
68	C321	RCS5D002	Artificial Intelligence and Machine Learning
69	C322	REE6C001	Communication Engineering
70	C323	RCS4D001	Computer Organization and Architecture
71	C324	RIK6F001	Essence of Indian Knowledge Tradition-I
72	C325	REL6C201	Power System and Operation and Control Lab
73	C326	REL6C202	Microprocessor and Microcontroller Lab
74	C327	RFC6H201	Future Ready Contributor Program
75	C328	RSM6H202	Seminar-I
76	C401	RED7E001	Entrepreneurship Development
77	C402	REL7D001	Advanced Control Systems
78	C403	REL7D002	High voltage Systems and DC Transmission
79	C404	REC7D006	Advanced Digital Signal Processing
80	C405	REL7D003	Smart Grid
81	C406	REL7D004	Flexible AC Transmission Systems
82	C407	REL7D005	Power Station Engineering
83	C408	RIT7D001	Internet Of Things
84	C409	REC5D006	Digital VLSI Design
85	C410	REI7D003	Mechatronics
86	C411	REV5D004	Disaster Management

87	C412	RIP7E002	Intellectual Property Right
88	C413	RGT6A003	Green Technology
89	C414	RIT7D002	Big data Analysis
90	C415	RCS7D007	Soft Computing
91	C416	REC7D002	Embedded System
92	C417	RIK7F001	Essence of Indian Knowledge Tradition-II
93	C418	RMP7H201	Minor Project
94	C419	RSM7H202	Seminar-II
95	C420	RCV7H203	Comprehensive Viva
96	C421	RMP8H201	Major Project

Table 2 Course outcomes of the individual courses

Course Name:	C101: Mathematics-1
CO No.	Statement
C101.1	Apply the knowledge of calculus, Gamma & Beta functions for analyzing engineering problems.
C101.2	Solve first order differential equation analytically using standard method.
C101.3	Demonstrate various physical models through higher order differential equation and solve such linear ordinary differential equation.
C101.4	Obtain series solution of differential equation.
C101.5	Understand the application of Power series method, Legendre equation, Legendre polynomial and Bessel's function.
C101.6	Apply Laplace problem to determine complete solution to ordinary differential equation.

Course Name:	C102: Physics
CO No.	Statement
C102.1	Understand and analyze the concept of oscillation and wave mechanics.
C102.2	Understand the concept of interference, diffraction which are very basic in the field of wave optics.
C102.3	Describe the principle of lasing and fiber optics in communication system.
C102.4	Understand the ideas of crystal structure, crystal diffraction and classification of materials.
C102.5	Interpret the fundamentals of electromagnetism and deduce the electromagnetic wave equations.
C102.6	Express the basics of quantum mechanical phenomenon with application.

Course Name:	C103: Basic Electrical Engineering
CO No.	Statement
C103.1	Understand the basics of D.C. circuits law, Theorems and Analysis techniques to solve simple circuits.
C103.2	Understand the basics of A.C. generation system and relevant terminology to solve R, L, C, RL, RC and RLC circuits.
C103.3	Determine three phase power in balance and unbalanced three phase circuits.
C103.4	Understand the Electromagnetic theory and its basic terminologies.
C103.5	Understand the basic theory and performance of Single Phase Transformer.
C103.6	Understand the dynamic operational characteristics of various rotating electrical machines.

Course Name:	C104: Basic Mechanical Engineering
CO No.	Statement
C104.1	Understand the Laws of Thermodynamics.
C104.2	Understand the pure substance and steam properties.
C104.3	Apply the laws of thermodynamics to air compressor, steam power plant, refrigerator, heat pump and IC engine.
C104.4	Understand the fundamentals of the power transmission devices.
C104.5	Understand the basics of the robotics system.
C104.6	Understand the mechanical measurements like temperature, pressure, velocity, flow, strain, force and torque measurement.

Course Name:	C105: Communicative English
CO No.	Statement
C105.1	Understand the process, basic factors & types of communication, knowledge about fundamental concepts in English grammar and its rectification.
C105.2	Identify the concepts of pronunciation, syllable division, stress, intonation, problem sounds and its application.
C105.3	Enhance communication in a culturally diverse workforce, addressing biases and creating polished business documents for effective written communication.
C105.4	Understand the process of writing at work for business letters, notices, circulars, emails, technical reports, proposals and CVs.

C105.5	Develop comprehensive workplace communication skills, encompassing impactful presentations and interview techniques.
C105.6	Enhance ability for team management, leadership, group discussions, and public speaking.

Course Name:	C106: Induction Training
CO No.	Statement
C106.1	Understand and familiarise with the basic of computer.
C106.2	Understand the navigation of the file system.
C106.3	Remember the procedure to create and edit word documents, spread sheets, and presentations.
C106.4	Remember the way to send and receive emails, forward and reply email, and communicate over the internet.
C106.5	Understand the way to safely and correctly use websites, social networks, chat sites, and email.
C106.6	Understand the procedure to safely use the social media.

Course Name:	C107: Physics Lab
CO No.	Statement
C107.1	Determine the acceleration due to gravity by using Bar pendulum
C107.2	Determine the surface tension of water by capillary rise method,
C107.3	Understand the resonance using sonometer for unknown frequency.
C107.4	Determine the rigidity modulus of the material of a wire by using Barton's apparatus.
C107.5	Determine e/m ratio, Magnetic field measurement from Helmholtz coil.
C107.6	Determine of grating element of a diffraction grating using spectrometer.

Course Name:	C108: Basic Electrical Engineering Lab
CO No.	Statement
C108.1	Understand the procedure to measure the three phase power using two watt meter method
C108.2	Analyze D.C. circuits using Thevenin's, Nortons and Superposition Theorems.

C108.3	Observe the behaviour of magnetic circuits from B-H curve.
C108.4	Analyze the performance of series R-L-C circuits.
C108.5	Evaluate the efficiency of single phase Transformer using O.C and S.C Test.
C108.6	Understand the basics of House Wiring.

Course Name:	C109: Basic Mechanical Engineering Lab
CO No.	Statement
C109.1	Understand the working principle of steam power plant, IC engine and refrigerator and air-conditioners.
C109.2	Understand different automobile parts.
C109.3	Determine the velocity ratio of belt drives.
C109.4	Understand the fundamentals of gear and gear trains.
C109.5	Apply Bernoulli's theorem in different applications.
C109.6	Calibrate Bourdon Tube Pressure gauge and measure pressure using Manometers.

Course Name:	C110: Engineering Graphics & Design Lab
CO No.	Statement
C110.1	Study the equipment required for engineering drawing.
C110.2	Understand the concept of different angle of projection.
C110.3	Apply projection rule in points, line, planes and solids.
C110.4	Understand the concept of development theory on different solids.
C110.5	Relate engineering drawing to AUTO CAD.
C110.6	Able to draw the basic views related to projections of Lines and Planes.

