Details of Course Outcome

ODD SEMESTER

2021 SCHEME

III SEM

21MAT31-MATHEMATICS COURSE

CO1-To solve ordinary differential equations using Laplace transform.

CO2-Demonstrate the Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory.

CO3- To use Fourier transforms to analyze problems involving continuous-time signals and to apply Z-Transform techniques to solve difference equations

CO4 -To solve mathematical models represented by initial or boundary value problems involving partial differential equations

CO5 -Determine the extremals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.

1PCC21BT32-UNIT OPERATIONS + LAB

CO1-Describe the nature and properties of fluids.

CO2-Perform various flow measurements using different instruments.

CO3- Explain the principles of various mechanical operations like size reductions, conveying equipment, sedimentation and mixing tanks.

CO4-Illustrate the laws governing the heat and mass-transfer operations.

CO5-Analyse the construction details of heat and mass transfer equipment for specific requirements.

1PCC21BT33- BIOCHEMISTRY+LAB

CO1-Explain the fundamentals of biologically important molecules such as structures, functions and interactions

CO2-Understand complex biochemical pathways within living cells and the associated metabolic disorders

CO3-Comprehend biochemical principles and apply them to biological systems/samples

CO4-Perform basic biochemical experiments, analyse, interpret and present the data

1PCC21BT34-MICROBIOLOGY

CO1-To understand the details of classification, structural features and functional aspects of prokaryotic and eukaryotic microorganisms.

CO2- To learn different techniques of microscopy and be able to describe microbial techniques for growth, cultivation and characterization of microorganisms.

CO3-To explain microbial metabolism, growth and control of microorganisms.

CO4- To describe and relate the occurrence of microbes caused diseases.

CO5- To analyse various industrial applications of micro biology.

1PCC21BTL35-MICROBIOLOGY LAB

CO1-To develop ability to use basic instruments in the microbiology lab

CO2-To prepare required media and sterile the glassware for culturing microbes

CO3-To be able to characterize and enumerate different microorganisms

CO4- To analyse the bacterial growth curves and phases of growth

CO5-To isolate and study the microbes from various sources in day-today life

21BT383 - BIODIVERSITY AND CONSERVATION LAW

CO1-To give an insight into Biodiversity and species evolution.

CO2-To acquire knowledge of ecological threats, habitat destruction and extinction of species.

CO3-To enable an understanding of Environmental law and IP issues

21UHV36: UNIVERSAL HUMAN VALUES

CO1 – To understand the importance of plants, origin and its usage in daily life.

CO2- To discuss the history, heritage and culture of the city.

CO3- To recognize the importance of organic farming and waste management.

CO4 – To study water conservation methods.

CO5- To explain indigenous materials used for preparation of regional food.

21UHV36: Universal Human Values

Module 1- Plantation activity and tree adoption.

Module 2- Poster preparation and visiting exhibition.

Module 3- Visiting to Organic fertilizer preparation place.

Module 4- Rain Water harvesting.

Module 5- Food Fest in Department.

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V SEM

2018 SCHEME

18BT51-BIOBUSINESS AND ENTREPRENEURSHIP

CO-1: Discuss about the Bio Entrepreneurship

CO-2: Illustrate the importance of Business in Agriculture at present era

CO-3: Assess the entrepreneurship opportunity in Industrial Biotechnology

CO-4: Infer the project Management, IPR and start up schemes

CO-5: Describe the Importance of bioethics, bio safety and Regulatory norms

18BT52 - CHEMICAL REACTION ENGINEERING

CO-1: Discuss about the different chemical reactions and analysis of experimental reactor data CO-2: Design of performance equations for the different reactors

CO-3: Discuss the performance and distinguish between the different types of ideal and non-ideal reactors

CO-4: Determine enzyme activity, to study the fundamentals of Microbial growth kinetics and its stoichiometry

CO-5: Describe medium requirements and media formulation for the optimal bio process

18BT53-ENZYME TECHNOLOGY AND BIOTRANSFORMATION

CO-1: Explain and apply the knowledge to select appropriate methods for isolation, purification and characterization of enzymes

CO-2: Discuss the catalytic action, mechanism & kinetics

CO-3: Choose and apply scientific method to the process of enzyme immobilization techniques CO-4: Comprehend the applications of nonconventional media in enzyme catalysis and design the methods for the creation of novel enzymes and biotransformation of drugs

CO-5: Explain and apply uses of enzymes in clinical diagnostics and bioprocess industries

18BT54-GENOMICS AND PROTEOMICS

CO-1: Define structural, comparative and functional genomics and proteomics and its uses in various research Fields

CO2: Summarize on genomics and genome management

CO3: Describe various methods and techniques of Genomics, high throughput DNA sequencing technology, expression profiling, proteome analysis, and its applications.

18BT55: BIO ANALYTICAL TECHNIQUES

CO1-Define the fundamentals of downstream processing for product recovery

CO2-Understand the requirements for successful operations of analytical techniques

CO3-Apply principles of various analytical devices used in in research and enhance problem solving techniques

18BT56-GENETIC ENGINEERING AND APPLICATIONS

CO1: Explain & compare the different tools & enzymes used in recombinant DNA

CO2: Illustration of techniques such as PCR, Blotting & construction of libraries

CO3: Differentiate and learn the gene/DNA transfer techniques between & learn the different gene/DNA transfer techniques

CO4: Outline the various methods of producing transgenic organisms and Plants

CO-5: Summarize the applications of genetic engineering for the welfare of mankind & society

18BTL57-BIOKINETICS AND ENZYME TECHNOLOGY LABORATORY

CO1: State and define the nature of the reaction, rate of the reaction, rate constant and enzyme activity

CO2: Compose RTD data in MFR and PFR CO3: Describe the batch reactor performance

18BTL58 GENETIC ENGINEERING AND CELL CULTURE LABORATORY

CO1-Demonstrate/perform the basic cell culture techniques in vitro.

CO2-To analyze the effects of physio-chemical factors and growth hormones for the growth and development of the cultures in vitro

18CIV59- ENVIRONMENTAL STUDIES

CO1: Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale.

CO2: Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.

CO3: Demonstrate ecology knowledge of a complex relationship between biotic and a biotic components.

CO4: Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues

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VII SEM

2018-SCHEME

18BT71-BIOPROCESS ENGINEERING

CO1-Study and design various statistical problems

CO2-Describe the factors affecting secondary metabolite production and its industrial importance.

CO3-Identify and summarize the effect of change in unit's operations and its impact on the process.

CO4-Illustrate how emerging technologies would benefit the bio chemical product recovery and show the likely benefits it would have over the traditional operations.

CO5-Analyzing both analytical and process validation issues that are critical to successful manufacturing

18BT72-CLINICAL AND PHARMACEUTICAL BIOTECHNOLOGY

CO1-Explain the significance of pharmaco-kinetic models, pharmaco-dynamic principles, various dosage forms and formulation.

CO2-Understand the specific techniques used in biotherapy & clinical Biotechnology

CO3-Comprehend specific applications of pharmaceutical & clinical Biotechnology

18BT732-BIOREACTOR DESIGN CONCEPTS

CO1-Design culture medium based on nutritional requirements of microbial cells.

CO2-Specify design criterion for medium sterilization and solve problems involving both batch and continuous sterilization.

CO3-Understand the bioreactor performance.

CO4-Apply mass and heat transfer correlations to bioreactor design.

CO5-Design a complete bioreactor based on targets, constraints and physical properties.

18BT742- AGRICULTURAL BIOTECHNOLOGY

CO1-Understand Basic concepts in plant growth and physiology

CO2-Define the problems in post-harvest losses and will investigate more solution for betterment.

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CO3-Understand the importance of organic farming and role of biotechnology in development of organic farming

CO4-Understand the techniques in molecular farming and concepts in nitrogen fixation.

18BT752-FORENSIC SCIENCE

CO1: To know about the various areas of forensic science.

CO2: To understand the steps involved in forensic analysis

CO3: To understand about the techniques in forensic analysis

CO4: To know about the legal issues and ethics related to forensic science

18BTL76- BIOPROCESS ENGINEERING LABORATORY

CO1-Define the fundamentals of downstream processing for biochemical product recovery.

CO2-Assess the impact of change in unit's operations and the impact on the process.

CO3-Examine traditional unit operations, as well as new concepts and emerging technology that is likely to benefit biochemical product recovery in the future.

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EVEN SEMESTER

IV SEMESTER

2021 SCHEME

21BT41 BIOSTATISTICS AND DESIGN OF EXPERIMENTS

CO1- To learn how to formulate and test the hypotheses about means, proportions and standard deviation to draw conclusions based on the results of statistical tests in large sample.

CO2-To learn how to formulate and test the hypotheses about means, variances for small samples using t and F test for small sample and have knowledge on ANOVA.

CO3-To understand the fundamentals of design and the methods of optimization

21BT42 PYTHON PROGRAMMING

CO1-Develop algorithmic solutions to simple computational problems.

CO2-Read, write, debug, and execute simple Python programs.

CO3-Structure simple Python programs for solving problems.

CO4-Decompose a Python program into functions

21BT43: CELL BIOLOGY & CELL CULTURE TECHNIQUES + LAB

CO1-To gain basic understanding of cellular processes, pathways and cytoskeletal organization.

CO2-To get a thorough understanding of microbiological procedures for the development, culture, and characterization of industrially important microorganisms.

CO3-To explain the fundamental principles and procedures of genetic engineering. Animal cell lines and plant tissue culture gene transfer technologies.

21BT44: MOLECULAR BIOLOGY & GENETIC ENGINEERING

CO1-Understand the basic concepts of genetic engineering for augmentation of traits.

CO2-Apply and comprehend the principles of gene manipulation, expression and interaction of genes and proteins.

CO3-Evaluate the screening and interaction studies using classical/conventional and high through put methods.

CO4-Design the strategies for gene cloning and gene editing.

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21BE45: BIOLOGY FOR ENGINEERS

CO1-Elucidate the basic biological concepts via relevant industrial applications and case studies.

CO2-Evaluate the principles of design and development, for exploring novel bioengineering projects.

CO3-Corroborate the concepts of biomimetics for specific requirements.

CO4-Think critically towards exploring innovative biobased solutions for socially relevant problems.

21BTL46: MOLECULAR BIOLOGY & GENETIC ENGINEERING LAB

CO1-Apply the principles of molecular biology and genetic engineering.

CO2-Conduct experiments related to isolation, separation, quantification, digestion and amplification of nucleic acids.

CO3-Interpret and discuss the outcome of the experiments formally through written reports.

VI SEM

2018 SCHEME

18BT61: PROCESS CONTROL & AUTOMATION

CO1-Understand the basics of process dynamics principles and instrumentation

CO2-Study various types of input functions and its response

CO3-Perform computational modelling to study different types of controllers

CO4-Analyse different control algorithms

18BT62: BIOPROCESS EQUIPMENT DESIGN & CAED

CO1-Differentiate between different types of heat exchangers

CO2-Do detailed design and drawing of DPHE, STHE and condenser

CO3-Design and draw the fermenter, packed column distillation

18BT63: BIOINFORMATICS

CO1-Know the relevant online resources, databases and software tools

CO2-Understand the underlying concepts of Bioinformatics

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CO3-Apply alignment and modelling tools

CO4-Analyse biological data using phylogenetic, predictive and comparative methods

CO5-Design in silico various biomolecules

18BT641: FOOD PROCESS ENGINEERING

CO1-Display a solid foundation in understanding the biochemical, nutritional, physiological, ethical and safety aspect of food.

CO2-Understand the factors influencing microbial growth, its intoxication and diagnostic system used in food industry to detect the microbial spoilage.

CO3-To illustrate the different processing, preservative techniques to enhance the shelf life and production of food by fermentation processes using biotechnological approach.

CO3-To analyse the different food sample for microbial contamination.

18BT651: BIOLOGY FOR ENGINEERS

CO1-Display a solid foundation in understanding the biochemical, nutritional, physiological, ethical and safety aspect of food.

CO2-Understand the factors influencing microbial growth, its intoxication and diagnostic system used in food industry to detect the microbial spoilage.

CO3-To illustrate the different processing, preservative techniques to enhance the shelf life and production of food by fermentation processes using biotechnological approach.

CO4- analyse the different food sample for microbial contamination.

18BTL66: PROCESS CONTROL & AUTOMATION LABORATORY

CO1-Understand the basics of instrumentation, classification, various input function of automatic process control system

CO2- and characterize the transducers based on critical process parameters

CO3-Demonstrate the working of First order systems and controllers.

CO4-Calculate and Analyze the output obtained from different systems and perform theoretical validation

18BTL67: BIOINFORMATICS LABORATORY

CO1-Understand fundamental concepts of bioinformatics

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CO2-Apply online resource tools

CO3-Solve sequence alignment problems

CO4-Design primers and peptide sequence

VIII SEM

2018 SCHEME

18BT71: REGULATORY AFFAIRS IN BIOTECH INDUSTRY

CO1-Outline the importance of the quality and compliance in the biotech industry.

CO2- Comprehend the various regulatory guidelines and rules as well as the organizations governing the same

18BT822: INDUSTRIAL MICROBIOLOGY

CO1-Understand the techniques used for the isolation, growth, identification, disinfection and sterilization of microorganisms used in the Industries.

CO2-Define the role of microorganisms towards environmental protection, industrial applications.

CO3-Out-line industrial fermentation processes leading to the production of antibiotics, organic acids, enzymes, vitamins and therapeutic products.

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Sapthagiri College of Engineering
Department of Civil Engineering
Course Outcomes

2022 SCHEME

I Year Civil Engineering

Course Code	Course Name	Course Outcomes-On completion of this course the students will be
BCIV104	Elements of Civil Engineering and Mechanics	CO1:Compute the resultant of force system and resolution of force CO2:Comprehend the action of forces, moments and other types of loads on rigid bodies and compute the reactive forces CO3:Analyze the frictional resistance offered by different planes CO4:Locate the centroid and compute the moment of inertia of sections CO5:Analyze the bodies in motion

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II Year Civil Engineering

Course Code	Course Name	Course Outcomes-On completion of this course the students will be
21MAT 31	TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES	CO1:To have an insight into solving ordinary differential equations by using Laplace transform techniques CO2: Learn to use the Fourier series to represent periodical physical phenomena in engineering analysis. CO3: To enable the students to study Fourier Transforms and concepts of infinite Fourier Sine and Cosine transforms and to learn the method of solving difference equations by the z-transform method. CO4: To develop proficiency in solving ordinary and partial differential equations arising in engineering applications, using numerical methods
21CV32	Geodetic Engineering	CO1:Provide basic knowledge about principles of surveying for location, design and construction of engineering projects CO2: Develop skills for using surveying instruments including, levelling instruments, plane tables, theodolite, compass CO3:Make students to familiar with cooperative efforts required in acquiring surveying data and applying fundamental concepts to eliminate errors and set out the works CO4 :Provide information about new technologies that are used to abstracting the information of earth surface
21CV33	STRENGTH OF MATERIALS	CO1:To understand the basic concepts of the stresses and strains for different materials and strength of structural elements CO2: To know the development of internal forces and resistance mechanism for one dimensional and twodimensional structural elements. CO3: To analyse and understand different internal forces and stresses induced due to representative loads on structural elements. CO4 :To determine slope and deflections of beams. CO5 :To evaluate the behaviour of torsion members, columns and struts

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21CV34	Earth Resources and Engineering	CO1: To understand the importance of earth's dynamic interior in civil engineering and Geo Hazard mitigation and management CO2:To analyse the physical characteristics of the rocks and Minerals for its suitable application in Engineering CO3: To evaluate earth Process for providing sustainable management and Development through Geoengineering. CO4: Subsurface Exploration for providing safe and suitable site condition and Earth Resources for Reengineering activities CO5: To application of modern tools and techniques in Earth Resources Management
21CVL35	COMPUTER AIDED BUILDING PLANNING AND DRAWI	CO1:Gain skill set to prepare Computer Aided Engineering Drawings CO2:Understanding the details of construction of different building elements CO3:Visualize the completed form of the building and the intricacies of construction based on the engineering drawings CO4:Get familiarization of practices used in Industry
21CV385	Fire Safety in Buildings	CO1: To understand the importance fire safety CO2:To learn various techniques involved in fire safety CO3:To design fire resistant buildings using proper materials and methods
21CIP37/47	Constitution of India and Professional Ethics (CIP)	CO1: To know the fundamental political structure & codes, procedures, powers, and duties of Indian government institutions, fundamental rights, directive principles, and the duties of citizens. CO2:To understand engineering ethics and their responsibilities, identify their individual roles and ethical responsibilities towards society.
21MAT41	COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS	CO1:Provide insight into applications of complex variables, conformal mapping arising in potential theory, quantum mechanics, heat conduction and field theory. CO2: Special functionsfamiliarize the Power series solution required to analyse the Engineering Problems. CO3: To have insight into Statistical methods, Correlation and regression analysis. CO4:To develop probability distribution of discrete and continuous random variables, Joint probability distribution occurs in digital signal processing, design engineering and microwave engineering.