Course Name:	C111: English Language Lab
CO No.	Statement
C111.1	Understand and apply the sounds of English with precision, using correct stress, tone, and rhythm in listening, speaking, reading, and writing contexts.

C111.2	Develop proficiency in communication through presentations, role-play, and one-on-one interactions, emphasizing word accent, intonation, and rhythm for improved pronunciation and increased vocabulary.
C111.3	Equip students with the ability to use language effectively in professional scenarios such as interviews, group discussions overcoming communication barriers for successful public speaking.
C111.4	Acquire practical skills in resume/CV preparation, report writing, and format creation, enhancing overall writing abilities.
C111.5	Enhance reading comprehension skills for both technical and general texts.
C111.6	Enabling students to extract, analyze, and synthesize information efficiently for academic and professional success.

Course Name:	C112: Mathematics-II
CO No.	Statement
C112.1	Apply the knowledge of matrix algebra for solving system of linear equations and compute the inverse of matrices.
C112.2	Understand the matrices to compute eigen values and eigen vectors required for matrix diagonalization process.
C112.3	Apply the concept of vector differential calculus to understand the solenoidal and irrotational vectors.
C112.4	Apply the concept of vector integral calculus and exhibit the inter dependence of line, surface and volume integrals.
C112.5	Understand the basics of Green Theorem, Surface integrals, Gauss theorem and Stokes Theorem
C112.6	Understand the use of periodic functions and Fourier series, Fourier integral, Fourier transform to analyze circuit and system communication.

Course Name:	C113: Engineering Mechanics
CO No.	Statement
C113.1	Analyze Concurrent Forces and Equilibrium in Two Dimensions.
C113.2	Evaluate Centers of Gravity and Moments of Inertia.
C113.3	Analyze Structures Using Truss Methods.
C113.4	Understand Kinematics and Dynamics of Rectilinear Motion.
C113.5	Apply Principles of Work, Energy, and Momentum.

C113.6	Analyze Curvilinear Motion and Kinetics of Rigid Bodies.
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Course Name:	C114: Chemistry
CO No.	Statement
C114.1	Understand the basics of quantum mechanical concepts and spectroscopy.
C114.2	Rationalize bulk properties and processes using thermodynamic considerations.
C114.3	Analyze the quantitative aspects of fuel combustion.
C114.4	Analyze different electronic fuel injection system, super charging and its effect on performance.
C114.5	Understand the basics of electrochemical theory of corrosion
C114.6	Preliminary understanding on introductory idea about nano materials.

Course Name:	C115: Basic Electronics Engineering
CO No.	Statement
C115.1	Understand the basic theory of semiconductor devices such as Diode, Zener Diode and operational characteristics of rectifier.
C115.2	Understand the Transistor operation and biasing characteristics with its applications.
C115.3	Understand the JFET, MOSFET and CMOS operational characteristics with its applications.
C115.4	Understand the architecture of OPAMP, its different configuration and applications.
C115.5	Understand the basic logic gates and Boolean algebra for digital electronics circuits.
C115.6	Analyze the basic combinational logic circuits and its implementation.

Course Name:	C116: Basic Civil Engineering
CO No.	Statement
C116.1	Understand the Scope of Civil Engineering the manufacturing process of bricks and cement.
C116.2	Understand the properties of plain concrete, reinforced concrete, prestressed concrete.

C116.3	Relate linear measurement, angle measurement by using chains and tapes and compass.
C116.4	Understand the working principles of modern survey instruments like EDM and Total Station.
C116.5	Understand the soil classification, the role of different soil types in construction and the ability to identify and design suitable shallow and deep foundations for various structures, along with basic principles of irrigation engineering and hydraulic structures.
C116.6	Understand the planning and design aspects of transportation engineering, covering the different modes of transport and the role of transportation systems in urban development.

Course Name:	C117: Programming for Problem Solving using C
CO No.	Statement
C117.1	Formulate simple algorithms for arithmetic and logical problems, translate the algorithms to programs (in C language), test and execute the programs and correct syntax and logical errors.
C117.2	Implement conditional branching, iteration and recursion.
C117.3	Decompose a problem into functions and synthesize a complete program using divide and conquer approach.
C117.4	Understand the use of arrays, pointers and structures to formulate algorithms and programs.
C117.5	Apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
C117.6	Apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.

Course Name:	C118: NCC/NSS/Yoga
CO No.	Statement
C118.1	Develop conceptual understanding of Traditional Yoga.
C118.2	Enhance knowledge of Yoga Sutra.
C118.3	Enhance and apply the knowledge of Asthang Yoga for the well being of people.
C118.4	Develop and apply knowledge of Gyan Yoga, Karma Yoga, and Bhakti Yoga.

C118.5	Select and demonstrate different yogic activities like Asanas, Pranayams and Shuddhi Kriyas for promotion of health.
C118.6	Develop counselling sessions on proper lifestyle for stress free life.

Course Name:	C119: Chemistry Lab
CO No.	Statement
C119.1	Determine of the alkalinity in the given water sample.
C119.2	Determine of the temporary and permanent hardness in the given water sample by complexometric titration using EDTA as standard solution.
C119.3	Determine of amount of available chlorine in bleaching powder. Standardization of potassium permanganate using sodium oxalate titration using EDTA as standard solution."
C119.4	Determine of amount of ferrous iron present in Mohr's salt. Determination of the rate constant of a chemical reaction.
C119.5	Estimate of calcium in Limestone Determination of dissolved oxygen in water sample.
C119.6	Determine the partition coefficient of a chemical between two immiscible liquids.

Course Name:	C120: Basic Electronics Engineering Lab
CO No.	Statement
C120.1	Understand the basic components of electronic devices and testing instruments.
C120.2	Analyse the V-I characteristics of semiconductor diode.
C120.3	Analyse the performance of half wave and full wave rectifier using CRO.
C120.4	Design and analyze clipper and clamper circuits using CRO
C120.5	Understand the design of inverting and non-inverting amplifiers using Op-Amp.
C120.6	Understand the truth tables and implementation of digital circuits using universal gates.

Course Name:	C121: Basic Civil Engineering Lab
CO No.	Statement

C121.1	Understand the strength of brick by knowing all the characteristics of it.
C121.2	Study and measure different type of chain, compass and use of it to know direction.
C121.3	Understand the operation different types advance survey instruments like total station.
C121.4	Examine different characteristics of Cement.
C121.5	Examine strength characteristics of concrete.
C121.6	Understand different characteristics of reinforcing steel.

Course Name:	C122: Workshop
CO No.	Statement
C122.1	Identify the various tools and tackles used in workshop.
C122.2	Understand fitting theory in engineering.
C122.3	Analyse the various methods of welding technology.
C122.4	Demonstrate the working principle of lathe machine.
C122.5	Understand joint such as a Lap joint, a T-joint or a Butt joint is to be prepared or to make furniture.
C122.6	Compare the mechanism of shaper machine, milling machine and drilling machine etc.

Course Name:	C123: Programming for Problem Solving using C Lab
CO No.	Statement
C123.1	Understand the logic, write the algorithm, and draw a flow chart for a given problem.
C123.2	Recognize different library functions and understand the syntax of C program and header files.
C123.3	Know the steps involved in compiling, linking and debugging a C program.
C123.4	Learn the methods of different control structures (branching and looping).
C123.5	Implement different data-structures like arrays, pointers, structures and files.
C123.6	Understand function declaration, definition, call and proper use of user defined functions.

Course Name:	C201: Mathematics - III
CO No.	Statement
C201.1	Apply the different type of methods to solve non-linear equation in one variable and numerical solutions of system of linear equations.
C201.2	Numerical Solution of ordinary differential equation and interpolation (determine the functional value at given data).
C201.3	Solve numerical differentiation, integration and solution of differential equations
C201.4	Understand the basic fundamental of probability in discrete and continuous events.
C201.5	Evaluating mean, variance, moments on probability of continuous events.
C201.6	Understand the correlation, regression analysis and ability to testing of hypothesis

Course Name:	C202: Object Oriented Programming Using JAVA
CO No.	Statement
C202.1	Understand different Object-oriented programming techniques.
C202.2	Understand basic object-oriented features.
C202.3	Understand the correlation between object and class.
C202.4	Determine inheritance and wrapper classes to achieve code reusability.
C202.5	Perform web applications using Applets and collection frame work.
C202.6	Design and create GUI based event driven programs using Swing and JavaFX.

Course Name:	C203: Engineering Economics
CO No.	Statement
C203.1	Understanding the concept and scope of economics and engineering economics
C203.2	Analyzing production function and law of return: Law of variable proportion, law of returns to scale, analysis of costs and revenue concepts.
C203.3	Understanding of different market structure, break-even analysis and linear approach.

C203.4	Understanding the calculation of time value of money, depreciation and evaluation of engineering projects.
C203.5	Understanding meaning of inflation, types, causes and measures to control inflation.
C203.6	Develop the ability to measure national income and functions of commercial bank, central bank.

Course Name:	C204: Analog Electronic Circuits
CO No.	Statement
C204.1	Understand the characteristics of a Field Effect Transistor.
C204.2	Design and analyze various amplifier circuits.
C204.3	Describe the effect of low and high frequency response and gain bandwidth relationship for amplifier scheme.
C204.4	Use the effect of positive and negative feedback to model oscillators.
C204.5	Examine the efficiency of different class of power amplifiers.
C204.6	Understand the functioning of OP-AMP and design OP-AMP based circuit.

Course Name:	C205: Network Theory
CO No.	Statement
C205.1	Apply basic circuit laws and simplification of network using different techniques and theorems,
C205.2	Understand the time domain analysis to evaluate transient response, steady state response of electrical network.
C205.3	Understand the fundamentals of single phase, three-phase and coupled circuit.
C205.4	Understand the frequency domain analysis and its application using Laplace transformation for electrical networks.
C205.5	Understand the resonance conditions for series and parallel electrical circuits.
C205.6	Determination of different parameters related to two-port network and its interconnections.

Course Name:	C206: Environment Science
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CO No.	Statement
C206.1	Understand about the ecosystem process and cycles.
C206.2	Remember environmental law and soil chemistry.
C206.3	Understand the water treatment, active sludge treatment, pollution and pollutant.
C206.4	Understand Solid waste, Solid Waste Management, Source classification and composition of MSW, Hazardous Waste Management, Hazardous waste and their generation.
C206.5	Apply inorganic waste treatment, Hazard Control Measures in integrated steel industry, Occupational Safety and Health Acts
C206.6	Implement Fire prevention, electrical safety, ppe, safety management.

Course Name:	C207: Analog Electronic Circuits Lab
CO No.	Statement
C207.1	Design, assemble and test BJT biasing circuits.
C207.2	Analyze the DC And AC performance of BJT And FET.
C207.3	Understand the frequency response of single & multi-stage BJT and compare the results
C207.4	Study operational amplifier and its various applications
C207.5	Analyze and design various wave shaping circuits
C207.6	Implement different oscillator circuits and analyze power amplifier characteristics.

Course Name:	C208: Network Theory Lab
CO No.	Statement
C208.1	Analysis of A.C Circuits using Thevenin's, Norton's, Superposition and Maximum Power transfer Theorems.
C208.2	Understand the Transient behaviour of D.C and A.C Circuits using storage Oscilloscope.
C208.3	Evaluate Z, Y, hybrid and ABCD circuit parameters of two port Network.
C208.4	Design of Low-pass. High-pass, Bandpass and Band-elimination Filters.
C208.5	Evaluate self, mutual Inductance and co-efficient coupling of single phase two winding transformer.

C208.6	Understand the Resonance Phenomena of R-L-C series and Parallel circuits using Oscilloscope.
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Course Name:	C209: OOP Using JAVA Lab
CO No.	Statement
C209.1	Define object-oriented features, such as abstraction, inheritance, polymorphism for writing an effective program.
C209.2	Explain different looping constructs for efficient programming.
C209.3	Perform class and object concepts for the construction of programming.
C209.4	Illustrate inheritance concepts for reusability of the code.
C209.5	Implement exception handling to write robust programmes.
C209.6	Design web based applications using applets.

Course Name:	C210: Evaluation of Internship - I
CO No.	Statement
C210.1	Understand the functioning of organization and observe changes for self-improvement.
C210.2	Understand how the internship placement site fits into a broader career field.
C210.3	Apply appropriate workplace behaviours in a professional setting.
C210.4	Solve real life challenges in the workplace by analysing work environment and conditions, and selecting appropriate skill sets acquired from the course
C210.5	Evaluate the internship experience in terms of personal, educational and career needs.
C210.6	Develop ideas for suitable startups to become successful entrepreneur.

Course Name:	C211: Digital Electronics
CO No.	Statement
C211.1	Understand the working of all Logic gates.
C211.2	Understand the design and application of logic functions.
C211.3	Design and implement sequential circuits.
C211.4	Understand the method of analog to digital and digital to analog conversion.
C211.5	Understand the different semiconductor memories.

C211.6	Understand the PLC implementation.
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Course Name:	C211: Electrical Machines-I
CO No.	Statement
C212.1	Understand the basic laws and terminologies of magnetic circuits and its behavior.
C212.2	Understand the characteristics of magnetic circuits, development of EMF-torque with its applications.
C212.3	Understand the construction, working principle, armature reaction and torque development of DC machines.
C212.4	Analyze the characteristics of DC machine and its performance evaluation using various tests.
C212.5	Understand the construction, working principle and performance evaluation of Single phase transformers and autotransformers.
C212.6	Understand the construction details and types of connections of three phase transformer.