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		CO4: Develop probability distribution of discrete, continuous random variables and joint probability distribution occurring in digital signal processing, information theory and design engineering. CO5: Demonstrate testing of hypothesis of sampling distributions and illustrate examples of Markov chains related to discrete parameter stochastic process.
21CV42	Fluid Mechanics and Hydraulics	CO1:. Fundamentals of fluid pressure and Hydrostatic laws CO2:Principles of Kinematics, Hydrodynamics and basic design of pipes CO3:Flow measurements CO4: 4Design of open channels and energy concepts CO5:Working principles of the hydraulic machines
21CV43	PUBLIC HEALTH ENGINEERING	CO1:Analyze the variation of water demand and to estimate water requirement for a community. CO2:Study drinking water quality standards and to illustrate qualitative analysis of water. CO3:Analysis of physical and chemical characteristics of water and wastewater. CO4:Understand and design of different unit operations and unit process involved in water and wastewater treatment proces
21CV44	ANALYSIS OF STRUCTURES	CO1:To determine slope and deflections in beams and trusses. CO2To analyse arches and cable structures. CO3:To analyse different structural systems and interpret data using slope deflection method. CO4:To apply matrix operations in analysing structures.
21CVL46	Earth Resources and Engineering Laboratory	CO1:To provide decision support on the nature of the basic raw materials used in construction. CO2:To provide decision support on Lithological characters and subsurface conditions. CO3: To describe various geological maps and interpretation of geological data for mining and subsurface investigations. CO4:To understand the subsurface using geospatial data.

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	HUMAN VALUES-II: UNDERSTANDING HARMONY and ETHICAL HUMAN CONDUCT	students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way. CO2.To help the students appreciate the essential complementarity between 'VALUES' and'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings. CO3.To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

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III Year

18CV51	Construction Management And Entrepreneurship	1.Prepare a project plan based on requirements and prepare schedule of a projec by understanding the activities and their sequence. 2. Understand labour output, equipment efficiency to allocate resources require for an activity / project to achieve desired quality and safety. 3. Analyze the economics of alternatives and evaluate benefits and profits of a construction activity based on monetary value and time value. 4. Establish as an ethical entrepreneur and establish an enterprise utilizing the provisions offered by the federal agencies.
18CV52	Analysis Of Indeterminate Structures	1.Determine the moment in indeterminate beams and frames having variable moment of inertia and subsidence using slope defection method 2. Determine the moment in indeterminate beams and frames of no sway and sway using moment distribution method. 3. Construct the bending moment diagram for beams and frames by Kani's method. 4. Construct the bending moment diagram for beams and frames using flexibilit method 5. Analyze the beams and indeterminate frames by system stiffness method.
18CV53	Design Of Rc Structural Elements	1.Understand the design philosophy and principles. 2. Solve engineering problems of RC elements subjected to flexure, shear and torsion. 3. Demonstrate the procedural knowledge in designs of RC structural elements such as slabs, columns and footings. 4. Owns professional and ethical responsibility.
18CV54	Basic Geotechnical Engineering	1. Ability to plan and execute geotechnical site investigation program for different civil engineering projects 2. Understanding of stress distribution and resulting settlement beneath the loaded footings on sand and clayey soils 3. Ability to estimate factor of safety against failure of slopes and to compute lateral pressure distribution behind earth retaining structures 4. Ability to determine bearing capacity of soil and achieve proficiency in proportioning shallow isolated and combined footings for uniform bearing pressure 5. Capable of estimating load carrying capacity of single and group of piles
18CV55	Municipal Wastewater Engineering	1. Select the appropriate sewer appurtenances and materials in sewer network. 2. Design the sewers network and understand the self purification process in flowing water. 3.Deisgn the varies physic- chemical treatment units 4. Design the various biological treatment units 5. Design various AOPs and low cost treatment units.

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	Engineering	existing roads, conduct necessary field investigation for generation of required data. 2. Evaluate the engineering properties of the materials and suggest the suitabilit of the same for pavement construction. 3. Design road geometrics, structural components of pavement and drainage. 4. Evaluate the highway economics by few select methods and also will have a basic knowledge of various highway financing concepts.
18CVL57	Surveying Practice	1. Apply the basic principles of engineering surveying and for linear and angula measurements. 2. Comprehendeffectivelyfieldproceduresrequiredforaprofessionalsurveyor. 3. Use techniques, skills and conventional surveying instruments necessary f o 1 engineering practice.
18CVL58	Concrete And Highway Materials Laboratory	1. Able to interpret the experimental results of concrete and highway materials based on laboratory tests. 2. Determine the quality and suitability of cement. 3. Design appropriate concrete mix Using Professional codes.
		4. Determine strength and quality of concrete. 5. Evaluate the strength of structural elements using NDT techniques. 6. Test the soil for its suitability as sub grade soil for pavements.
18CIV59	Environmental Studies	1: Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale, 2: Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment. 3: Demonstrate ecology knowledge of a complex relationship between biotic an a biotic components. 4: Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.
18CV61	Design Of Steel Structural Elements	1. Possess knowledge of Steel Structures Advantages and Disadvantages of Ste structures, steel code provisions and plastic behaviour of structural steel. 2. Understand the Concept of Bolted and Welded connections. 3. Understand the Concept of Design of compression members, built-up colum and columns splices. 4. Understand the Concept of Design of tension members, simple slab base and gusseted base. 5. Understand the Concept of Design of laterally supported and un-supported steel beams.
18CV62	Applied Geotechnical Engineering	1. Ability to plan and execute geotechnical site investigation program for different civil engineering projects 2. Understanding of stress distribution and resulting settlement beneath the loaded footings on sand and clayey soils 3. Ability to estimate factor of safety against failure of slopes and to compute lateral pressure distribution behind earth retaining structures 4. Ability to determine bearing capacity of soil and achieve proficiency in proportioning shallow isolated and combined footings for uniform bearing pressure 5. Capable of estimating load carrying capacity of single and group of piles
18CV63	Hydrology And Irrigation Engineering	1. Understand the importance of hydrology and its components. 2. Measure precipitation and analyze the data and analyze the losses in precipitation. 3. Estimate runoff and develop unit hydrographs. 4. Find the benefits and ill-effects of irrigation. 5. Find the quantity of irrigation water and frequency of irrigation for various crops. 6. Find the canal capacity, design the canal and compute the reservoir capacity.

	Management	drawbacks. 2. Evaluate different elements of solid waste management system. 3. Suggest suitable scientific methods for solid waste management elements. 4. Design suitable processing system and evaluate disposal sites.
18CV643	Alternate Building Materials	1. Solve the problems of Environmental issues concerned to building materials and cost effective building technologies; 2. Select appropriate type of masonry unit and mortar for civil engineering constructions; also they are able to Design Structural Masonry Elements under Axial Compression. 3. Analyse different alternative building materials which will be suitable for specific climate and in an environmentally sustainable manner. Also capable of
		suggesting suitable agro and industrial wastes as a building material. 4. Recommend various types of alternative building materials and technologies and design a energy efficient building by considering local climatic condition and building material.
18CV645	Railways, Harbour, Tunneling And Airports	1. Acquires capability of choosing alignment and also design geometric aspects of railway system, runway and taxiway. 2. Suggest and estimate the material quantity required for laying a railway track and also will be able to determine the hauling capacity of a locomotive. 3. Develop layout plan of airport, harbor, dock and will be able relate the gained knowledge to identify required type of visual and/or navigational aids for the same. 4. Apply the knowledge gained to conduct surveying, understand the tunneling activities.
18CV651	Remote Sensing And Gis	1.Collectdataanddelineatevariouselementsfromthesatelliteimageryusingtheirspectralsignature. 2. Analyze different features of ground information to create raster or vector data. 3. Perform digital classificationandcreatedifferentthematicmapsforsolvingspecificproblems 4. Make decision based on the GIS analysis on thematic maps.
18CV652	Traffic Engineering	1. Understandthehumanfactorsandvehicularfactorsintrafficengineeringdesign. 2.Conductdifferenttypesoftrafficsurveysandanalysisofcollecteddatausingstatistical concepts. 3.Useanappropriatetrafficflowtheoryandtocomprehendthecapacity&signalizedintersectionanalysis. 4. Understand the basic knowledge of Intelligent Transportation System.
18CVL66	Software Application Laboratory	use software skills in a professional set up to automate the work and thereby reduce cycle time for completion of the work
18CVL67	Environmental Engineering Laboratory	1. Acquire capability to conduct experiments and estimate the concentration of different parameters. 2. Compare the result with standards and discuss based on the purpose of analysis. 3. Determine type of treatment, degree of treatment for water and waste water. 4. Identify the parameter to be analyzed for the student project work in environmental stream.

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	Project	2. Understanding Task environment, Goals, responsibilities, Task focus, working in Teams towards common goals, Organizational performance expectations, technical and behavioral competencies. 3. Application of individual effectiveness skills in team and organizational context, goal setting, time management, communication and presentation skills. 4. Professional etiquettes at workplace, meeting and general 5. Establishing trust based relationships in teams & organizational environment 6. Orientation towards conflicts in team and organizational environment, Understanding sources of conflicts, Conflict resolution styles and techniques

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IV YEAR

18CV71	Quantity Surveying And Contract Management	1. Taking out quantities and work out the cost and preparation of abstract for the estimated cost for various civil engineering works. 2. Prepare detailed and abstract estimates for various road works, structural works and water supply and sanitary works. 3. Prepare the specifications and analyze the rates for various items of work. 4. Assess contract and tender documents for various construction works. 5. Prepare valuation reports of buildings.
18CV72	Design Of Rcc And Steel Structures	1. Students will acquire the basic knowledge in design of RCC and Steel Structures. 2. Students will have the ability to follow design procedures as per codal provisions and skills to arrive at structurally safe RC and Steel members.
18CV733	Pavement Materials And Construction	1. Students will be able to evaluate and assess the suitability of any pavement material to be used in various components of pavement by conducting required tests as per IS,IRC specifications 2. Students will be able to formulate the proportions of different sizes of aggregates to suit gradation criteria for various mixes as per MORTH and also design bituminous mixes. 3. Students will be competent to adapt suitable modern technique and equipment for speedy and economic construction. 4. Student will be able to execute the construction of embankment, flexible, rigid pavement and perform required quality control tests at different stages of pavement construction.
18CV734	Ground Water Hydraulics	1. Find the characteristics of aquifers. 2. Estimate the quantity of ground water by various methods. 3. Locate the zones of ground water resources. 4. Select particular type of well and augment the ground water storage.
18CV745	Urban Transport Planning	1. Design, conduct and administer surveys to provide the data required for transportation planning. 2. Supervise the process of data collection about travel behavior and analyze the data for use in transport planning. 3. Develop and calibrate modal split, trip generation rates for specific types of land use developments. 4. Adopt the steps that are necessary to complete a long-term transportation plan.
18CVL76	Computer Aided Detailing Of Structures	Prepare detailed working drawings
18CVL77	Geotechnical Engineering Laboratory	1. Physical and index properties of the soil 2. Classify based on index properties and field identification 3. To determine OMC and MDD, plan and assess field compaction program 4.Shearstrengthandconsolidationparameterstoassessstrengthanddeformationcharacteristics 5. In-situshear strength characteristics(SPT-Demonstration)
18CV81	Design Of Pre-Stresseconcrete	1. Understand the requirement of PSC members for present scenario. 2. Analyse the stresses encountered in PSC element during transfer and at working. 3. Understand the effectiveness of the design of PSC after studying losses

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		5. Design PSC beam for different requirements.
18CV821	Bridge Engineering	1. Understand the load distribution and IRC standards. 2. Design the slab and T beam bridges. 3. Design Box culvert, pipe culvert 4. Use bearings, hinges and expansion joints and 5. Design Piers and abutments.
18CV825	Pavement Design	1. Systematically generate and compile required data's for design of pavement (Highway & Airfield). 2. Analyze stress, strain and deflection by boussinesq's, bur mister's and westergaard's theory. 3. Design rigid pavement and flexible pavement conforming to IRC58-2002 an IRC37-2001. 4. Evaluate the performance of the pavement and also develops maintenance statement based on site specific requirements.
18CVP83	Project Work Phase-2	Describe the project and be able to defend it. · Develop critical thinking and problem solving skills. · Learn to use modern tools and techniques. · Communicate effectively and to present ideas clearly and coherently both in written and oral forms. · Develop skills to work in a team to achieve common goal. · Develop skills of project management and finance. · Develop skills of self learning, evaluate their learning and take appropriate actions to improve it. · Prepare them for life-long learning to face the challenges and support the technological changes to meet the societal needs.
18CVS84	Technical Seminar	· Develop knowledge in the field of Civil Engineering and other disciplines through independent learning and collaborative study. · Identify and discuss the current, real-time issues and challenges in engineering & technology. · Develop written and oral communication skills. · Explore concepts in larger diverse social and academic contexts. · Apply principles of ethics and respect in interaction with others. · Develop the skills to enable life-long learning.
18CVI85	Internship /Professional Practice	enable students to get the field exposure and experience

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COURSE OUTCOMES

Second year-2021 scheme

Course Code	Course Name	Course Outcomes (COs)		
18MAT31	Transform calculus, Fourier series and Numerical Techniques	CO-1		To solve ordinary differential equations using Laplace transform
		CO-2		Demonstrate the Fourier series to study the behavior of periodic functions and their applications in system communications, digital signal processing and field theory
		CO-3		To use Fourier series to analyze problems involving continuous-time signals and to apply Z-Transform techniques to solve difference equations
		CO-4		To solve mathematical models represented by initial or boundary value problems involving partial differential equations
		CO-5		Determine the extremals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis
18CS32	Data Structure and Application	CO-1	C203.1	Apply knowledge of various types of data structures, operations and algorithms.
		CO-2	C203.2	Illustrate the working of Linear data structure- Stack, Queue, Lists.
		CO-3	C203.3	Illustrate the working of Non-Linear data structure -Trees, Graphs, Searching and Sorting techniques.
		CO-4	C203.4	Implement all the applications of Data structures in a high-level language.
		CO-5	C203.5	Analyze the Computing problems using appropriate data Structure
		CO-6	C203.6	

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21CS33	Analog and Digital Electronics	CO-1	C313.1	Design and analyze application of analog circuits using photo devices, timer IC, power supply and regulator IC and op-amp.
		CO-2	C313.2	Explain the basic principles of A/D and D/A conversion circuits and develop the same.
		CO-3	C313.3	Simplify digital circuits using Karnaugh Map, and Quine-McClusky Methods.
		CO-4	C313.4	Explain Gates and flip flops and make us in designing different data processing circuits, registers and counters and compare the types.
		CO-5	C313.5	Develop simple HDL programs.
		CO-6	C313.6	

21CS34	Computer Organization and Architecture	CO-1	Explain the organization and architecture of computer systems with machine instructions and programs
		CO-2	Analyze the input/output devices communicating with computer system
		CO-3	Demonstrate the functions of different types of memory devices
		CO-4	Apply different data types on simple arithmetic and logical unit
		CO-5	Analyze the functions of basic processing unit, Parallel processing and pipelining

21CSL35	Object Oriented Programming with JAVA Laboratory	CO-1	Use Eclipse/NetBeans IDE to design, develop, debug Java Projects.
		CO-2	Analyze the necessity for Object Oriented Programming paradigm over structured programming and become familiar with the fundamental concepts in OOP.
		CO-3	Demonstrate the ability to design and develop java programs, analyze, and interpret object-oriented data and document results.
		CO-4	Apply the concepts of multiprogramming, exception/event handling, abstraction to develop robust programs.
		CO-5	Develop user friendly applications using File I/O and GUI concepts.

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21SCR36	Social Connect & Responsibilities	CO-1	CS.1	Understand social responsibility
		CO-2	CS.2	Practice sustainability and creativity
		CO-3	CS.3	Showcase planning and organizational skills
21CS382	Programming with C++	CO-1	CSE.1	Able to understand and design the solution to a problem using object-oriented programming concepts.
		CO-2	CSE.2	Able to reuse the code with extensible Class types, User-defined operators and function Overloading.
		CO-3	CSE.3	Achieve code reusability and extensibility by means of Inheritance and Polymorphism
		CO-4	CSE.4	Identify and explore the Performance analysis of I/O Streams.
		CO-5	CSE.5	Implement the features of C++ including templates, exceptions and file handling for providing programmed solutions to complex problems.
		CO-6	CSE.6	

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COURSE OUTCOMES

Second year-2021 scheme

Course Code	Course Name	Course Outcomes (COs)		
21CS41	Mathematical Foundations for Computing	CO-1		Use the concept of an analytic function and complex potential to solve the problem in electric field theory, utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing
		CO-2		Special function familiarizes the power series solution requires to analyze the engineering problems
		CO-3		Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data
		CO-4		To understand the concept of probability distribution of discrete and continuous random variables
		CO-5		To develop the knowledge of joint probability distribution and validity for testing hypothesis
21CS42	Design and Analysis of Algorithms	CO-1	CSE.1	Analyze the performance of the algorithms, state the efficiency using asymptotic notations and analyze mathematically the complexity of the algorithm.
		CO-2	CSE.2	Apply divide and conquer approaches and decrease and conquer approaches in solving the problems analyze the same
		CO-3	CSE.3	Apply the appropriate algorithmic design technique like greedy method, transform and conquer approaches and compare the efficiency of algorithms to solve the given problem
		CO-4	CSE.4	Apply and analyze dynamic programming approaches to solve some problems. and improve an algorithm time efficiency by sacrificing space
		CO-5	CSE.5	Apply and analyze backtracking, branch and bound methods and to describe P, NP and NP Complete problems
		CO-6	CSE.6	

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21CS43	Microcontroller and embedded system	CO-1	Explain C-Compilers and optimization
		CO-2	Describe the ARM microcontroller's architectural features and program module
		CO-3	Apply the knowledge gained from programming on ARM to different applications.
		CO-4	Program the basic hardware components and their application selection method.
		CO-5	Demonstrate the need for a real-time operating system for embedded system applications
		CO-6	Explain C-Compilers and optimization
21CS44	Operating Systems	CO-1	Identify the structure of an operating system and its scheduling mechanism. Demonstrate the allocation of resources for a process using scheduling algorithm.
		CO-2	Demonstrate the allocation of resources for a process using scheduling algorithm.
		CO-3	Identify root causes of deadlock and provide the solution for deadlock elimination.
		CO-4	Explore about Virtual memory management & Implementation of File system.
		CO-5	Analyze Storage Structures and Implement Customized Case study.
21BE45	Biology for Engineers	CO 1.	Elucidate the basic biological concepts via relevant industrial applications
		CO 2.	Evaluate the principles of design and development for exploring novel bio engineering
		CO 3.	Collaborate the concepts of biomimetics for specific requirements
		CO 4.	Think critically towards exploring innovative bio-based solutions for socially relevant problems
		CO 5.	

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21CSL46	Python Programming Laboratory	CLO 1.	Demonstrate the use of IDLE or PyCharm IDE to create Python Applications.
		CLO 2.	Using Python programming language to develop programs for solving real-world problems
		CLO 3.	Implement the Object-Oriented Programming concepts in Python.
		CLO 4.	Appraise the need for working with various documents like Excel, PDF, Word and Others.
		CLO 5.	Demonstrate regular expression using python programming
21CS482	Unix and Shell Programming	CO 1.	Know the basics of Unix concepts and commands.
		CO 2.	Evaluate the UNIX file system.
		CO 3.	Apply Changes in file system.
		CO 4.	Understand scripts and programs.
		CO 5.	Analyze Facility with UNIX system process
21UH49	Universal Health Values	CO 1.	The students start exploring themselves: get comfortable with each other and with the teacher; they start appreciating the need and relevance for the course.
		CO 2.	The students are able to list down activities related to proper upkeep of the body and practice them in their daily routine.
		CO 3.	The students are able to see that respect is right evaluation, and only right evaluation leads to fulfillment in relationship.
		CO 4.	The students are able to differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them.
		CO 5.	The students are able to present sustainable solutions to the problems in society and nature. They are also able to see that these solutions are practicable and draw roadmaps to achieve them.

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Computer Science Engineering
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COURSE OUTCOMES

Third year-2018 scheme

Course Code	Course Name	Course Outcomes (COs)		
18CS51	Management and Entrepreneurship for IT Industry	CO-1	C301.1	To identify the relevance of management concepts
		CO-2	C301.2	To describe importance, discuss and relate management techniques adopted within an organization
		CO-3	C301.3	To apply management techniques for meeting current and future management challenges faced by the organization
		CO-4	C301.4	To compare the management theories and models critically and to inspect and question its validity in the real world
		CO-5	C301.5	To assess and modify different theories of management so as to relate it to current management challenges
		CO-6	C301.6	

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18CS52	Computer Networks	CO-1	C302.1	Explain principles of application layer protocols
		CO-2	C302.2	Recognize transport layer services and infer UDP and TCP protocols
		CO-3	C302.3	Classify routers, IP and Routing Algorithms in network layer
		CO-4	C302.4	Understand and apply different security algorithms
		CO-5	C302.5	Describe Multimedia Networking and Network Management
		CO-6	C302.6	
18CS53	Database Management System	CO-1	c313.1	Identify, analyze and define database objects
		CO-2	c313.2	enforce integrity constraints on a database using RDBMS
		CO-3	c313.3	Use Structured Query Language (SQL) for database manipulation
		CO-4	c313.4	Design and build simple database systems
		CO-5	c313.5	Develop application to interact with databases
		CO-6	c313.6	

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18CS54	Automata Theory and Computation	CO-1	Introduce core concepts in Automata and Theory of Computation.
		CO-2	Learn how to translate between different models of Computation.
		CO-3	Design Grammars and Automata for different Language classes and become Knowledgeable.
		CO-4	Develop skills in formal reasoning and reduction of a problem to a formal model, with an emphasis on semantic precision and conciseness
		CO-5	Classify a problem with respect to different models of Computation.
		CO-6	
18CS55	Application Development using Python	CO-1	Understand the graphical user interface and web interface Employ MapReduce programming model to process the big data. Understand various machine learning algorithms for Big Data Analytics, Web Mining and Social Network Analysis Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data
		CO-2	Explore the human interaction speed and human characteristics considered while designing the interface
		CO-3	Understanding the concepts of system menus and navigation scheme.
		CO-4	Understand various windows creation and connection between menus and windows.
		CO-5	Illustrate the concepts regarding the screen-based controls and testing concepts
		CO-6	

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18CS56	UNIX Programming	CO-1	C506.1	Explain Unix architecture file system and basics commands
		CO-2	C506.2	illustrate the shell programming and to write shell scripts
		CO-3	C506.3	Categorize compare and make use of Unix system calls
		CO-4	C506.4	Build an application/service over a Unix system
		CO-5	C506.5	
		CO-6	C506.6	
18CSL57	Computer Network Lab	CO-1	understand and analyze various networking protocols	
		CO-2	Demonstrate the working of different concepts of networking	
		CO-3	Implement, analyze and evaluate networking protocols in NS2 / NS3	
18CSL58	DBMS Laboratory with Mini Project	CO-1	C116.1	Create, Update and query on the database
		CO-2	C116.2	Demonstrate the working of different concepts of DBMS
		CO-3	C116.3	Implement, analyze and evaluate the project developed for an application.
		CO-4	C116.4	
		CO-5	C116.5	
		CO-6	C116.6	

18CS61	System Software and Compiler Design	CO-1	C311.1	Implement the System Software such as Assemblers and Macro processors.
		CO-2	C311.2	Define the System Software such as Loaders and Linkers.
		CO-3	C311.3	Interpret the necessity of various system software's to generate executable files.
		CO-4	C311.4	Demonstrate the theory of Lexical Analyzers, Parser and Code Generator of Compiler.
		CO-5	C311.5	Describe the front-end and Back-end compiler and their importance.
		CO-6	C311.6	
18CS62	Computer Graphics	CO-1	C602.1	Design and implement algorithms for 2D graphics primitives and attributes.
		CO-2	C602.2	Illustrate Geometric transformations and viewing on 2D objects.
		CO-3	C602.3	Apply concepts of clipping, Geometric transformations on 3D objects, 3D viewing and Illumination Models.
		CO-4	C602.4	Apply concepts of visible surface detection and 3D viewing,
		CO-5	C602.5	Decide suitable hardware and software for developing graphics packages using OpenGL and also Concepts of Curves
17CS63	Web Technology and its application	CO-1		Adapt HTML and CSS syntax and semantics to build web pages
		CO-2		Construct and visually format tables and forms using HTML and CSS
		CO-3		Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically.
		CO-4		Appraise the principles of object oriented development using PHP
		CO-5		Inspect JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core features

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18CS643	Cloud Computing	CO-1	C604.1	Explain the fundamentals of cloud computing, virtualization.
		CO-2	C604.2	Illustrate architecture of cloud.
		CO-3	C604.3	Develop programming in cloud environment.
		CO-4	C604.4	Define the platform for development of cloud applications.
		CO-5	C604.5	List the applications of cloud.

18CSL66	System Software Lab	CO-1	To make students familiar with Lexical Analysis and Syntax Analysis phases of Compiler Design and implement programs on these phases using LEX & YACC tools and/or C/C++/Java
		CO-2	To enable students to learn different types of CPU scheduling algorithms used in operating system.
		CO-3	To make students able to implement memory management - page replacement and deadlock handling algorithms
		CO-4	
		CO-5	
		CO-6	

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18CSL67	Computer Graphics Laboratory with Mini Project	CO-1	C307.1	Apply the concepts of computer graphics
		CO-2	C307.2	Illustrate Geometric transformations on both 2D and 3D objects.
		CO-3	C307.3	Apply concepts of clipping and visible surface detection in 2D and 3D viewing, and Illumination Models
		CO-4	C307.4	Implement computer graphics applications using OpenGL
		CO-5	C307.5	Animate real world problems using OpenGL
		CO-6	C307.6	

18CSMP68	Mobile Application Development	CO-1	Create, test and debug Android application by setting u Android development environment
		CO-2	Implement adaptive, responsive user interfaces that work across a wide range of devices
		CO-3	Infer long running tasks and background work in Android Application.
		CO-4	Demonstrate methods in storing, sharing and retrieving data in android application

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COURSE OUTCOMES

Fourth year-2018 scheme

Course Code	Course Name	Course Outcomes (COs)		
18CS71	Artificial Intelligence and Machine Learning	CO-1	C701.1	Appraise the theory of Artificial intelligence and Machine Learning
		CO-2	C701.2	Illustrate the working of AI and ML Algorithms
		CO-3	C701.3	Demonstrate the application of AI and ML
		CO-4	C701.4	
		CO-5	C701.5	
		CO-6	C701.6	

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18CS72	Big data analytics	CO-1	BDA.1	Understand fundamentals of Big Data analytics. Employ MapReduce programming model to process the big data. Understand various machine learning algorithms for Big Data Analytics, Web Mining and Social Network Analysis Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data
		CO-2	BDA.2	Explore the Hadoop framework and Hadoop Distributed File System Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data
		CO-3	BDA.3	Employ MapReduce programming model to process the big data.
		CO-4	BDA.4	Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data
		CO-5	BDA.5	Understand various machine learning algorithms for Big Data Analytics, Web Mining and Social Network Analysis
		CO-6	BDA.6	

18CS734	User Interface Design	CO-1	Understand the graphical user interface and web interface Employ MapReduce programming model to process the big data. Understand various machine learning algorithms for Big Data Analytics, Web Mining and Social Network Analysis Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data
		CO-2	Explore the human interaction speed and human characteristics considered while designing the interface
		CO-3	Understanding the concepts of system menus and navigation scheme.
		CO-4	Understand various windows creation and connection between menus and windows.
		CO-5	Illustrate the concepts regarding the screen-based controls and testing concepts
		CO-6	

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18CS744	Cryptography	CO-1	Define cryptography and its principles
		CO-2	Explain Cryptography algorithm
		CO-3	Illustrate Public and Private key cryptography
		CO-4	Explain Key management, distribution and certification
		CO-5	Explain authentication protocols and tell about IPSec
18CSL76	Artificial Intelligence And Machine Learning Laboratory	CO-1	Implement and demonstrate AI and ML algorithms.
		CO-2	Evaluate different algorithms

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18CS81	Internet of Things	CO-1	C408.1	Interpret the impact and challenges posed by IoT networks leading to new architectural models.
		CO-2	C408.2	Compare and contrast the deployment of smart objects and the technologies to connect them to network
		CO-3	C408.3	Appraise the role of IoT protocols for efficient network communication.
		CO-4	C408.4	Elaborate the need for Data Analytics and Security in IoT.
		CO-5	C408.5	Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry
		CO-6	C408.6	
18CS822	Storage Area Networks	CO-1	C408.1	Identify key challenges in managing information, virtualization, analyze various components of data center environment and performance parameter of disk drive
		CO-2	C408.2	Interpret various levels and implementations of RAID, Components and types of Intelligent Storage Systems, SAN, FC SAN and its components
		CO-3	C408.3	Interpret iSCSI, FCIP and various aspects of NAS
		CO-4	C408.4	Describe various aspects of BC, archives and backup
		CO-5	C408.5	Apply the techniques used for local, remote replication and secure storage infrastructure
		CO-6	C408.6	

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Department of Electronics & Communication Engineering

2021 BATCH Course Outcomes

2021 Scheme			
Course code	**Subject code**	**Course Name**	Course out comes: on completion of the course the student will be able to
C101	21MAT11	CALCULUS AND DIFFERENTIAL EQUATIONS	Apply the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of a curve...
			Learn the notion of partial differentiation to calculate rate of change of multivariate functions and solve problems related to composite functions and Jacobian
			Solve first-order linear/nonlinear ordinary differential equations analytically using standard methods.
			Demonstrate various models through higher order differential equations and solve such linear ordinary differential equations
			Test the consistency of a system of linear equations and to solve them by direct and iterative methods.
C102	21PHY12/ 22	ENGINEERING PHYSICS	Interpret the types of mechanical vibrations and their applications, the role of Shock waves in various fields.
			Demonstrate the quantisation of energy for microscopic system.
			App[y LASER and Optical fibers in opto electronic system. 4. Illustrate merits of quantum free electron theory and applications of Hall effect.
			Analyse the importance of XRD and Electron Microscopy in Nano material characterization.
C103	21ELE13/2	BASIC ELECTRICAL	To explain the laws used in the analysis of DC and AC.
			To explain the behavior of circuit elements in single-phase circuits.