Course Name:	C213: Organizational Behavior
CO No.	Statement
C213.1	Understand the development of the field of organizational behaviour and explain the micro and macro approaches.
C213.2	Understand different models used to explain individual behaviour related to motivation and rewards.
C213.3	Understand skills required for working in groups (team building).
C213.4	Analyze the various leadership styles and the role of leaders in a decision making process.
C213.5	Compare organizational cultures and describe its dimensions and to examine various organizational designs.
C213.6	Compose the implementation of organizational change.

Course Name:	C214: Power Electronics
CO No.	Statement
C214.1	Understand the characteristics and performance of Diode, Thyristor, MOSFET and IGBT.

C214.2	Analyze various single and three phase power converter circuits and their applications.
C214.3	Analyze the operation and performance of the DC-DC Chopper.
C214.4	Analyze the operation of Buck and Boost Converter and their applications.
C214.5	Understand of Single phase voltage source inverters using various modulation techniques.
C214.6	Analyze the performance of three phase VSI using the SPWM technique.

Course Name:	C215: Electromagnetic Theory
CO No.	Statement
C215.1	Understand vector analysis and coordinate systems to solve static electric and magnetic field problems.
C215.2	Explain fundamental laws governing electromagnetic fields and evaluate the physical quantities of electromagnetic fields.
C215.3	Explain the concepts of Faradays law, Induced emf and Maxwell's equations to analyze the electrodynamic fields.
C215.4	Explain the concepts of wave equations for different medium.
C215.5	Understand the concepts of guided structures like transmission line, means of transporting energy or information, commonly used in power distribution and communication.
C215.6	Analyze electromagnetic wave propagation in different media.

Course Name:	C216: Signal and Systems
CO No.	Statement
C216.1	Understand the basic fundamentals about discrete time signals and systems.
C216.2	Analyze the discrete time LTI systems and correlation of discrete time signals
C216.3	Understand the basic concepts and application of the Fourier series in continuous time signals
C216.4	Understand the properties and application of the continuous-time Fourier Transform.
C216.5	Understand the application of Z-Transform and Inverse Z- Transform.
C216.6	Understand the properties and application of Discrete Fourier Transform.

Course Name:	C217: Electrical and Electronics Measurement
CO No.	Statement
C217.1	Understand the basic fundamentals of measuring instruments and classifications of measuring instruments.
C217.2	Understand the measurement of Resistance, Inductance and Capacitance using Kelvin's Double, Maxwell's and Schering Bridge respectively.
C217.3	Understand of characteristics of various transducers and it's operation such as strain gauges, thermistors, thermocouples, linear variable differential Transformer (LVDT) etc..
C217.4	Understand the basic theory and application of Galvanometer and Potentiometer.
C217.5	Understand the characteristics and testing of CT and PT and measurement of basic parameters using electronic instruments.
C217.6	Understand the construction and working principle of oscilloscope.

Course Name:	C218: Digital Signal Processing
CO No.	Statement
C218.1	Understand of the basic discrete time signals, their classifications and its properties.
C218.2	Analyse the application of Z-Transformation in linear time invariant systems
C218.3	Understand the application and properties of Discrete Fourier Transform and its computation using Fast Fourier Transform algorithm.
C218.4	Understand the design and implementation of FIR and IIR Filters.
C218.5	Understand the design of analog filters and adaptive filter.
C218.6	Realization of DFT, FFT, Z-transform, IIR, FIR and adaptive filter using MATLAB.

Course Name:	C219: Optoelectronics Device and Instrumentation
CO No.	Statement
C219.1	Understand the basics of wave optics, wave polarization and transmission.
C219.2	Understand the mechanism and operation of LED and LASERS
C219.3	Understand the basics of Fiber optic components such as coupler, splicer, polarizer.
C219.4	Understand modulation techniques, polarization and interference of optoelectronic instruments.

C219.5	Understand the sensing techniques for displacement, pressure, acceleration, flow, current and voltage measurement.
C219.6	Understand principles of Fiber optic gyroscope and Fiber Optic sensors.

Course Name:	C220: Embedded System
CO No.	Statement
C220.1	Understand the concept and design process of Embedded System.
C220.2	Understand the ARM pipeline, Instruction architecture and data processing instructions.
C220.3	Understand the necessity of device drivers and communication buses for device networks.
C220.4	Develop embedded system modules using RTOS, EDF and RMA.
C220.5	Understand the basic concept modelling techniques.
C220.6	Design low power embedded system mechanism.

Course Name:	C221: Constitution of India
CO No.	Statement
C221.1	Remember historical background of the constitutional making and its importance for building a democratic India.
C221.2	Understand the functioning of three wings of the government that is executive, legislative and judiciary.
C221.3	Remember the Fundamental Rights and Fundamental Duties for good citizen of India.
C221.4	Analyze the Directive Principles of State policy
C221.5	Analyze the distribution of powers between of Union and states
C221.6	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

Course Name:	C222: Digital Electronics Laboratory
CO No.	Statement
C222.1	Understand the logic behaviour of gates and implementation of two level and multi-level Boolean function

C222.2	Understand to design, assemble and tests of code converters, grey code and 7 segment display
C222.3	Understand to design and implementation of universal gates with minimum number of gates
C222.4	Understand to design of multiplexer, demultiplexer and clock pulse generator
C222.5	Understand to design, assemble and tests of flip flop circuits
C222.6	Understand to design, assemble and tests of sequential circuits with parallel load

Course Name:	C223: Electrical Machines-I Laboratory
CO No.	Statement
C223.1	Evaluate the voltage regulation and efficiency of single phase transformer using O.C, S.C and Back to Back Test.
C223.2	Observe the Parallel operation of two single phase Transformers.
C223.3	Understand the open delta and Scott connections using two single phase Transformers.
C223.4	Analyse the performance of variable frequency drive of 3-phase Induction motor.
C223.5	Evaluate 3-phase Induction motor circuit parameters using No load and Block rotor Test.
C223.6	Study the performance of Induction Generator and single phase Induction Motor.

Course Name:	C224: Power Electronics Laboratory
CO No.	Statement
C224.1	Plot the V-I characteristics of SCR, TRIAC, IGBT and MOSFET and measure the latching and holding current of SCR.
C224.2	Observe the performance of Cosine controlled triggering circuit.
C224.3	Plot the voltage, current waveform and evaluate the performance parameter of Single phase and three phase converter circuits for R and R-L Load.
C224.4	Design and observe the performance of Buck, Boost, forward and Flyback convertor.
C224.5	Understand the performance of single phase PWM VSI.