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	1ELE23	ENGINEERING	To explain the generation of three-phase power and operation of three-phase circuits.
			To explain the construction and operation of transformers, DC generators and motors, inductionmotors, and synchronous generators
			To explain electric transmission and distribution, electricity billing and, equipment, and personalsafety measures.
C104	21CIV14/24	ELEMENTS OF CIVIL ENGINEERING AND MECHANICS	Understand the various fields of civil engineering.
			Compute the resultant of a force system and resolution of a force
			Comprehend the action for forces, moments, and other types of loads on rigid bodies and compute the reactive forces.
			Locate the centroid and compute the moment of inertia of regular and built-upsections.
			Analyze the bodies in motion.
C105	21EVN15/25	ENGINEERING VISUALIZATION	Understand and visualize the objects with definite shape and dimensions
			Analyze the shape and size of objects through different views
			Develop the lateral surfaces of the object
			Create a 3D view using CAD software.
			Identify the interdisciplinary engineering components or systems through its graphical representation.
C106	21PHYL16/26	ENGINEERING PHYSICS LABORATORY	Understand the measuring techniques
			Operate different instruments and be capable to analyse the experimental results.
			Construct the circuits and theiranalysis.
C107	21ELE17/27	BASICELECTRICALENGINEERINGLABORATORY	Verify KCL and KVL and maximum power transfer theorem for DC circuits.
			Compare power factors of different types of lamps.
			Demonstrate them measurement of the impedance of an electrical circuit and power consumed by a 3-phase load

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			Analyze two-way and three-way control of lamps.
			Explain the effects of open and short circuits in simple circuits.
			Interpret the suitability of earth resistance measured.
C108	21IDT19/29	INNOVATION and DESIGN THINKING	Appreciate various design process
			Generate and develop design ideas through different technique.
			Identify the significance of reverse Engineering to Understand products
			Draw technical drawing for design ideas
C109	21MAT21	ADVANCED CALCULUS AND NUMERICAL METHODS	Apply the concept of change of order of integration and change of variables to evaluate multiple integrals and their usage in computing the area and volume.
			Illustrate the applications of multivariate calculus to understand the solenoidal and irrotational vectors and also exhibit the inter dependence of line, surface and volume integrals.
			Formulate physical problems to partial differential equations and to obtain solution for standard practical PDE's.
			Apply the knowledge of numerical methods in modelling of various physical and engineering phenomena.
			Solve first order ordinary differential equations arising in engineering problems.
C110	21CHE12/22	ENGINEERING CHEMISTRY	Discuss the electrochemical energy systems such as electrodes and batteries
			Explain the fundamental concepts of corrosion, its control and surface modification methods namely electroplating and electroless plating
			Enumerate the importance, synthesis and applications of polymers. Understand properties and application of nanomaterials
			Describe the principles of green chemistry, understand properties and application alternative fuels.
			Illustrate the fundamental principles of water chemistry, applications of volumetric and analytical

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			instrumentation.
C111	21PSP23/13	PROBLEM-SOLVING THROUGH PROGRAMMING	Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.
			Apply programming constructs of C language to solve the real world problem
			Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting
			Explore user-defined data structures like structures, unions and pointers in implementing solutions
			Design and Develop Solutions to problems using modular programming constructs using functions
C112	21ELN14/24	BASIC ELECTRONICS & COMMUNICATION ENGINEERING	Describe the concepts of electronic circuits encompassing power supplies, amplifiers and oscillators
			Present the basics of digital logic engineering including data representation, circuits and the microcontroller system with associated sensors and actuators.
			Discuss the characteristics and technological advances of embedded systems.
			Relate to the fundamentals of communication engineering spanning from the frequency spectrum to the various circuits involved including antennas.
			Explain the different modes of communications from wired to wireless and the computing involved.
C113	21EME15/25	ELEMENTS OF MECHANICAL ENGINEERING	Understand basic concepts of mechanical engineering in the fields of energy and its utilization, materials technology, manufacturing techniques, and transmission systems through demonstrations.
			Understand the application of energy sources in Power generation and utilization, Engineering materials, manufacturing, and machining techniques leading to the latest advancements and transmission systems in day to day activities
			Apply the skills in developing simple mechanical elements and processes

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C114	21CHEL16 /26	ENGINEERING CHEMISTRY LABORATORY	Determine the pKa and coefficient of Viscosity of a given organic liquid
			Estimate the amount of substance present in the given solution using Potentiometer Conductometric and Colorimetric
			Determine the total hardness and chemical oxygen demand in the given solution by volumetric analysis method
			Estimate the percentage of Nickel, copper and Iron in the given analyte solution by titration method.
			Demonstrate flame photometric estimation of sodium & potassium and the synthesis of nanomaterials by Precipitation method.
C115	21CPL27/1 7	COMPUTER PROGRAMMING LABORATORY	Define the problem statement and identify the need for computer programming
			Make use of C compiler, IDE for programming, identify and correct the syntax and syntactic errors in programming
			Develop algorithm, flowchart and write programs to solve the given problem 4.
			Demonstrate use of functions, recursive functions, arrays, strings, structures and pointers in problem solving.
C201	21MAT31	TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES	To solve ordinary differential equations using Laplace transform.
			Demonstrate the Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory.
			To use Fourier transforms to analyze problems involving continuous-time signals and to apply ZTransform techniques to solve difference equations
			To solve mathematical models represented by initial or boundary value problems involving partial differential equations 5. Determine the extremals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.
C202	21EC32	DIGITAL SYSTEM	Simplify Boolean functions using K-map and Quine-McCluskey minimization technique using

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		DESIGN USING VERILOG	Flip Flops.
			Analyze and design for combinational logic circuits.
			Analyze the concepts of Flip Flops (SR, D, T and JK) and to design the synchronous sequential circuits
			Model Combinational circuits (adders, subtractors, multiplexers) and sequential circuits using Verilog descriptions.
C203	21EC33	BASIC SIGNAL PROCESSING	Understand the basics of Linear Algebra
			Analyse different types of signals and systems
			Analyse the properties of discrete time signals & systems
			Analyse discrete time signals & systems using Z transforms
C204	21EC34	ANALOG ELECTRONIC CIRCUITS	Understand the characteristics of BJTs and FETs for switching and amplifier circuits.
			Design and analyze FET amplifiers and oscillators with different circuit configurations and biasing conditions.
			Understand the feedback topologies and approximations in the design of amplifiers and oscillators
			Design of circuits using linear ICs for wide range applications such as ADC, DAC, filters and timers.
			Understand the power electronic device components and its functions for basic power electronic circuits.
C205	21ECL35	ANALOG AND DIGITAL ELECTRONICS LAB	Design and analyze the BJT/FET amplifier and oscillator circuits.
			Design and test Opamp circuits to realize the mathematical computations, DAC and precision rectifiers.
			Design and test the combinational logic circuits for the given specifications.

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			Test the sequential logic circuits for the given functionality.
			Demonstrate the basic electronic circuit experiments using SCR and 555 timer.
C206	21EC381	LD (LOGIC DESIGN) LAB USING PSPICE / MULTISIM	Demonstrate the truth table of various expressions and combinational circuits using logic gates.
			Design various combinational circuits such as adders, subtractors, comparators, multiplexers and code converters.
			Construct flips-flops, counters and shift registers.
			Design and implement synchronous counters.
C207	21EC41	MATHS FOR COMMUNICATION ENGINEERS	Recall the basic laws and definitions (with mathematical representations) in Electric and Magnetic fields.
			Apply the basic laws of Electric and Magnetic fields to arrive at Divergence Theorem, Current continuity Equation, Curl, Stokes' theorem.
			Apply Electric and Magnetic field concepts to arrive at Maxwell's equations, Electromagnetic wave equations and Poynting's theorem (Important concepts related to Communication link).
			Recall the definitions related to Random variables and Random Processes.
			Model the Random events in the Communication set-up and determine useful statistical parameters.
C208	21EC42	DIGITAL SIGNAL PROCESSING	Determine response of LTI systems using time domain and DFT techniques
			Compute DFT of real and complex discrete time signals
			Compute DFT using FFT algorithms
			Design FIR and IIR Digital Filters
			Design of Digital Filters using DSP processor
C209	21EC43	CIRCUITS & CONTROLS	Analyse and solve Electric circuit, by applying, loop analysis, Nodal analysis and by applying network Theorems.
			Deduce transfer function of a given physical system, from differential equation representation or

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			Block Diagram representation and SFG representation.
			Calculate time response specifications and analyse the stability of the system.
			Draw and analyse the effect of gain on system behaviour using root loci. Evaluate two port parameters of a network and Apply Laplace transforms to solve electric networks
			Perform frequency response Analysis and find the stability of the system.
			Represent State model of the system and find the time response of the system.
C210	21EC44	COMMUNICATION THEORY	Understand the amplitude and frequency modulation techniques and perform time and frequency domain transformations.
			Identify the schemes for amplitude and frequency modulation and demodulation of analog signals and compare the performance.
			Characterize the influence of channel noise on analog modulated signals.
			Understand the characteristics of pulse amplitude modulation, pulse position modulation and pulse code modulation systems
			Illustration of digital formatting representations used for Multiplexers, Vocoders and Video transmission.
C211	21ECL46	COMMUNICATION LABORATORY	Demonstrate the AM and FM modulation and demodulation by representing the signals in time and frequency domain.
			Design and test the sampling, Multiplexing and PAM with relevant circuits.
			Demonstrate the basic circuitry and operations used in AM and FM receivers.
			Illustrate the operation of PCM and delta modulations for different input conditions.
C212	21EC481	EMBEDDED C BASICS	Write C programs in 8051 for solving simple problems that manipulate input data using different instructions of 8051 C.
			Develop testing and experimental procedures on 8051 Microcontroller, analyze their operation

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			under different cases.
			Develop programs for 8051 Microcontroller to implement real world problems.
			Design and Develop Mini projects

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Department of Electronics & Communication Engineering

Course Outcomes (2018-2022 Batch)

Subject Name / Subject code/ Course code	Course Outcome Number	Course out comes: On completion of the course the student will be able to
ENGINEERING MATHEMATICS –I /18MAT11/C101	C101.1	Find nth derivative of standard functions, Radius of Curvature and angle between curves of functions in Cartesian and Polar form.
	C101.2	Find Taylor's and Maclaurin's series of the functions, the limits in indeterminate form and to solve the problems on Partial differentiation.
	C101.3	Find the velocity, acceleration, gradient, curl, divergence using vector identities in two and three dimensions.
	C101.4	Find the integrals involving Sinnx, Cosnx, Sinnx Cosnx between the limits 0 to $\pi/2$.
	C101.5	Solve the ordinary first order and first-degree differential equations and system of linear equations by using different techniques of Linear Algebra.
ENGINEERING PHYSICS/18PHY12/C102	C102.1	Explain the concept, types and applications of oscillations and shockwaves.
	C102.2	Analyse the elastic properties of materials for engineering applications.
	C102.3	Describe the concept and types of Maxwell Equations, Electromagnetic waves and optical fibers.
	C102.4	Describe the fundamentals and applications of quantum mechanics through Schrodinger's wave equation and Laser.
	C102.5	Differentiate the conductivity of conductors, semiconductors based on quantum free electron theory and Dielectrics.

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BASIC ELECTRICAL ENGINEERING /18ELE23/C103	C103.1	Analyse D.C circuits and Explain fundamentals in AC system.
	C103.2	Analyze single phase and three phase A.C circuits.
	C103.3	Explain the construction, operation and performanceof single-phase transformers and domestic wiring concepts together with protective devices.
	C103.4	Explain the construction, working and performance of DC machines.
	C103.5	Explain the construction and operation of AC rotating machines.
ELEMENTS OF CIVIL ENGINEERING AND MECHANICS/ 18CIV14/C104	C104.1	Understand the applications of various fields of Civil Engineering
	C104.2	Compute the resultant of given force system subjected to various loads.
	C104.3	Explain the comprehend the action of Forces, Moments and other loads on systems of rigid bodies and compute the reactive forces that develop as a result of the external loads.
	C104.4	Demonstrate to locate the Centroid and compute the Moment of Inertia of regular and built-up sections.
	C104.5	Apply Knowledge of kinetics and kinematics, to understand about curvilinear and rectilinear motion and to analyse the various problems based on these.
COMPUTER AIDED ENGINEERING/ DRAWING 18EGDL15/C105	C105.1	Demonstrate the usage of CAD software.
	C105.2	Draw orthographic projections of points, lines, planes and solids.
	C105.3	Generate the development of lateral surfaces of solids and isometric projections of solids
	C106.1	Formulate, Conduct and inference of the Engineering physics experiments

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ENGINEERING PHYSICS LAB /18PHY16/C106	C106.2	Characterize the conductor, semiconductor and Dielectric materials.
	C106.3	Determine the physical parameter in optical experiments.
	C106.4	Find the mechanical properties of materials.
	C106.5	Analyse the electrical resonance and Magnetic effect of current.
BASIC ELECTRICAL ENGINEERING LAB /18ELEL17/C107	C107.1	Demonstrate basic electrical laws and discuss the effects of open and short circuits in simple electrical circuits.
	C107.2	Compare the power consumed and power factor of Incandescent lamps, Fluorescent Lamps, and LED lamps.
	C107.3	Determine the earth resistance and describe the operation of two-way and three-way control of lamps.
	C107.4	Determine the resistance and inductance of a choke coil.
	C107.5	Measure the three-phase power consumed in three phase star and delta loads by establishing the relation between phase and line quantities.
ENGINEERING MATHEMATICS – II/18MAT21/C108	C108.1	Solve linear and nonlinear ordinary differential equations of higher degree.
	C108.2	Solve the Partial differential equations of Fluid Mechanics, Electromagnetic Theory & Heat transfer
	C108.3	Indicate Area, Volume, Moment of Inertia of Plane and Solids using double and triple integrals.
	C108.4	Relate Beta and Gamma functions and its properties.

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	C108.5	Solve initial and boundary value problems of ODE using Laplace Transforms.
ENGINEERING CHEMISTRY/18CHE22/C109	C109.1	Analyse use of thermodynamics concepts to understand and to calculate potential value and nature of different classes of batteries applications
	C109.2	Analyse the understand nature of corrosion of different metals, causes and their protection through different techniques
	C109.3	Analyse calorific value of solid or liquid fuel and understand utilization of various energy sources
	C109.4	Explain the source sand effects of environmental pollution, the knowledge of waste management and assessment of water quality parameters
	C109.5	Use instruments for various quantitative analysis and prepare the nano-materials and their applications
C PROGRAMMING FOR PROBLEM SOLVING/18CPS23/C110	C110.1	Explain the basic concepts of computer systems, storage device, OS and networking and fundamentals of C and techniques of solving problems
	C110.2	Make use of the basic principles of Programming in C language
	C110.3	Construct a programming solution to the given problem using C
	C110.4	Utilize the concepts of arrays and string with their simple applications
	C110.5	Apply and modularize the given problem using functions and structures
BASIC ELECTRONICS /18ELN24/C111	C111.1	Describe the operation and applications of basic semiconductor devices like diodes, transistors and Zener diodes.
	C111.2	Describe the operation of special semiconductor devices like SCR, JFET's, CMOSFET's

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	C111.3	Describe the operation of IC devices like operational amplifiers and their applications.
	C111.4	Describe the advantages of feedback in amplifiers and their applications.
	C111.5	Describe the fundamentals of digital electronics and their applications in computing devices.
	C111.6	Describe the principle of operation of communication system and cellular communication systems.
ELEMENTS OF MECHANICAL ENGINEERING /18EME25/C112	C112.1	Explain different sources of energy and its conversion
	C112.2	Explain the conversion of energy by prime movers.
	C112.3	Explain the different machine tool operations and basics of Robotics and Automation.
	C112.4	Explain basic engineering materials and identify its application.
	C112.5	Explain the working principle of refrigeration and air conditioning.
ENGINEERING CHEMISTRY LAB /18CHEL26/C113	C113.1	Analyse hardness of water and quality of cement.
	C113.2	Analyse copper and iron metal from its alloy and ore.
	C113.3	Analyse waste water and Bleaching powder sample.
	C113.4	Estimate the strength and concentration of analytes by pH, Potentiometer & Conductometer
	C113.5	Measure the viscosity coefficient of organic liquids & Colorimetric estimation of Copper

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COMPUTER PROGRAMMING LAB/18CPL27/C114	C114.1	Write flowcharts, algorithms and program for simple problems
	C114.2	Identify Syntax and logical errors to execute a program
	C114.3	Develop iterative and recursive programs
	C114.4	Demonstrate use of functions, arrays, strings, structures and pointers in problem solving
ENGINEERING MATHEMATICS – III/18MAT 31/C201	C201.1	Analyse the principle of functioning of basic communication systems and mobile phones.
	C201.2	Find the Fourier and inverse Fourier transforms of a periodic function.
	C201.3	Solve the finite difference equations using Z-transforms.
	C201.4	Apply the concept of statistics for curve fitting, correlation and regression
	C201.5	Analyse and apply proper numerical techniques to solve the algebraic/transcendental equation, to find polynomials, intermediate values and evaluation of integrals
	C201.6	Find the integrals using Green's, Stokes and Gauss divergence theorem and extremal of a functional.
NETWORK THEORY/ 18EC32/C202	C202.1	Determine current and voltages using source transformation/source shifting/Mesh /nodal analysis and reduce given network using star delta transformation/source transformation/source shifting
	C202.2	Solve network problems by applying superposition/Thevenin's/Norton's/Maximum power transfer/Millman network theorems and electrical loss to reduce circuit complexity and arrive at feasible solutions
	C202.3	Solve the given network using specified two port network parameters like Z or Y or T or h

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	C202.4	Calculate current and voltages for the given circuit under transient conditions
	C202.5	Apply the Laplace transform to solve the given network and also to understand the concept of resonance.
ELECTRONIC DEVICES/18EC33/C203	C203.1	Explain the basics of semiconductors and illustrate application of Hall effect
	C203.2	Explain the construction and working principles of PN junction devices and select optoelectronic devices to different applications
	C203.3	Derive the mathematical model for BJT and list the different applications of BJT
	C203.4	Explain the construction and working principles of MOSFET and prove MOS as a capacitor
	C203.5	Illustrate the fabrication process of semiconductor devices like PN junction diode, transistor CMOS and process of integration
DIGITAL SYSTEM DESIGN/18EC34/C204	C204.1	Develop simplified switching equations using Karnaugh Maps and Quine McClusky techniques
	C204.2	Apply the knowledge of decoders, encoders, multiplexers and demultiplexers to generate specific functions and describe the operation of adders, subtractors and comparators
	C204.3	Analyse the working of Latches and Flip Flops (SR, D, T and JK) and design synchronous/asynchronous counters.
	C204.4	Develop Mealy/Moore Models and state diagrams for the given clocked sequential circuits
	C204.5	Apply the knowledge of flip flops in the design of various digital circuits
COMPUTER ORGANIZATION AND	C205.1	Explain the basic organization of computer system.

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ARCHITECTURE /18EC35/C205	C205.2	Apply the different addressing modes and instructions to write assembly language programmes
	C205.3	Explain different ways of accessing input output device including interrupts
	C205.4	Illustrate the organization of different types of semiconductor and other secondary storage memories
	C205.5	Illustrate simple processor organization based on hard wired control and micro program control
POWER ELECTRONICS AND INSTRUMENTATION 18EC36/C206	C206.1	classify the power electronic devices based on their performance characteristics
	C206.2	Analyse and design phase-controlled convertors and choppers for applications
	C206.3	Illustrate the working operation of various types of invertors and SMPS, Identify the various types of errors and calculate the same and describe the operation of ammeters, voltmeters and multimeters and develop circuits for multi range Ammeters and Voltmeters
	C206.4	Analyse and design AC and DC bridges, Explain the operation of digital voltmeters and multimeters.
	C206.5	Classify different types of transducers for different applications and Explain instrumentation amplifiers
ELECTRONICS DEVICES AND INSTRUMENTATION LAB/ 18ECL37/C207	C207.1	Design and Test rectifiers, clipping circuits, clamping circuits and voltage regulators
	C207.2	Determine the parameters from the characteristics of JFET and MOSFET devices
	C207.3	Evaluate BJT amplifiers in CE configuration as well as JFET/MOSFET amplifiers

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	C207.4	Test a power amplifier and compute its conversion efficiency
	C207.5	Design and test various types of oscillators
DIGITAL SYSTEM DESIGN LAB /18ECL37/C207	C208.1	Apply DE Morgan's theorem to simplify the various expressions, combinational circuits and verify the functionality.
	C208.2	Design, test and evaluate combinational circuits such as adders, subtractors, comparators, multiplexers and demultiplexers.
	C208.3	Construct flipflops, Counters and shift registers
	C208.4	Simulate serial adder and binary multiplier
ENGINEERING MATHEMATICS – IV/18MAT 41/C209	C209.1	Apply appropriate numerical methods to solve ordinary differential equations
	C209.2	Derive and Apply Bessel's function, Legendre's polynomials & Rodrigue's formula, and its properties.
	C209.3	Solve problems on analytic functions using Cauchy–Riemann equations, complex line integrals, conformal and bilinear transformations.
	C209.4	Analyze and solve the probability distribution problems.
	C209.5	Analyze and interpret the hypothesis for the given sampling distribution and to solve stochastic process problems.
ANALOG ELECTRONIC/18EC42/C210	C210.1	Design and analyse BJT/FET amplifier circuits
	C210.2	Analyse and explain different feedback amplifier and power amplifiers.
	C210.3	Explain the functioning of linear IC741 and design applications using 741 and 555 timer

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CONTROLS SYSTEM/18EC43/C211	C211.1	Develop mathematical model of Mechanical, Electrical and Electro mechanical systems
	C211.2	Apply block diagram reduction techniques and signal flow graph method to determine Transfer function of a system
	C211.3	Determine the time domain specification for first and second order system
	C211.4	Apply RH criterion, root locus technique, Nyquist plot, polar plots and Bode plots to analyse and determine the stability of a system
	C211.5	Apply state variable analysis to develop control system models
ENGINEERING STATISTICS AND LINEAR ALGEBRA /18EC44/C212	C212.1	Analyse and evaluate single multiple random variables
	C212.2	Identify and associate random variables and random process in communication events
	C212.3	Analyse and model random events in typical communication events to extract quantitative statistical parameters.
	C212.4	Analyse and model typical signal sets in terms of basis functions
	C212.5	Demonstrate the ease of analysis, employing basis function, statistical representation and eigen values.
SIGNALS AND SYSTEMS /18EC45/C213	C213.1	Analyse and classify the signals and determine the properties of continuous/discrete time systems
	C213.2	Analyse and compute the response of a Continuous and Discrete LTI system using convolution integral and convolution sum.
	C213.3	Analyse and determine the spectral characteristics of continuous and discrete time signal using Fourier analysis.

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	C213.4	Analyse discrete time systems using Z-transforms.
MICROCONTROLLER/18EC46/C214	C214.1	Define an embedded system and describe the architecture of 8-51 micro-controller.
	C214.2	Apply 8-51 instructions to develop embedded system applications
	C214.3	Apply the concepts of stacks and subroutines in designing 8-51 based embedded systems
	C214.4	Apply the concepts of timers and UART in delay generation and serial communication.
	C214.5	Explain interrupts and apply Interfacing concepts to develop 8-51 based Embedded systems
MICROCONTROLLER LAB /178CL47/C215	C215.1	Develop assembly language programs to solve the problems that manipulate input data using 8-51 instruction set
	C215.2	Develop simple 8-51 based embedded system applications by Interfacing different input and output devices
	C215.3	Develop embedded C program for serial communication by interfacing 8-51 to COM port of PC.
ANALOG CIRCUITS LAB/18ECL48/C216	C216.1	Design Amplifiers and Oscillators using BJT/FETs and evaluate their performance.
	C216.2	Design analog circuits using OPAMPs / 555 timer for different applications
	C216.3	Simulate and analyse analog circuits that uses ICs for different electronic applications.
TECHNOLOGICAL INNOVATION AND	C301.1	Illustrate the fundamental concepts of Management and Planning

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MANAGEMENT ENTREPRENEURSHIP 18ES51/17ES51/C301	C301.1	Examine various functions of management and to differentiate various leadership styles
	C301.1	Describe the functions of Entrepreneurs and their social responsibilities and select a best Entrepreneurship model for the required domain of establishment
	C301.1	Describe the role and contributions of family business and Analyze the components in developing a business plan and Identify various sources of funding and Institutions supporting Entrepreneurs
	C301.1	Apply different project network analysis techniques to design a project and understand the various levels of project management
DIGITAL SIGNAL PROCESSING/18EC52/C302	C302.1	Determine the response of LTI system using time domain and DFT techniques.
	C302.2	Solve DFT of real and complex discrete time signals.
	C302.3	Computation of DFT using FFT algorithms and linear filtering approach
	C302.4	Solve problems on digital filter design and realise using discrete structures.
	C302.5	Illustrate the architecture of DSP processor and implement the basic concepts
PRINCIPALS OF COMMUNICATION SYSTEM/ 18EC53/C303	C303.1	Analyse and differentiate amplitude modulation and demodulation techniques
	C303.2	Analyse frequency modulation and demodulation techniques
	C303.3	Analyse and compute the performance of AM and FM in presence of noise at the receiver
	C303.4	Analyse and compute the performance of digital formatting processes

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	C303.4	Design/demonstrate/explain the use of digital formatting in multiplexer, vocoders, and video transmission
INFORMATION THEORY AND CODING/18EC54/C304	C304.1	Apply the concept of measure of information, entropy, rate of information for dependent and independent sources.
	C304.2	Apply Shannonencoding, ShannonFano prefix codes and Huffman encoding algorithms for the given information source
	C304.3	Determine a code word comprising of the check bits computed using linear block codes, cyclic codes and convolutional codes.
	C304.4	Design the encoding and decoding for linear block codes, cycliccodes, convolutional codes and model the continuous and discrete communication channels using input, output and joint probabilities
ENGINEERING ELECTROMAGNETICS /18EC55 /C305	C305.1	Evaluate the problems on Electric Fields due to different charge distributions by applying conventional methods
	C305.2	Apply Gauss law to evaluate electric fields due to different charge distributions and volume charge distribution by using divergence theorem
	C305.3	Solve problems related to Poisson's and Laplace's Equations, Uniqueness theorem, and solution of Laplace's equation and steady magnetic field.
	C305.4	Analyse and solve problems related to Magnetic Forces, Time-varying fields using Maxwell's equations
	C305.5	Evaluate power associated with EM waves using Poynting theorem
VERILOG HDL/18EC56/C306	C306.1	Able to describe the need of HDL with different design styles and design methodologies in HDL
	C306.2	Able to describe the components of Verilog module and data types supported by Verilog.

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	C306.3	Design digital circuit/system using different verilog modeling styles like, gate, dataflow (RTL) and switch level and verify the functionality with delay and timing simulation using test benches.
	C306.4	Apply the concepts of verilog tasks, functions and directives to Write the programs in behavioral modeling more effectively.
	C306.5	Interpret the various constructs in logic synthesis
DSP LAB/18ECL57/C307	C307.1	Model analog to digital conversion system using MATLAB
	C307.2	Model discrete time signals and systems and its properties and results
	C307.3	Analyse and implement different discrete computations on DSP processor
	C307.4	Design the digital filters using a simulation tool and a DSP processor and verify the result
HDL LAB/18ECL58/C308	C308.1	Develop, synthesize Verilogcode for combinational circuits
	C308.2	Develop, synthesize Verilog code for sequential circuits like flip flops and counters.
	C308.3	Develop, Synthesize and implement Verilog code for Combinational and Sequential circuits on FPGA
	C308.4	Develop,synthesize and implement Verilog code on FPGA to interface input, output devices
DIGITAL COMMUNICATION/17EC61/C309	C309.1	Apply Hilbert transform and represent the signals mathematically and compare different line coding formats
	C309.2	Apply the concept of transmission of signals over AWGN channels

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	C309.3	Apply the concept of different digital modulation techniques.
	C309.4	Design and analyse the transmission of signals through band limited channels
	C309.5	Apply the principles of secured digital communication systems
ARM MICRO-CONTROLLER AND EMBEDDED SYSTEM/18EC62/C310	C310.1	Describe the architectural features and instructions of 32-bit microcontroller ARM Cortex M3.
	C310.2	Describe the memory map of cortex m3 and apply the knowledge gained for Programming ARM Cortex M3 for different applications.
	C310.3	Apply the knowledge in selecting basic hardware components in the design of embedded systems
	C310.4	Describe the development of an embedded system using the hardware /software co-design and firmware design approaches.
	C310.5	Apply the need of real time operating system for embedded system applications.
MICRO WAVE AND ANTENNA /18EC63/C311	C311.1	Illustrate the advantages and applications of microwaves
	C311.2	Analyze various parameters related to microwave transmission lines and waveguides
	C311.3	Identify microwave devices for several applications
	C311.4	Analyze various antenna parameters necessary for building an RF system
	C311.5	Analyze various antenna configurations according to the applications

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PYTHON APPLICATION PROGRAMMING /18EC646 /C312	C312.1	Explain and implement python syntax and semantics and be fluent in the use of Python flow control and functions in python programming
	C312.2	Analyze and implement strings and file systems in python
	C312.3	Create run and manipulate python programs using core data structures like lists dictionaries and use regular expressions.
	C312.4	Interpret the concepts of object oriented programming as used in Python
	C312.5	Implement applications related to network programming, web services and databases in python
EMBEDDED CONTROLLER LAB/18ECL66/C313	C313.1	Develop assembly level program using 32-bit ARM Cortex M3 microcontroller
	C313.2	Develop ARM Cortex M3 based embedded c programs for different applications.
	C313.3	Develop ARM Cortex M3 based embedded systems by interfacing I/O devices
	C313.4	Develop embedded system applications using C language programs by using library functions.
COMMUNICATION LAB /18ECL67/C314	C314.1	Design and demonstrate the digital modulation techniques
	C314.2	Demonstrate the measurement of the operating frequency, guided wavelength and VSWR in micro wave test bench
	C314.3	Measure the performance parameters for a given micro strip passive device
	C314.4	Simulate PCM, NRZ QPSK, DPSK using MATLAB
MINI PROJECT 18ECMP68/C315	C315.1	Identify, formulate and analyse engineering problems for the need of society.

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	C315.2	Design solutions for engineering problems using modern tool/technology to investigate with interpretation of data.
	C315.3	Analyse the impact of the engineering solutions in societal and environmental contexts for sustainable development with commit to professional ethics
	C315.4	Work individually and in team, Communicate effectively through reports and presentations.
	C315.5	Apply engineering, management and ethical principles for Project management and finance.