C224.6	Understand the performance of Three phase PWM VSI.
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Course Name:	C301: Electrical Power Transmission and Distribution
CO No.	Statement
C301.1	Understand the general structure of power systems and impart the knowledge of the generation of electricity based on conventional energy sources.
C301.2	Analyze the Transmission line parameters and the various effects that occur in transmission lines.
C301.3	Understand different types of transmission lines, power flow capability, surge impedance loading and compensation of transmission lines.
C301.4	Understand the basics of overhead line insulators, mechanical design and Sag of transmission system.
C301.5	Analyze the sequence components during balanced and unbalanced faults of the generator, lines and transformers.
C301.6	Understand the design of power distribution systems and the family of distribution cables.

Course Name:	C302: Control system
CO No.	Statement
C302.1	Understand the mathematical modelling of physical system and reduction of transfer function using Block diagram algebra, Signal Flow Graph and Mason's Gain formula.
C302.2	Understand the time response and stability analysis of first and second order LTI system.
C302.3	Formulate different types of analysis in frequency domain to explain the nature of stability of the system
C302.4	Understand control systems stability parameters such as steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness.
C302.5	Identify the needs of different types of controllers and compensator to determine the required dynamic response from the system.
C302.6	Understand the state-space model and evaluate its controllability and observability of Linear discrete time system.

Course Name:	C303: Electrical Machine-II
CO No.	Statement
C303.1	Understand the generalized principles of rotating Electrical machines.
C303.2	Understand the concept of static and dynamic magnetic fields for rotating Electrical Machines.
C303.3	Understand the basic theory and performance of three phase Induction Machines.

C303.4	Understand the double field revolving theory of single phase Induction Motor and determine its equivalent circuit parameters.
C303.5	Understand the salient features of synchronous Machines.
C303.6	Understand the performance of synchronous machine using V-Inv. V, two reaction theory and power angle characteristics.

Course Name:	C304: Electrical Machine Design
CO No.	Statement
C304.1	Understand and Design of conservator, Core, winding, Tank, Cooling system etc. of Transformers.
C304.2	Understand the design principles of Insulation, surge protection window, Yoke and overall diagnosis.
C304.3	Understand the design of Armature and field of D.C. Machine.
C304.4	Understand the design of Commutators, Brushes, Interpoles, Pole shoes etc of D.C. Machines.
C304.5	Understand the design of core, slots, Rotor bars, rotor teeth etc. of stator and Rotor of a three phase Induction Motor.
C304.6	Understand the design of core, Armature winding, Fielding winding, slots etc. of stator and Rotor of a three phase Synchronous Machines.

Course Name:	C305: Electrical Energy Conservation and Auditing
CO No.	Statement
C305.1	Understand the Electrical Energy conservation and Energy Economics.
C305.2	Understand the preparation of EB- Billing for an HT and LT supply, Transformer, Electric Motors , DG setts, Illuminating devices etc.
C305.3	Understand the basic principles of Electrical Energy Audit.
C305.4	Understand the procedure and Technics for Data gathering, Evaluation of saving opportunities and Energy Audit reporting.
C305.5	Understand the basic theory of Illumination of Incandescent, CFL and LED.
C305.6	Design and analysis of Illumination Process.

Course Name:	C306: Industrial Process Control and Dynamics
CO No.	Statement
C306.1	Understand the basic principles of Process control and its components.
C306.2	Understand the basic principles of Digital signal conditioning.
C306.3	Understand the fundamental theory of Thermal sensors and Mechanical Sensors.

C306.4	Understand the fundamental theory of Optical Sensors.
C306.5	Understand the fundamental theory of Final control, Discrete process control.
C306.6	Understand the characteristics of Analog and Digital controllers.

Course Name:	C307: Electric Drives
CO No.	Statement
C307.1	Understand the fundamentals of A.C, D.C. Drives.
C307.2	Understand the transient operation, steady state stability and control of electrical drives.
C307.3	Understand the performance of D.C. Motor during starting, Braking, Transient operation, speed control etc. in electric drives.
C307.4	Understand the performance of PWM converter, VSI, CSI and VFD in Electric Drive operations.
C307.5	Understand the performance of Synchronous Motor Drives and Electric Traction.
C307.6	Understand the specific applications in Textile mills, steel Rolling mills, Cranes, Hoist etc.

Course Name:	C308: Renewable Power Generation System
CO No.	Statement
C308.1	Understand the basic concepts of Renewable Power Generation System.
C308.2	Design and Analysis of Solar thermal system and Solar power system.
C308.3	Understand the basic concepts of Wind Energy system.
C308.4	Understand the performance of DFIG for Wind Energy conversion system.
C308.5	Understand the basic Principle of Bio-mass conversion system and its application.
C308.6	Understand the basic architecture of Hybrid systems.

Course Name:	C309: Sensors and Transducers
CO No.	Statement
C309.1	Understand the design, calibration and characteristics of various measuring systems/ instruments.
C309.2	Recognize the fundamental principles of sensor such as potentiometer, RTD, thermistor and strain gauge.
C309.3	Understand the principle of LVDT and velocity sensor.

C309.4	Understand the behavior of thermos electric and elastic sensing elements.
C309.5	Understand the concept of signal conditioning element.
C309.6	Understand the characteristics of OPAMP based amplifiers and their applications.

Course Name:	C310: Universal Human Values
CO No.	Statement
C310.1	Explore holistic vision of life - themselves and their surroundings.
C310.2	Develop competence and capabilities for maintaining Health and Hygiene.
C310.3	Analyse various problems in life, family, Society and in handling problems with Sustainable Solutions.
C310.4	Apply values to their own self in different day-to-day settings in real life and in handling problems with sustainable solutions.
C310.5	Adopt the value of appreciation and aspiration for excellence and gratitude for all.
C310.6	Apply the concept of ideal village and smart city for the development of modern society.

Course Name:	C311: Electrical Power Transmission & Distribution Lab
CO No.	Statement
C311.1	Understand Ferranti effect in transmission line.
C311.2	Determine ABCD Parameters and string efficiency of a transmission line.
C311.3	Determine earth resistance and Series and shunt capacitance computation in transmission line.
C311.4	Perform transformer oil test.
C311.5	Understand various lightning arresters and corona discharge in transmission line.
C311.6	Perform power factor improvement of distribution system using switched capacitor.

Course Name:	C312: Control and Instrumentation Lab
CO No.	Statement
C312.1	Determination of Magnitude and phase angle of D.C. Motor driven position control system using Synchroscope.

C312.2	Plot the speed-torque characteristic and evaluate the transfer function of two phase A.C Servomotor.
C312.3	Determination of Frequency response for Lag-Lead compensator.
C312.4	Determination of Transfer function of a system Network using Transfer function Analyzer.
C312.5	Determine the time response of Servomotor control system using P, PI and PID controller.
C312.6	Determination of Temperature using thermocouple, Linear displacement using LVDT, R-L-C using different bridges.