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Department of Electronics & Communication Engineering

2018 BATCH Course Outcomes

2018 Scheme IV Year			
Course code	**Subject code**	**Course Name**	Course out comes: on completion of the course the student will be able to
C401	18EC71	Computer Communication Networks	Understand the concepts of networking
			Describe the various networking architectures
			Distinguish the protocols and services of different layers
			Distinguish the basic network configuration and standards associated with each network
			Analyze a simple network and measure its parameters
C402	18EC72	VLSI design	Demonstrate understanding of MOS transistor theory, CMOS fabrication flow and technology scaling
			Draw the basic gates using the stick and layout diagrams with the knowledge of physical design aspects.
			Demonstrate ability to design combinational, sequential and dynamic logic circuits as per the requirements.
			Interpret memory elements along with timing considerations
			Interpret testing and testability issues in VLSI design
C403	18EC731	Real time system	Explain the fundamentals of real time systems and its classifications.
			Understand the concepts of computer control and the suitable computer hardware requirements for real time systems
			Describe the operating system concepts and techniques required for real time systems
			Develop the software algorithms using suitable languages to meet real time applications
			Apply suitable methodologies to design and develop real-time systems
C404	18EC732	Satellite	Describe the satellite orbits and its trajectories with the definition of parameters associated with it
			Describe the electronic hardware systems associated with the satellite subsystem and earth station

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		communication	Describe the communication satellites with the focus on national satellite system
			Compute the satellite link parameters under various propagation conditions with the illustration of multiple access techniques.
			Describe the satellites used for applications in remote sensing, weather forecasting and navigation
C405	18EC743	Multimedia communication	Understand the basics of different multimedia networks and applications.
			Understand different compression techniques to compress audio and video
			Describe multimedia communication across networks
			Analyze different media types to present them in digital form
			Compress different types of text and images using different compression techniques
C406	18EC745	Machine Learning with Python	Explain the core concepts of Machine Learning.
			Apply decision tree algorithm.
			Acquire knowledge and apply neural networks, Bayesian techniques and instant based learning algorithms.
			Apply analytical learning and reinforcement learning algorithms.
C407	18EC76	CCN lab	Choose suitable tools to model a network and understand the protocolas at various OSI reference levels
			Design a suitable network and simulate using network simulator tool
			Simulate the networking concepts and protocols using C/C++ programming
			Model the networks for different configurations and analyse the results.
C408	18EC77	VLSI lab	Write test bench to simulate various digital circuits.
			Interpret concepts of DC Analysis, AC Analysis and Transient Analysis in analog circuits.
			Design and simulate basic CMOS circuits like inverter, common source amplifier and differential amplifiers.
			Use basic amplifiers and further design higher level circuits like operational amplifier and analog/digital converters to meet desired parameters.
			Use transistors to design gates and further using gates realize shift registers and adders to meet desired parameters.

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C409	18EC78	Project work phase-1	Identify, formulate and analyze engineering problems for the need of society.
			Design solutions for engineering problems using modern tool/technology to investigate with interpretation of data
			Analyze the impact of the engineering solutions in societal and environmental contexts for sustainable development with commit to professional ethics
			Work individually and in team, Communicate effectively through reports and presentations.
C410	18EC81	Wireless &Cellular Communication	Explain concepts of propagation mechanisms like Reflection, Diffraction, Scattering in wireless channels.
			Develop a scheme for idle mode, call set up, call progress handling and call tear down in a GSM cellular network.
			Develop a scheme for idle mode, call set up, call progress handling and call tear down in a CDMA cellular network.
			Explain the Basic operations of Air interface in a LTE 4G system.
C411	18EC821	Network Security	Explain network security services and mechanisms and explain security concepts
			Understand the concept of Transport Level Security and Secure Socket Layer.
			Explain Security concerns in Internet Protocol security
			Explain Intruders, Intrusion detection and Malicious Software
			Describe Firewalls, Firewall Characteristics, Biasing and Configuration
C412	18EC84	INTERNSHIP/ PROFESSIONAL PRACTICE	Apply gained knowledge and skills in engineering practice.
			Analyse and design solutions for engineering problems.
			Work individually, in team and communicate effectively through reports and presentations.
			Demonstrate professionalism and ethics.
C413	18EC85	Project work	Identify, formulate and analyse engineering problems for the need of society.
			Design solutions for engineering problems using modern tool/technology to investigate with interpretation

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			of data.
			Analyse the impact of the engineering solutions in societal and environmental contexts for sustainable development with commit to professional ethics
			Work individually and in team, Communicate effectively through reports and presentations.
			Apply engineering, management and ethical principles for Project management and finance.
C414	18EC86	TECHNICAL SEMINAR	Identify and explore recent trends in Electronics and Communication Engineering.
			Prepare effective report on the selected topic.
			Prepare Power point presentation (PPT), Communicate and answer the queries.

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Department of Electrical and Electronics Engineering

COURSE OUTCOMES-2018 SCHEME

TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES-18MAT31

Students able to

C201.1	Find the Fourier series, half range Fourier series and Fourier coefficients of periodic functions
C201.2	Find the Fourier and inverse Fourier transforms of a periodic functions
C201.3	Solve the finite difference equations using Z-transforms
C201.4	Apply the concept of statistics for curve fitting, correlation and regression
C201.5	Analyze and apply proper numerical techniques to solve the algebraic/transcendental equation, to find polynomials, intermediate values and evaluation of integrals
C201.6	Find the integrals using Green's, Stokes and Gauss divergence theorem and extremal of a functional

ELECTRIC CIRCUIT ANALYSIS-18EE32

Students able to

C202.1	Analyze the electric circuit with different technique.
C202.2	Apply network theorems in electric circuits
C202.3	Examine the resonance condition of parallel and series RLC circuits.
C202.4	Determine the transient behavior of networks
C202.5	Evaluate the two port parameters and unbalanced three phase systems

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TRANSFORMERS AND GENERATORS 18EE33

Students able to

C203.1	Explain construction and operation of single phase, three phase and auto transformer.
C203.2	Analyze the performance of single phase and three phase transformer.
C203.3	Explain the construction of DC generator and Synchronous generators.
C203.4	Analyze the performance of salient and Non-salient pole generators.

ANALOG ELECTONICS CIRCUITS 18EE34

Students able to

C204.1	Design diode circuits and transistor biasing.
C204.2	Analyze the performance of transistor amplifier circuits.
C204.3	Analyze multi-stage and feedback amplifiers.
C204.4	Design the power amplifiers and oscillators.
C204.5	Design amplifiers using JFET/MOSFET.

DIGITAL SYSTEM DESIGN -18EE35

Students able to

C205.1	Develop simplified switching equation using Karnaugh Maps and QuineMcClusky techniques.
C205.2	Design Multiplexer, Encoder, Decoder, Adder, Subtractors and Comparator as digital combinational control circuits.
C205.3	Design latch and flip flops, their characteristic equations
C205.4	Develop counters, shift registers as sequential control circuits. and state diagrams for the given clocked sequential circuits.
C205.5	Develop Mealy/Moore Models and illustrate the functioning of Read only and Read/Write Memories, Programmable ROM, EPROM and Flash memory.

ELECTRICAL & ELECTRONICS MEASUREMENTS -18EE36

Students able to

C206.1	Determine the resistance, inductance and capacitance using bridges and also determine earth resistance.
C206.2	Explain the various meters used for measurement of Power & Energy.
C206.3	Explain the calibration & errors in energy meters & also methods of extending the range of instruments & instrument transformers.
C206.4	Examine the working of different electronic& digital instruments.
C206.5	Analyze various display devices and recording mechanisms

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ELECTRICAL MACHINES LAB 1 -18EEL37

Students able to

C207.1	Evaluate the performance of transformers from the test data obtained
C207.2	Operate two single phase transformers of different KVA rating in parallel
C207.3	Build the three phase operation and phase conversion using single phase transformers.
C207.4	Compute the voltage regulation of synchronous generator using the test data obtained in the laboratory

ELECTRONICS LAB -18EEL38

Students able to

C208.1	Design and test different diode circuits.
C208.2	Experiment with amplifier and oscillator circuits to analyze their performance.
C208.3	Examine the universal gates and ICs for code conversion and arithmetic operations.
C208.4	Design and verify different counters

AADALITHA KANNADA - 18KAK39

Students able to

C209.1	Make use of kannada language and understand usage.
C209.2	Use the language grammatically and utilize the same for writing essay and report.
C209.3	Apply the knowledge of kannada for writing CV and understand the government circular.

VYAVAHARIKA KANNADA - 18KVK39

Students able to

C210.1	Read and understand the simple words in kannada language
C210.2	Make use of kannada language for communication.

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COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS -18MAT41

Students able to

C211.1	Apply appropriate numerical methods to solve ordinary differential equations
C211.2	Derive and Apply Bessel's function, Legendre's polynomials & Rodrigue's formula, and its properties.
C211.3	Solve problems on analytic functions using Cauchy–Riemann equations, complex line integrals, conformal and bilinear transformations.
C211.4	Analyze and solve the probability distribution problems.
C211.5	Analyze and interpret the hypothesis for the given sampling distribution and to solve stochastic process problems.

POWER GENERATION AND ECONOMICS -18EE42

Students able to

C212.1	Classify and explain the working of hydroelectric power plants.
C212.2	Explain the working of steam power plants, diesel power plants and gas turbine power plants.
C212.3	Illustrate the working of nuclear power plants.
C212.4	Classify various substations and explain the importance of grounding.
C212.5	Compute various economic factors of power system operation including the power factor improvement

TRANSMISSION AND DISTRIBUTION -18EE43

Students able to

C213.1	Explain the concepts and importance of HVAC, HVDC, EHVAC and UHVAC transmission systems and its components.
C213.2	Determine inductance and capacitance of overhead transmission lines.
C213.3	Determine the parameters of the transmission line for different configurations and asses the performance of line.
C213.4	Explain the effect of corona and use of underground cables.
C213.5	Explain different types and reliability of AC distribution system.

ELECTRIC MOTOR-18EE44

Students able to

C214.1	Explain the constructional features of different DC motors and its applications.
C214.2	Assess the performance characteristics of DC motors by various tests and control the speed by suitable method
C214.3	Explain the constructional features of Three Phase and Single phase induction Motors and assess their performance
C214.4	Analyze the various methods for speed Control of induction motor
C214.5	Analyze the performance of Synchronous motor and operation of special motors.

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FIELD THEORY -18EE45

Students able to

C215.1	Explain the concept of gradient, divergence , curl of a vector.
C215.2	Explain Coulomb's Law and Gauss Law for the evaluation of electric fields produced by different charge configurations.
C215.3	Determine the energy and potential due to a system of charges.
C215.4	Illustrate the behavior of electric field across a boundary between a conductor and dielectric and between two different dielectrics.
C215.5	Evaluate the behavior of magnetic fields and magnetic materials.
C215.6	Assess time varying fields and propagation of waves in different media.

OP-AMPS & LINEAR ICS- 18EE46

Students able to

C216.1	Explain the operation and application of Op-Amp and DC Voltage Regulators
C216.2	Design Active Filters, Signal Generators using Op-Amps.
C216.3	Analyze various types of Comparators and converters using op-amps
C216.4	Analyse various Signal Processing circuits, A/D and D/A converters.
C216.5	Explain the operation of Phase Locked Loop (PLL) and Timer ICs (555Timer)

ELECTRIC MACHINE LAB 2- 18EEL47

Students able to

C217.1	Demonstrate the speed control of DC machines
C217.2	Determine the performance characteristics of dc machines by conducting suitable tests
C217.3	Analyse the performance of single phase and three phase induction motor
C217.4	Test induction motor to pre-determine the performance characteristics.
C217.5	Evaluate performance of synchronous motor to draw the characteristics curves.

OP-AMP & LIC LAB -18EEL48

Students able to

C218.1	Determine the characteristics parameters of op-amp practically like Gain,Frequency response.
C218.2	Design adder,subtractor,differentiator and integrator using op-amp and test the performance.
C218.3	Analyse Oscillator and filters using op-amp and test its performance
C218.4	Design Multivibrator and power supply using linear IC'S like 555 timer and IC Regulator to test its performance

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CONSTITUTION OF INDIA, PROFESSIONAL ETHICS AND CYBER LAW - 18CPC49

C219.1	manage complex societal issues in society using general knowledge and legal literacy about Indian Constitution.
C219.2	Understand Engineering and Professional ethics and responsibilities of Engineers.
C219.3	Understand the the cybercrimes and cyber laws for cyber safety measures.

MANAGEMENT AND ENTREPRENEURSHIP-18EE51

Students able to

C301.1	Explain the field of management, task of the manager, planning and steps in decision making.
C301.2	Discuss the structure of organization, importance of staffing, leadership styles, modes of communication, techniques of coordination and importance of managerial control in business.
C301.3	Explain the concepts of entrepreneurship and a businessman's social responsibilities towards different groups.
C301.4	Illustrate the role of SSI's in the development of country and state/central level institutions/agencies supporting business enterprises.
C301.5	Discuss the concepts of project management, capital budgeting, project feasibility studies, need for project report and new control techniques.

MICROCONTROLLER -18EE52

Students able to

C302.1	Discuss the internal architecture, addressing modes of 8051
C302.2	Utilize the concept of assembler, stack, flag register, loop, jump and call instructions to write assembly language program.
C302.3	Develop 8051C programs for time delay, I/O bit manipulation, logic and arithmetic operations, data conversion and data serialization
C302.4	Make use of the hardware connection of 8051 chip for programming its timers, serial ports and interrupts
C302.5	Explain the Interfacing of 8051 with real-world devices.

POWER ELECTRONICS -18EE53

Students able to

C303.1	Explain the concepts of Power diodes and Diode rectifiers.
C303.2	Explain the switching characteristics and gate control requirement of transistor.
C303.3	Classify the types of thyristor operation, gate characteristics and applications.
C303.4	Discuss the thyristor controlled Rectifiers with different loads.
C303.5	Explain the operation of single phase and 3 phase converter and controllers.

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SIGNALS AND SYTEMS -18EE54

Students able to

C304.1	Classify signals, relate between elementary signals and identify the properties of system
C304.2	Solve convolution operation,realize LTI System by differential and difference Equations.
C304.3	Explain the properties of CT and DT Fourier Transform and its applications.
C304.4	Analyze the properties of Z transform and its applications.

ELECTRICAL MACHINE DESIGN -18EE55

Students able to

C305.1	Judge and select the engineering material for the construction of electrical machines.
C305.2	Estimate the dimensions of DC machine armature with the help of output equation and relationship between various parameters.
C305.3	Determine the dimensions of field and commutator.
C305.4	Estimate the dimensions of transformer with the help of output equation and relationship between various parameter.
C305.5	Determine the dimensions of AC machine with the help of output equation and relationship between various parameters.
C305.6	design the field of synchronous machines define SCR, effect of SCR and then estimate the air gap length.

	HIGH VOLTAGE ENGINEERING-18EE56
	Students able to
C306.1	Explain breakdown phenomenon in gas, liquid and solid dielectrics.
C306.2	Discuss the generation of high voltages and currents.
C306.3	Analyze measurement techniques of high voltages and currents
C306.4	Explain overvoltage phenomenon and insulation coordination in electric power systems
C306.5	Analyze non-destructive testing of materials and electric apparatus and high-voltage testing of electric apparatus

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MICROCONTROLLER LAB -18EEL57

Students able to

C307.1	Build assembly language programs for data transfer, arithmetic, Boolean and logical instructions and code conversions.
C307.2	Apply ALP subroutines for generation of delays, counters, configuration of SFRs for serial communication and timers.
C307.3	Demonstrate interfacing of LCD, stepper motor and dc motor for controlling the speed.
C307.4	Develop different waveforms using DAC interface.

POWER ELECTRONICS LAB-18EEL58

Students able to

C308.1	Demonstrate the performance of various semiconductor devices with the help of their static characteristics.
C308.2	Design the Trigger circuit for SCR by different methods.
C308.3	Demonstrate the operation of single phase controlled full wave rectifier and AC voltage controller with R and RL loads.
C308.4	Demonstrate the speed control of dc motor, universal motor and stepper motors.
C308.5	Demonstrate the performance of PWM inverter.

ENVIRONMENTAL STUDIES - 18CIV59

C309.1	Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale,
C309.2	Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
C309.3	Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components.
C309.4	Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.

CONTROL SYSTEMS -18EE61

Students able to

C310.1	Determine the transfer function of a linear time invariant system.
C310.2	Apply block diagram manipulation techniques and signal flow graph to obtain transfer function of LTI systems.
C310.3	Analyze time response of first and second order control systems.
C310.4	Evaluate the stability of LTI systems using RH criterion, Root locus, Bode plots and Nyquist plots.
C310.5	Design of PD, PI &PID controllers.

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POWER SYSTEM ANALYSIS 1- 18EE62

Students able to

C311.1	Illustrate the single line diagram of the power system in per unit.
C311.2	Identify and analyse symmetrical faults in power system.
C311.3	Analyze various unsymmetrical faults by resolving unbalanced phasors into symmetrical components.
C311.4	Evaluate power system stability in graphical method using the concept of power system stability.