Course Name:	C313: Electrical Machine Lab-II
CO No.	Statement
C313.1	Determine the voltage regulation of an alternator using Synchronous Impedance Method and ZPF Method.
C313.2	Plot V and Inv. V curve of a Synchronous Motor.
C313.3	Determine positive, negative, zero sequence reactance and power angle characteristics of synchronous machines.
C313.4	Study the variable frequency drives and the performance of grid connected Induction machines.
C313.5	Determine the Direct axis, Quadrature axis, Transient and Sub-transient reactance of a Salient pole reactance.
C313.6	Determine the circuit parameters, efficiency using No-load Test, Block rotor Test and Break Test of Three phase Induction Motor.

Course Name:	C314: Evaluation of Summer Internship
CO No.	Statement
C314.1	To learn the application of knowledge in real world problems.
C314.2	To get exposure to team-work and leadership quality.
C314.3	To deal with industry-professionals and ethical issues in the work environment.
C314.4	To strengthen the association of students with electrical section of industry.
C314.5	To create awareness amongst the students the recent trends of electrical engineering in industries.
C314.6	To percept the role and responsibility of electrical engineer in the industry.

Course Name:	C315: Power System Operation and Control
CO No.	Statement
C315.1	Understand the structure of a Power System and its operation.
C315.2	Determine Power System parameters using Per Unit value and mathematical methods for power flow solutions.
C315.3	Understand the economic aspects of power system operation and management.
C315.4	Understand the mathematical modelling of Power System components.
C315.5	Understand methods for frequency and voltage control of Power System.
C315.6	Determine Power System Stability using Swing Equation and Equal area criteria.

Course Name:	C316: Microprocessors and Microcontrollers
CO No.	Statement
C316.1	Understand the architecture, features and basic instructions of 8086.
C316.2	Apply 8086 assembly language code to solve problems for arithmetic operations, code conversion and handle interrupts.
C316.3	Illustrate the design aspects of I/O and memory interfacing circuits with microprocessor.
C316.4	Understand the basic architecture of 8051 microcontroller and programming.
C316.5	Understand the concepts related to I/O and memory interfacing of 8051 microcontroller.
C316.6	Understand the basics of various interfacing used in 8051 microcontroller and microprocessor family.

Course Name:	C317: Optimization in Engineering
CO No.	Statement
C317.1	Apply basic concepts of mathematics to formulate an optimization problem.
C317.2	Analyze and appreciate variety of performance measures for various optimization problems.
C317.3	To understand importance of optimization in different sectors.
C317.4	To understand the theory of optimization methods and algorithms developed for solving various types of optimization problems.

C317.5	To develop and promote research interest in applying optimization techniques in problems of Engineering and Technology.
C317.6	To apply the mathematical results and numerical techniques of optimization theory to concrete Engineering problems.

Course Name:	C318: Electric Power System Protection
CO No.	Statement
C318.1	Understand the necessity of various protective schemes for electric power system.
C318.2	Discrimination of various faults and its significance in power system networks.
C318.3	Understand the basic theory of various types of DC, AC and static relays.
C318.4	Understand the various protecting schemes for different power apparatus used in electric power system.
C318.5	Understand the numerical relaying system for transformer differential protection and transmission line distance protection
C318.6	Understand the structure of various circuit breakers and its operational characteristic for the protection of power system.

Course Name:	C319: Electric and Hybrid Vehicles
CO No.	Statement
C319.1	Understand the phenomena of Hybrid-electric vehicle and its social and environmental importance.
C319.2	Design the mathematical model of Hybrid electric Vehicle.
C319.3	Understand the basic concept of Hybrid Traction, Drive train topologies, power flow control and fuel efficiency analysis.
C319.4	Understand the Electric propulsion unit using D.C. Motor drive and Induction Motor Drives.
C319.5	Analyze the impact of Energy storage devices and BMS in Hybrid Electric Vehicles.
C319.6	Understand the comparative analysis of Electric Machine and Internal combustion engine.

Course Name:	C320: Biomedical Instrumentation
CO No.	Statement

C320.1	Understand the basics of bioengineering, biochemical and biomedical engineering.
C320.2	Understand the importance of bioelectrical signal and electrodes in biomedical engineering.
C320.3	Understand the basic theory and operation of ECG.
C320.4	Aware about the basic uses of physiological transducers in biomedical engineering.
C320.5	Understand the structure of recording system in biomedical engineering.
C320.6	Understand the basics of Electrostatic and electromagnetic coupling of AC signals.

Course Name:	C321: Artificial Intelligence and Machine Learning
CO No.	Statement
C321.1	Understand the foundation of Artificial Intelligence.
C321.2	Understand the problem-solving methods by different search strategies.
C321.3	Apply the adversarial search method for developing gaming platforms.
C321.4	Understand first order logic system and its use for different applications.
C321.5	Aware about uncertainty, probabilistic reasoning and its use.
C321.6	Understand different learning methods and expert system in Artificial Intelligence.

Course Name:	C322: Communication Engineering
CO No.	Statement
C322.1	Understand the basic elements of communication system and frequency domain analysis of various signals.
C322.2	Understand the principles of signal transmission and reception.
C322.3	Understand the different pulse modulation techniques used in Communication system
C322.4	Understand delta modulation and its limitations.
C322.5	Analyse the comparative Analysis of Delta modulation and Pulse code modulation.
C322.6	Understand about the S-Ary system.

Course Name:	C323: Computer Organization and Architecture
CO No.	Statement
C323.1	Define the various algorithm analysis methods and the asymptotic time complexities of various statements with its correctness
C323.2	Explain important algorithmic design paradigms (divide-and-conquer, greedy method, dynamic-programming and Backtracking) and apply when an algorithmic design situation calls for it
C323.3	Demonstrate the major graph algorithms and Employ graphs to model engineering problems, when appropriate
C323.4	Apply different data structures for problem solving and pick an appropriate data structure for a design situation
C323.5	Compare the classes P, NP, and NP Complete and be able to prove that a certain problem is NP-Complete.
C323.6	Familiarizing students with specific algorithms for a number of important computational problems design and development.

Course Name:	C324: Essence of Indian Knowledge Tradition-I
CO No.	Statement
C324.1	Understand the concept of Indian Knowledge Tradition System.
C324.2	Know the need and importance of protecting traditional knowledge.
C324.3	Know the various enactments related to the protection of traditional knowledge.
C324.4	Ability to understand, connect up and explain basics of Indian Traditional knowledge modern scientific perspective.
C324.5	To apply in Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.
C324.6	Imparting basic principles of thought process, reasoning and inferencing.

Course Name:	C325: Power System and Operation and Control Lab
CO No.	Statement
C325.1	Determine the negative, Zero sequence reactance and Sub-transient reactance of an alternator.
C325.2	Determine the fault current for L, G, L-G, L-L, L-L-G and L-L-L faults at the terminals of an alternator.