DIGITAL SIGNAL PROCESSING -18EE63

Students able to

C312.1	Classify the DFT of various signals using its properties and by its different methods.
C312.2	Apply fast and efficient algorithms to compute DFT and IDFT of a finite sequence.
C312.3	Design analog and digital IIR filters using Impulse invariant technique and Bilinear transformation.
C312.4	Design FIR filters using window techniques and frequency sampling technique.
C312.5	Analyze IIR and FIR filters by direct form-I, direct form –II,Cascade and Parallel realizations.

INTRODUCTION TO NUCLEAR POWER - 18EE641

Students able to

C313.1	Describe the fission process in nuclear materials, basic components of nuclear reactors, types of nuclear reactors and their working.
C313.2	Classify different types of coolants, their features, and cooling of reactors
C313.3	Explain loss of cooling accidents in different reactors.
C313.4	Explain postulated severe accidents in reactors and cooling of reactor during removal of spent fuel.
C313.5	Describe the methods of cooling and disposing the nuclear waste and prospect of fusion energy in the future.

ELECTRICAL ENGINEERING MATERIALS - 18EE642

Students able to

C314.1	Explain electrical and electronics materials, their importance, classification and operational requirement
C314.2	Explain conducting materials,dielectric materials,insulating materials,magnetic materials used in engineering, their properties and classification.
C314.3	Explain the phenomenon superconductivity, super conducting materials and their application in engineering.
C314.4	Explain the plastic and its properties and applications.
C314.5	Explain materials used for Opto electronic devices.

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COMPUTER AIDED ELECTRICAL DRAWING - 18EE643

Students able to

C315.1	Develop the 2D model of different types of DC and AC machine windings using Electrical CAD software.
C315.2	Draw the components of substation like CT, PT, SA, CB, Isolator using Electrical CAD software.
C315.3	Develop the 2D Model of various parts and different views of transformer using Electrical CAD software.
C315.4	Develop the 2D Model of various parts and different views of DC & AC machine using Electrical CAD software.

EMBEDDED SYSTEMS - 18EE644

Students able to

C316.1	Explain the Embedded system components
C316.2	Apply technological aspects to various interfacing with devices.
C316.3	Elaborate various design tradeoffs.
C316.4	Apply software aspects and programming concepts to the design of Embedded System.
C316.5	Explain how to interface subsystems with external systems.

OBJECT ORIENTED PROGRAMMING USING C++ - 18EE645

C317.1	Explain the basics of Object Oriented Programming concepts.
C317.2	Apply the object initialization and destroy concept using constructors and destructors.
C317.3	Apply the concept of polymorphism to implement compile time polymorphism in programs by using overloading methods and operators.
C317.4	Utilize the concept of inheritance to reduce the length of code and evaluate the usefulness.
C317.5	Apply the concept of run time polymorphism by using virtual functions, overriding functions and abstract class in programs.
C317.6	Utilize I/O operations and file streams in programs.

INDUSTRIAL SERVO CONTROL SYSTEMS - 18EE651

Students able to

C318.1	Explain the evolution and classification of servos, with descriptions of servo drive actuators, amplifiers,feedback transducers, performance, and troubleshooting techniques.
C318.2	Explain system analogs and vectors and the concept of transfer functions for the representation of differential equations
C318.3	Explain mathematical equations for electric servo motors, both DC and brushless DC servo motors.
C318.4	Represent servo drive components by their transfer function, to combine the servo drive building blocks into system block diagrams.
C318.5	Determine the frequency response techniques for proper servo compensation.
C318.6	Explain perform indices and performance criteria for servo systems and the mechanical considerations of servo systems.

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PLC and SCADA - 18EE652

C319.1	Discuss history of PLC and describe the hardware components of PLC
C319.2	Describe field devices Relays, Contactors, Motor Starters, Switches, Sensors, Output Control Devices, Seal-In Circuits, and Latching Relays commonly used with I/O module
C319.3	Analyze PLC timer and counter ladder logic programs and describe the operation of different program control instruction.
C319.4	Discuss the execution of data transfer instructions, data compare instructions and the basic operation of PLC closed-loop control system.
C319.5	Describe the operation of mechanical sequencers, bit and word shift registers, processes and structure of control systems and communication between the processes.

RENEWABLE ENERGY RESOURCES - 18EE653

Students able to

C320.1	Explain causes of energy scarcity and its solution, sun-earth geometry and solar thermal applications.
C320.2	Explain the types, configurations of solar collectors, performance of solar cell and their applications.
C320.3	Explain the generation of energy from hydrogen, wind, geothermal system, solid waste and agriculture refuse
C320.4	Explain the generation of energy from biomass, biogas and tidal energy.
C320.5	Discuss power generation from sea wave energy and ocean thermal energy

TESTING AND COMMISSIONING OF POWER SYSTEM APPARATUS - 18EE654

Students able to

C321.1	Explain the Installation of transformers and different tools used for installation process.
C321.2	Discuss the Installation of Synchronous Machines and their tests.
C321.3	Explain the installation and Commissioning test of Induction motor.
C321.4	Explain the Handling, Testing and installation of underground cables and its fault clearance.
C321.5	Discuss the protection of electrical equipment , its maintenance and domestic testing methods and rules.

CONTROL SYSTEM LABORATORY - 18EEL66

Students able to

C322.1	Determine the time and frequency domain responses of a given second order system using software package and discrete components.
C322.2	Design and analyse Lead, Lag and Lag–Lead compensators for given specifications.
C322.3	Determine the performance characteristics of AC and DC servomotors and synchro-transmitter receiver pair used in control systems.
C322.4	Demonstrate a study on the effect of P, PI, PD and PID controllers for the step response of the system by simulating the second order system.
C322.5	Construct a script file to draw root locus plot, bode plot and Nyquist plots to study the stability of the system using a software package.

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DIGITAL SIGNAL PROCESSING LABORATORY - 18EEL67

Students able to

C323.1	Verify the sampling theorem in time and frequency domain using software package.
C323.2	Evaluate the solution of impulse response, step response, steady response, steady state response and arbitrary i/p of a given difference equation using software package.
C323.3	Evaluate the responses of a system using convolution of a given sequence using software package.
C323.4	Build DFT &IDFT of a given sequence using basic definition and Fast method using software package.
C323.5	Design and implementation of IIR & FIR filters using software package.

Mini-project - 18EEMP68

Students able to

C324.1	Demonsrate the design and solution of the selected mini-project.
C324.2	Build the critical thinking and use problem solving skills in societal and environmental contexts.
C324.3	Develop on their own, reflect on their learning and take appropriate actions to improve it.
C324.4	Develop team work for conducting the mini-project and Communicate effectively through reports & presentations.

POWER SYSTEM ANALYSIS-2 -18EE71

Students able to

C401.1	Develop network matrices and models for solving load flow problems.
C401.2	Evaluate the steady state power flow analysis of power systems using numerical iterative techniques.
C401.3	Determine optimum generation scheduling and optimal unit commitment of thermal power plants.
C401.4	Analyse short circuit faults in power system networks using bus impedance matrix.
C401.5	Determine numerical solution of swing equation for multi-machine stability.

POWER SYSTEM PROTECTION - 18EE72

Students able to

C402.1	Classify various protective relays based on their construction and operating principles.
C402.2	Compare the characteristics of various schemes and forms of overcurrent protection.
C402.3	Explain the working of various distance relays and the effects of arc resistance, power swings, line length and source impedance on their performance.
C402.4	Explain the performance of differential relays, protection of power system components and various pilot protection schemes.
C402.5	Discuss the principle of current interruption in different types of circuit breakers.
C402.6	Explain the construction and operating principle of different types of fuses, protection against overvoltage and Gas Insulated Substation (GIS).

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SOLAR AND WIND ENERGY - 18EE731

Students able to

C403.1	Discuss the importance of energy in human life, relationship among economy and environment with energy use and the increasing role of renewable energy.
C403.2	Explain the concept of energy storage, the principles of energy storage devices and solar radiation on horizontal and tilted surface, its characteristics, measurement and analysis of radiation data.
C403.3	Describe the process of harnessing solar energy and its applications in heating and cooling.
C403.4	Discuss fabrication, operation of solar cell, electrical characteristics, sizing and design of solar PV systems and their applications.
C403.5	Explain basic Principles of Wind Energy Conversion, collection of wind data, energy estimation and site selection.
C403.6	Discuss the performance of Wind-machines, energy storage, applications of Wind Energy and environmental aspects.

SENSORS AND TRANSDUCERS - 18EE732

Students able to

C404.1	Explain need of transducers and sensors, their classification, advantages and disadvantages and their working.
C404.2	Discuss the recent trends in sensor technologies and their selection.
C404.3	Explain the basics of signal conditioning, signal conditioning equipment, configuration of Data Acquisition System and data conversion
C404.4	Describe data transmission and telemetry
C404.5	Explain the measurement of non-electrical quantities- Pressure,temperature, flow, speed, force, torque, power and viscosity

INTEGRATION OF DISTRIBUTED GENERATION - 18EE733

Students able to

C405.1	explain power generation by alternate energy source like wind power and solar power
C405.2	Discuss the integration of distributed generation and its effect on the performance of the power system.
C405.3	Examine the impact of integration of distributed generation on Voltage Magnitude Variations.
C405.4	explain the impact of integration of distributed generation on Power Quality Disturbances.

ADVANCED CONTROL SYSTEMS - 18EE734

Students able to

C406.1	Discuss state variable approach for linear time invariant systems in both the continuous and discrete time systems.
C406.2	Develop of state models for linear continuous – time and discrete – time systems.
C406.3	Apply vector and matrix algebra to find the solution of state equations for linear continuous – time and discrete – time systems.
C406.4	Define controllability and observability of a system and test for controllability and observability of a given system.
C406.5	Design pole assignment and state observer using state feedback.
C406.6	Develop the describing function for the nonlinearity present to assess the stability of the system and Lyapunov function for the stability analysis of nonlinear systems.

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REACTIVE POWER CONTROL IN ELECTRIC POWER SYSTEMS - 18EE735

C407.1	Distinguish the importance of load compensation in symmetrical as well as unsymmetrical loads.
C407.2	Explain various compensation methods in transmission lines.
C407.3	Distinguish demand side reactive power management & user side reactive power management.
C407.4	Construct model for reactive power coordination and effects of harmonics on electrical equipments.
C407.5	Discuss the Reactive Power Planning for the electricity boards.

INDUSTRIAL DRIVES AND APPLICATIONS - 18EE741

Students able to

C408.1	Explain choice of electric drives,its parts and advantages
C408.2	Discuss dynamics and modes of operation of electric drives.
C408.3	Explain the selection of power rating of motor and control of dc motor using rectifiers.
C408.4	Analyze the performance of induction motor drives under different conditions
C408.5	Analyse the control of induction motor, synchronous motor and stepper motor drives
C408.6	Discuss typical applications of electrical drives in the industry .

UTILIZATION OF ELECTRICAL POWER - 18EE742

Students able to

C409.1	Analyze heating , welding scheme and Electrolytic process
C409.2	Design illumination scheme for various application .
C409.3	Explain the different traction system and speed control for the traction systems.
C409.4	Explain the various braking operation for different types of drives ,Tramways and Trolley.
C409.5	Analyze about the Performance, concept and architecture of different Electric Vehicles.

PLC and SCADA - 18EE743

C410.1	Describe the hardware components of PLC: I/O modules, CPU, memory devices, other support devices, operating modes and PLC programming.
C410.2	Describe field devices Relays, Contactors, Motor Starters, Switches, Sensors, Output Control Devices, Seal-In Circuits, and Latching Relays commonly used with I/O module.
C410.3	Convert relay schematics and narrative descriptions into PLC ladder logic programs.
C410.4	Analyse PLC timer and counter ladder logic programs.

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SMART GRID - 18EE744

C411.1	Explain the architecture, measurement techniques and tools for the analysis of of smart grid.
C411.2	Discuss classical optimization techniques and computational methods for smart grid design, planning and operation.
C411.3	Explain predictive grid management and control technology for enhancing the smart grid performance
C411.4	Develop cleaner, more environmentally responsible technologies for the electric system.
C411.5	Discuss the computational techniques, communication, measurement, and monitoring technology tools essential to the design of the smart grid.

ARTIFICIAL NEURAL NETWORK WITH APPLICATIONS TO POWER SYSTEMS - 18EE745

C412.1	Develop Neural Network and apply elementary information processing tasks that neural network can solve.
C412.2	Develop Neural Network and apply powerful, useful learning techniques.
C412.3	Develop and Analyze multilayer feed forward network for mapping provided through the first network layer and error back propagation algorithm.
C412.4	Analyze and apply algorithmic type problems to tackle problems for which algorithms are not available.
C412.5	Develop and Analyze supervised/unsupervised, learning modes of Neural Network for different applications.

INDUSTRIAL MOTORS & CONTROL - 18EE751

C413.1	explain the procedure of selecting rating of the motor for any application.
C413.2	Classify DC motors, explain the torque speed characteristics and select a motor for an application.
C413.3	Explain the types of Starting and Breaking of Motors
C413.4	Explain the different types of Speed Control of Motors
C413.5	Selection of Motors for Industrial Drives & Economic Selection of Electric Motors.
C413.6	Discuss Electrical Drawings, Installation, Maintenance & Safety

SENSORS AND TRANSDUCERS - 18EE752

Students able to

C414.1	Explain need of transducers and sensors, their classification, advantages and disadvantages and their working.
C414.2	Discuss the recent trends in sensor technologies and their selection.
C414.3	Explain the basics of signal conditioning, signal conditioning equipment, configuration of Data Acquisition System and data conversion
C414.4	Describe data transmission and telemetry
C414.5	Explain the measurement of non-electrical quantities- Pressure,temperature, flow, speed, force, torque, power and viscosity

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ELECTRIC VEHICLES - 18EE753

C415.1	Explain the roadway fundamentals, laws of motion, vehicle mechanics and propulsion system design.
C415.2	Explain the working of electric vehicles and hybrid electric vehicles in recent trends.
C415.3	Model batteries, Fuel cells, PEMFC and super capacitors.
C415.4	Analyze DC and AC drive topologies used for electric vehicle application.
C415.5	Develop the electric propulsion unit and its control for application of electric vehicles.

ELECTRICAL ENERGY CONSERVATION AND AUDITING - 18E

C416.1	Analyze about energy scenario nationwide and worldwide
C416.2	Discuss load management techniques and energy efficiency.
C416.3	Explain the need of energy audit and energy audit methodology.
C416.4	Explain various pillars of electricity market design.
C416.5	Conduct energy audit of electrical systems and buildings.

POWER SYSTEM SIMULATION LABORATORY - 18EEL76

Students able to

C417.1	Develop a program in MATLAB to assess the performance of medium transmission lines.
C417.2	Build a program in MATLAB to obtain the power-angle curve of salient and non-salient pole synchronous machines.
C417.3	Develop a program in MATLAB to assess transient stability through swing curve.
C417.4	Build programs in MATLAB to formulate bus admittance and bus impedance matrices and analyse short circuit faults using Mi-Power software package.
C417.5	Solve power flow problem for a simple power system using Mi-Power software package.
C417.6	Solve optimal generation scheduling problems for thermal power plants using Mi-Power software package.

RELAY AND HIGH VOLTAGE LABORATORY - 18EEL77

Students able to

C418.1	Determine the characteristics of electromagnetic relays
C418.2	Determine the characteristics of microprocessor based relays
C418.3	Analyze the spark over characteristics for both uniform and non-uniform configurations using High AC and DC voltages.
C418.4	Measure high AC and DC voltages and breakdown strength of transformer oil.
C418.5	Determine the electric field and measure the capacitance of different electrode configuration models

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PROJECT PHASE – I - 18EEP78

Students able to

C419.1	Identify and formulate the engineering problems for the need of society.
C419.2	Demonstrate a sound technical knowledge of their selected project topic
C419.3	Design solutions for engineering problems using modern tool/technology to investigate with interpretation of data.
C419.4	Discuss the impact of the engineering solutions in societal and environmental contexts for sustainable development with commit to professional ethics.
C419.5	Develop team work for conducting the project and Communicate effectively through reports & presentations.
C419.6	Adapt engineering, management and ethical principles for Project management and finance.