C325.3	Plot Time vs Current characteristics of an IDMT over current Relay.
C325.4	Understand operating characteristic of Differential relay, MHO Relay and Reactance Relay.
C325.5	Formulate Y-Bus Matrix using MATLAB.
C325.6	Determine the transmission line parameters of a π Transmission line Model and Analyze Symmetrical fault and Unsymmetrical faults using MATLAB.

Course Name:	C326: Microprocessor and Microcontroller Lab
CO No.	Statement
C326.1	Design a program for arithmetic operation, sorting & searching, string manipulations numbers, digital clock & stop watch using 8086 microprocessors.
C326.2	Interfacing and Programming for ADC and DAC.
C326.3	Parallel Communication between two MP Kits using Mode 1 and Mode 2 of 8255 and Serial Communication between two MP Kits using 8251.
C326.4	Interfacing and Programming 8279, 8259, 8253, Stepper Motor and DC Motor Speed control.
C326.5	Programming and verifying arithmetic, logical and Bit Manipulation instructions, Timer, Interrupts and UART operations using 8051 microcontroller.
C326.6	Communication between 8051 Microcontroller kit and PC and design a problem using 8051 microcontrollers.

Course Name:	C327: Future Ready Contributor Program
CO No.	Statement
C327.1	Improve the employability of students by giving them the right work ethic and thinking that employers are looking for.
C327.2	Improve their ability to engage better in the workplace and to be able to handle the challenges that come up there.
C327.3	Widen their choices of career and success, so that they are able to open up more opportunities for themselves and take up unconventional career pathways.
C327.4	Build their confidence with which they can go into any job and contribute meaningfully.

C327.5	Enable them recognize how they as technical professionals, can participate and make a positive contribution to their communities and to their state.
C327.6	Build their career-worthiness and help them develop into future-ready contributors with ability to navigate a career in a volatile, changing world.

Course Name:	C328: Seminar-I
CO No.	Statement
C328.1	Identify promising new directions of various cutting-edge technologies.
C328.2	Discuss the problems in existing technologies and their possible solutions.
C328.3	Show an ability to explain complex technology in a logical and convincing way.
C328.4	Demonstrate effective communication and presentation skills through oral presentations.
C328.5	Apply smart and innovative PPT preparation skills for presentation on new technologies.
C328.6	Apply report writing skills for preparing detailed professional report on new technologies.

Course Name:	C401: Entrepreneurship Development
CO No.	Statement
C401.1	Outline the business environment in order to identify business opportunities.
C401.2	Understand the legal and financial conditions for starting a business venture.
C401.3	Apply the knowledge on enterprise and design business plans those are suitable for funding by considering all dimensions of business.
C401.4	Analyze the effectiveness of different entrepreneurial strategies.
C401.5	Evaluate the basic performance indicators of entrepreneurial activity.
C401.6	Generate the importance of marketing and management in small businesses venture.

Course Name:	C402: Advanced Control Systems
CO No.	Statement
C402.1	Understand the basic concept of Discrete time control system.

C402.2	Analysis of digital control system using Z-Transformation.
C402.3	Analyze state space model of LTI system, SISO and MIMO system.
C402.4	Understand the properties of state transition matrix and its computation using Cayley-Hamilton theorem and Sylvester's expansion theorem.
C402.5	Understand the behaviour of Non-Linear control system and its properties.
C402.6	Understand the Stability analysis of non-linear control system using limit cycles, phase trajectories, Lyapunov's stability criteria etc.

Course Name:	C403: High voltage Systems and DC Transmission
CO No.	Statement
C403.1	Understand the design, planning and layout of High voltage H.V laboratory
C403.2	Understand the phenomena of solid dielectric and liquid dielectric.
C403.3	Understand the concept of High voltage D.C. voltage generation, Impulse voltage, Impulse current, Tripping and control of Impulse generator.
C403.4	Understand the basics theory of HVDC transmission system.
C403.5	Analyse the characteristics of various HVDC converters and its control scheme.
C403.6	Understand the protection scheme of D.C. line using smoothing reactor, D.C. breaker, D.C. filters etc.

Course Name:	C404: Advanced Digital Signal Processing
CO No.	Statement
C404.1	Understand the concept of signals and systems along with frequency analysis.
C404.2	Explain the concept of multi rate signal processing.
C404.3	Apply FFT Algorithm to compute DFT of discrete signals.
C404.4	Illustrate the effect of finite register length in FIR digital filters.
C404.5	Analyze the frequency characteristics of IIR and FIR digital filters for given requirements or specifications.
C404.6	Understand the theory of power spectrum estimation.

Course Name:	C405: Smart Grid
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CO No.	Statement
C405.1	Understand the basic concept of smart grid system.
C405.2	Understand the smart features of smart grid such as smart meters, real time pricing, Automatic meter reading (AMR), and outage management system (OMS) etc.
C405.3	Understand the smart features of Home and building automation such as substation automation, Feeder automation, smart sensors, and geographic information system (GIS) etc.
C405.4	Understand the principle of phasor measurement units, wide area management system based protection and control of Micro-grid.
C405.5	Understand the concepts of storage systems such as batteries, SMES, Pump-hydro, compressed air energy storage.
C405.6	Understand the impact of distributed generation in power quality improvement and EMC in smart grid.

Course Name:	C406: Flexible AC Transmission Systems
CO No.	Statement
C406.1	Understand the basic concepts of FACTS and types of FACTS Controllers.
C406.2	Understand the design and Analysis of static and shunt compensator, SVC and STATCOM.
C406.3	Understand the basic concept static series compensator like DCSC, TSSC, TCSC and SSSC.
C406.4	Understand the basic concept of static voltage and phase angle regulator like TCVR and TCPAR.
C406.5	Understand the basic concepts of UPFC.
C406.6	Understand the basic concepts of IPFC.

Course Name:	C407: Power Station Engineering
CO No.	Statement
C407.1	Analyze different types of sources and mathematical expressions related various terms and factors involved with power plant operation.
C407.2	Understand economics of power generation and tariffs or charge to consumers.
C407.3	Analyze the working and layout of basic components of the nuclear power plant and the economic principles involved with it.
C407.4	Analyze the working and layout of basic components of the hydro power plant and the economic principles involved with it.

C407.5	Analyze the working and layout of thermal power plants and the different systems comprising the plant and discuss about its economic and safety impacts.
C407.6	Explain working principles of different electrical equipment's involved in the generation of power using thermal power plant.

Course Name:	C408: Internet Of Things
CO No.	Statement
C408.1	Identify the IoT networking components with respect OSI layer.
C408.2	Summarize the schematic for IoT solutions
C408.3	Demonstrate and develop IoT based smart environment.
C408.4	Illustrate the IoT protocols and software.
C408.5	Justify cloud computing for developing IoT based applications.
C408.6	Develop a real time system prototype by using Arduino or node MCU.

Course Name:	C409: Digital VLSI Design
CO No.	Statement
C409.1	Aware about historical perspective of VLSI design methodology.
C409.2	Understand the design of MOSFETs and MOS Transistors.
C409.3	Understand the static and switching characteristics of MOS inverters.
C409.4	Understand the fundamentals of sequential and dynamic MOS logic circuits.
C409.5	Understand the design for testability.
C409.6	Aware about different semiconductor memories and its uses in VLSI design.

Course Name:	C410: Mechatronics
CO No.	Statement
C410.1	Understand the evolution of mechatronics, components and types of mechatronic products.
C410.2	Apply the concept of signal theory, signal analysis and processing in mechatronics.
C410.3	Understand the basic digital technology, digital number system, Boolean algebra and logic gates.

C410.4	Understand the modelling of mechanical, electrical, thermal and fluid system.
C410.5	Understand the basics of different types actuators, transducer and sensors .
C410.6	Understand the programmable logic controller, microprocessor and microcontroller.

Course Name:	C411: Disaster Management
CO No.	Statement
C411.1	Understand concept of disaster and risk.
C411.2	Understand disaster management mechanism.
C411.3	Understand the concept of capacity building and legislative support.
C411.4	Understand the copying strategies with disaster.
C411.5	Aware about the use of safety plans, safety norms and survival kits during disaster.
C411.6	Understand the strategies for disaster management and planning.

Course Name:	C412: Intellectual Property Right
CO No.	Statement
C412.1	Understand the significance and necessity for intellectual property right (IPR).
C412.2	Aware about the patent and patent laws for licensing and enforcing intellectual property.
C412.3	Understand all the procedures of copyright for ownership, transfer and termination of transfers.
C412.4	Understand about Infringement and Remedies.
C412.5	Aware about state laws such as Trade Secret, Contract, Misappropriation, Right of Publicity Trademarks etc.
C412.6	Aware about Criminal Liability, Misappropriation, Clickwrap Agreements, Idea Submissions etc.

Course Name:	C413: Green Technology
CO No.	Statement

C413.1	Understand concepts of geothermal and marine power systems and their implementation.
C413.2	Enlist different concepts of green technologies in a project
C413.3	Understand the principles of Energy efficient technologies
C413.4	Estimate the carbon credits of various activities
C413.5	Identify the importance of life cycle assessment
C413.6	Recognize the benefits of green fuels with respect to sustainable development.

Course Name:	C414: Big data Analysis
CO No.	Statement
C414.1	Explain the building block of Big Data and overview of an exciting growing field of big data analytics
C414.2	Understand the structure of SQL database system.
C414.3	Understand and apply the programming aspects of map reduce.
C414.4	Analyze pig architecture to made easier Hadoop programming
C414.5	Applying Structure to Hadoop data with Hive
C414.6	Design applications to solve complex real-world problems in for decision support.

Course Name:	C415: Soft Computing
CO No.	Statement
C415.1	Define importance of soft computing application in real life problem.
C415.2	Explain supervised and unsupervised learning algorithm to find optimised solution for linear and non-linear problems.
C415.3	Demonstrate fuzzy system using knowledge of fuzzy rule based system.
C415.4	Analyze derivative free optimisation models and optimised search techniques using evolutionary operators.
C415.5	Evaluate and apply hybrid tools to find optimised solution for highly complex problems.
C415.6	Develop soft computing techniques to solve real life problems.

Course Name:	C416: Embedded System
CO No.	Statement
C416.1	Understand the concept and design process of Embedded system.
C416.2	Understand the concept and type of “instruction set architecture”.
C416.3	Understand device drivers and communication buses for device network.
C416.4	Develop embedded system modules using RTOS.
C416.5	Understand the basic concept of modelling techniques.
C416.6	Design low power embedded system mechanism.

Course Name:	C417: Essence of Indian Knowledge Tradition-II
CO No.	Statement
C417.1	Understand the concept of Indian Knowledge System.
C417.2	Know the various enactments related to the protection of traditional knowledge.
C417.3	Understand the concepts of Intellectual property to protect the traditional knowledge.
C417.4	Imparting basic principles of thought process, reasoning and inferencing.
C417.5	Ability to understand, connect up and explain basics of Indian Traditional knowledge modern scientific perspective.
C417.6	To apply in Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.

Course Name:	C418: Minor Project
CO No.	Statement
C418.1	Competence in applying the electrical engineering principles in planning, formulating an innovative design for the anticipated requirements to solve the real time problem within the context of legal, global and environment constraint.
C418.2	Capability to develop/implement the design with appropriate techniques, resources and contemporary tools exhibiting integrity and ethical behavior in engineering practice.
C418.3	Ability to plan, monitor, and manage project schedule, resources, and work assignments to ensure timely completion.

C418.4	Ability to test and defend performance of the implemented project and understand the implication of the solution.
C418.5	Perform professionally as a team member, accepting responsibility, taking initiative and providing leadership necessary to ensure Project success.
C418.6	Ability to use formal and informal Communication with team members and guide, make presentation and prepare technical document.

Course Name:	C419: Seminar-II
CO No.	Statement
C419.1	Outline the topics on modern technology; prepare implementation of the same as the presentation.
C419.2	Understanding the technologies used by extracting the new things to be implemented by reviewing the journals/research papers.
C419.3	Sketch the application of the technology for the use of the mankind.
C419.4	Analyze and correlate the new technology with the subject of interest for further study.
C419.5	Evaluate, plan and reframe the technology with the communication skills for a better explanation and presentation.
C419.6	Modify and design the concept into the realistic world.

Course Name:	C420: Comprehensive Viva
CO No.	Statement
C420.1	Reproduce confidence and strength to present the understanding of the courses.
C420.2	Develop interview skills.
C420.3	Develop listening ability to the interviewer questions and deliver the appropriate answer positively with confidence.
C420.4	Develop the presentation ability.
C420.5	Define industrial and societal problem solution by effective communication
C420.6	Examine technical knowledge in most effective manner for industries

Course Name:	C421: Major Project
CO No.	Statement
C421.1	Competence in applying the electrical engineering principles in planning, formulating an innovative design for the anticipated requirements to solve the real time problem within the context of legal, global and environment constraint.
C421.2	Capability to develop/implement the design with appropriate techniques, resources and contemporary tools exhibiting integrity and ethical behavior in engineering practice.
C421.3	Ability to plan, monitor, and manage project schedule, resources, and work assignments to ensure timely completion.
C421.4	Ability to test and defend performance of the implemented project and understand the Implication of the solution.
C421.5	Perform professionally as a team member, accepting responsibility, taking initiative, and providing leadership necessary to ensure Project success.
C421.6	Ability to use formal and informal Communication with team members and guide, make presentation and prepare technical document.