POWER SYSTEM OPERATION AND CONTROL-18EE81

Students able to

C420.1	Describe various levels of controls in power systems, components, architecture and configuration of SCADA.
C420.2	Build mathematical models of ALFC by identifying the basic control loops in generator and functions of AGC in an isolated and interconnected systems.
C420.3	Apply the voltage and reactive power controls in power system.
C420.4	Explain reliability, security, contingency analysis, state estimation and its issues in power systems.

FACTS AND HVDC TRANSMISSION - 18EE821

Students able to

C421.1	Discuss transmission interconnections, flow of Power in an AC System, limits of the loading capability,dynamic stability considerations of a transmission interconnection and controllable parameters.
C421.2	Explain the basic concepts, definitions of flexible ac transmission systems and benefits from FACTS technology.
C421.3	Describe shunt controllers, Static Var Compensator and Static Compensator for injecting reactive power in the transmission system in enhancing the controllability and power transfer capability.
C421.4	Describe series Controllers Thyristor-Controlled Series Capacitor (TCSC) and the Static Synchronous Series Compensator (SSSC) for control of the transmission line current.
C421.5	Explain advantages of HVDC power transmission, overview and organization of HVDC system and converter control for HVDC systems, commutation failure, control functions.
C421.6	Describe the basic components of a converter, the methods for compensating the reactive power demanded by the converter.

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ELECTRICAL ESTMATION AND COSTING - 18EE822

C422.1	Explain the principles of estimation and Indian electricity rules.
C422.2	Estimate internal wiring installation using the concepts of cable types and specifications.
C422.3	Estimate service connections and motor wiring installations.
C422.4	Estimate overhead transmission and distribution lines.
C422.5	Estimate substation using the substation components.

ELECTRIC VEHICLE TECHNOLOGIES - 18EE823

C423.1	Explain the working of electric vehicles and recent trends.
C423.2	Analyze different power converter topology used for electric vehicle appli
C423.3	Develop the electric propulsion unit and its control for application of elec
C423.4	Design converters for battery charging and explain transformer less topolc

POWER SYSTEM PLANNING - 18EE824

Students able to

C424.1	Explain the basic concept and structure of power system planning.
C424.2	Analyse the different strategy of generation planning to improve national grid.
C424.3	Analyse different designing of optimum power system expansion with computer aided planning.
C424.4	Explain the process to improve reliability of power system and reactive power compensation.

ELECTRICAL POWER QUALITY - 18EE825

C425.1	evaluate power quality procedures and standards.
C425.2	Estimate voltage sag performance; explain principles of protection and Sources of transient over voltages.
C425.3	Identify various sources of harmonics, explain effects of harmonic distorti
C425.4	Evaluate harmonic distortion, control harmonic distortion.
C425.5	Estimate power quality in distribution planning. Identify power quality issues in utility system.

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PROJECT WORK PHASE-II - 18EEP83

Students able to

C426.1	Demonsrate the design and solution of the selected project.
C426.2	Build the critical thinking and use problem solving skills
C426.3	Discuss the impact of the engineering solutions in societal and environmental contexts for sustainable development with commit to professional ethics.
C426.4	Develop on their own, reflect on their learning and take appropriate actions to improve it.
C426.5	Develop team work for conducting the project and Communicate effectively through reports & presentations.
C426.6	Adapt engineering, management and ethical principles for Project management and finance.

TECHNICAL SEMINAR - 18EES84

Students able to

C427.1	Develop knowledge in the field of electrical and electronics engineering and other disciplines through independent learning and collaborative study.
C427.2	Identify and discuss current, real-time issues
C427.3	Develop oral and written communication skills
C427.4	Build an appreciation of the self in relation to its larger diverse social and academic contexts
C427.5	Apply principles of ethics and respect in interaction with others.

INTERNSHIP - 18EEI85

Students able to

C428.1	Adapt the practical experience within industry in which the internship is done.
C428.2	Apply knowledge and skills learned to classroom work and project.
C428.3	Develop a greater understanding about career options.
C428.4	Develop and refine the oral and written communication skills.
C428.5	Adapt the knowledge of administration, marketing, finance and economics.

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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

I Year Information Science and Engineering

Course Code	Course Name	Course Outcomes-On completion of this course the students will be able to
18MAT11	**Calculus and Linear Algebra**	CO1: Find the angle between radius vector and tangent, Pedal Equations, curvature, radius of curvature and their applications. CO2: Find the Taylor's and Maclaurin's series, indeterminate forms, partial differentiation, Maxima and Minima for a function of two variables. CO3: Evaluate the double and triple integrals, and by changing the order of integration, using Beta and Gamma functions and their application. CO4: Solve linear and non-linear ordinary differential equations. CO5: Solve the system of linear equations and to compute the Eigen value, Eigen vectors for diagonalization.
18PHY12/22	**Engineering Physics**	CO1: Classify various types of oscillations and their implications, the role of Shock waves in various fields Engineering and Technical fields. CO2: Recognize the elastic properties of materials for engineering applications. CO3: Realize the interrelation between time varying electric field and magnetic field, the transverse nature of the EM waves and their role in optical fiber communication. CO4: Compute Eigen values, Eigen functions of a particles using Time independent 1-D Schrodinger's wave equation and apprehend theoretical background of different types of laser and its applications in various fields. CO5: Distinguish various electrical and thermal properties of materials like conductors, semiconductors and dielectrics using different theoretical models.
		CO1: Analyse D.C circuits. CO2: Analyse A.C circuits CO3: Explain the principle of operation and construction of single phase transformers.Discuss concepts of

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18ELE13/23	**Basic Electrical Engineering**	electrical wiring, circuit protecting devices and earthing CO4: Explain the principle of operation and construction of DC machine and its performance. CO5: Explain the principle of operation and construction of synchronous machines and three phase induction motors.
18CIV14/24	**Elements of Civil Engineering and Mechanics**	CO1: Mention the applications of various fields of Civil Engineering. CO2: Compute the resultant of given force system subjected to various loads. CO3: Comprehend the action of Forces, Moments and other loads on systems of rigid bodies and compute the reactive forces that develop as a result of the external loads. CO4: Locate the Centroid and compute the Moment of Inertia of regular and built-up sections. CO5: Express the relationship between the motions of bodies and analyze the bodies in motion. CO6: Apply the concepts of kinetics and kinematics, to understand about curvilinear and rectilinear motion and to analyze the various problems based on these.
18EGDL15/25	**Engineering Graphics**	CO1: Demonstrate the usage of CAD software. CO2: Draw orthographic projections of points, lines, planes and solids. CO3: Generate the development of lateral surfaces of solids. CO4: Covert orthographic views to isometric projections of solids and vice-versa.
18PHYL16/17	**Engineering Physics Laboratory**	CO1: Apprehend the concepts of interference of light, diffraction of light, Fermi energy and magnetic effect of current CO2: Understand the principles of operations of optical fibers and Semiconductor devices such as Photodiode, and NPN transistor using Simple circuits CO3: Determine elastic moduli and moment of inertia of given materials with the help of suggested procedures CO4: Recognize the resonance concept and its practical applications CO5: Understand the importance of measurement procedure, honest recording and representing the data, reproduction of final results
		CO1: Identify common electrical components, measuring instruments used in electrical laboratory and understand basic electrical laws such as Ohm's Law, Kirchhoff's Current Law, and Kirchhoff's Voltage Law, then, verify the same in simple electrical circuits. CO2: Compare the power consumed and power factor of various types of lamps, such as

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18ELEL17/27	**Basic Electrical Engineering Laboratory**	Incandescent lamps, Fluorescent Lamps, and LED lamps. CO3: Understand the operation of two-way and three-way control of lamps in domestic wiring. CO4: Determine the various parameters of a choke coil, such as impedance, resistance, inductance, and quality factor. CO5: Establish star and delta type of connections using three numbers of single-phase loads and verify the phase and line relationships of voltage and currents. CO6: Determine and verify the total power consumed by a three phase star connected load using the two-wattmeter method. CO7: Understand the effects of open and short circuits in a simple electrical circuit.
18EGH18	**Technical English-I**	CO 1: Use grammatical English and essentials of language skills and identify the nuances of phonetics, intonation and flawless pronunciation CO2: Implement English vocabulary at command and language proficiency CO3: Identify common errors in spoken and written communication CO4: Understand and improve the non verbal communication and kinesics CO5: Perform well in campus recruitment, engineering and all other general competitive examinations.
18MAT21	**Advanced calculus and numerical methods**	CO1: Find the velocity, acceleration, gradient, curl and divergence CO2: Solve linear ordinary differential equations. CO3: Form and solve partial differential equations. CO4: Solve the infinite series and power series solutions. CO5: Solve algebraic and transcendental equations, interpolating polynomials, Intermediate values and evaluation of integrals using appropriate numerical techniques.
18CHE12/22	**Engineering Chemistry**	CO1: Analyze use of thermodynamics concepts to understand and to calculate potential value and nature of different classes of batteries applications. CO2: Analyze the understand nature of corrosion of different metals, causes and their protection through different techniques. CO3: Analyze calorific value of solid or liquid fuel and understand utilization of various energy sources. CO4: Explain the source sand effects of environmental pollution, the knowledge of waste management and assessment of water quality parameters CO5: Use instruments for various quantitative analysis and prepare the nonmaterial's and their applications.

18CPS13/23	**C Programming for Problem Solving**	CO1: Illustrate simple algorithms from the different domains such as mathematics, physics, etc. CO2: Construct a programming solution to the given problem using C. CO3: Identify and correct the syntax and logical errors in C programs. CO4: Modularize the given problem using functions and structures.
18ELN14/24	**Basic Electronics**	CO1: Apply the Knowledge of Semiconductor diode for designing Regulated power supply Using Rectifier, filter and IC regulator. CO2: Describe the construction, working and operation of JFET, MOSFET also discuss the Operating Principles of SCR with the Phase control application. CO3: Explain the Various Op-Amp parameters and using Op-amp design basic application like Inverting, non -inverting amplifier, Integrator differentiator etc. CO4: Use BJT for applications like amplifier and switch for power control, Describe the Principles operation of feedback amplifier and oscillators. CO5: Explain the different number system and their conversions and construct simple combinational and sequential logic circuits using Flip-Flops. CO6: Describe the basic principle of operation of communication system and mobile phones.
18ME15/25	**Elements of Mechanical Engineering**	CO1: Explain various sources of energy and conversion, basics of thermodynamics and properties of steam. CO2: Describe the principles & operations of boilers, hydraulic turbines and hydraulic pumps. CO3: Describe principles and operations of internal combustion engines, refrigeration and air-conditioning. CO4: Explain basics of engineering materials and various joining processes of metals. CO5: Describe power transmission methods by belt and gear drives and estimation of velocity ratios. CO6: Explain different machining processes by lathe, milling machines and basics of CNC machines and robotics
18CHEL16/26	**Engineering Chemistry Laboratory**	CO1: Handling different types of instruments for analysis of materials using small Quantities of materials involved for quick and accurate results. CO2: Carrying out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results.

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18CPL17/27	**C Programming Laboratory**	CO1: Write algorithms, flowcharts and program for simple problems. CO2: Correct syntax and logical errors to execute a program. CO3: Write iterative and wherever possible recursive programs. CO4:Demonstrate use of functions, arrays, strings, structures and pointers in problem solving.
18EGH28	**Technical English-II**	CO1: Improve the functional effectiveness through better workplace communication skills. CO2: Acquire basic proficiency in English reading and listening, comprehensions, writing and speaking skills. CO3: Write campus recruitment exams, engineering competitive exams and all other general competitive exams. CO4: Improve business and technical communication skills and technical writing skills.

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DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Second Year Course outcomes

Course Code	Course Name	Course Outcomes-On completion of this course the students will be able to
18MAT31	TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES	**CO1:** Use Laplace transform and inverse Laplace transform in solving differential/ integral equation arising in network analysis, control systems and other fields of engineering. **CO2:** Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory. **CO3:** Make use of Fourier transform and Z-transform to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems. **CO4:** Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods. **CO5:** Determine the externals of functional using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.
18CS32	DATA STRUCTURES AND APPLICATIONS	**CO1:** Use different types of data structures, operations and algorithms **CO2:** Apply searching and sorting operations on files **CO3:** Use stack, Queue, Lists, Trees and Graphs in problem solving **CO4:** Implement all data structures in a high-level language for problem solving
18CS33	ANALOG AND DIGITAL ELECTRONICS	**CO1:** Design and analyze application of analog circuits using photo devices, timer IC, power supply and regulator IC and op-amp. **CO2:** Explain the basic principles of A/D and D/A conversion circuits and develop the same. **CO3:** Simplify digital circuits using Karnaugh Map , and Quine-McClusky Methods **CO4:** Explain Gates and flip flops and make us in designing different data processing circuits, registers and counters and compare the types. **CO5:** Develop simple HDL programs
18CS34	COMPUTER ORGANIZATION	**CO1:** Explain the basic organization of a computer system. **CO2:** Demonstrate functioning of different sub systems, such as processor, Input/output,and memory. **CO3:** Illustrate hardwired control and micro programmed control, pipelining, embedded and other computing systems. **CO4:** Design and analyse simple arithmetic and logical units.
18CS35	SOFTWARE ENGINEERING	**CO1:** Design a software system, component, or process to meet desired needs within realistic constraints. **CO2:** Assess professional and ethical responsibility • Function on multi-disciplinary teams **CO3:** Use the techniques, skills, and modern engineering tools necessary for engineering practice **CO4:** Analyze, design, implement, verify, validate, implement, apply, and maintain software systems or parts of software systems

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SAPTHAGIRI College of Engineering Creating Tomorrow

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18CS36	DISCRETE MATHEMATICAL STRUCTURES	**CO1:** Use propositional and predicate logic in knowledge representation and truth verification. **CO2:** Demonstrate the application of discrete structures in different fields of computer science. **CO3:** Solve problems using recurrence relations and generating functions. **CO4:** Application of different mathematical proofs techniques in proving theorems in the courses. **CO5:** Compare graphs, trees and their applications.
18CSL37	ANALOG AND DIGITAL ELECTRONICS LABORATORY	**CO1:** Use appropriate design equations / methods to design the given circuit. **CO2:** Examine and verify the design of both analog and digital circuits using simulators. **CO3:** Make us of electronic components, ICs, instruments and tools for design and testing of circuits for the given the appropriate inputs. **CO4:** Compile a laboratory journal which includes; aim, tool/instruments/software/components used, design equations used and designs, schematics, program listing, procedure followed, relevant theory, results as graphs and tables, interpreting and concluding the findings.
18CSL38	DATA STRUCTURES LABORATORY	**CO1:**Analyze and Compare various linear and non-linear data structures **CO2:** Code, debug and demonstrate the working nature of different types of data structures and their applications **CO3:** Implement, analyze and evaluate the searching and sorting algorithms **CO4:** Choose the appropriate data structure for solving real world problems
18MAT41	COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS	**CO1:** Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory. **CO2:** Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing. **CO3:** Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field. **CO4:** Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data. **CO5:** Construct joint probability distributions and demonstrate the validity of testing the hypothesis.
18CS42	DESIGN AND ANALYSIS OF ALGORITHMS	**CO1:** Describe computational solution to well-known problems like searching, sorting etc. **CO2:** Estimate the computational complexity of different algorithms. **CO3:** Devise an algorithm using appropriate design strategies for problem solving.
18CS43	OPERATING SYSTEMS	**CO1:** Demonstrate need for OS and different types of OS **CO2:** Apply suitable techniques for management of different resources **CO3:** Use processor, memory, storage and file system commands **CO4:** Realize the different concepts of OS in platform of usage through case studies

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18CS44	MICROCONTROLLER AND EMBEDDED SYSTEMS	**CO1:** Describe the architectural features and instructions of ARM microcontroller **CO2:** Apply the knowledge gained for Programming ARM for different applications. **CO3:** Interface external devices and I/O with ARM microcontroller. **CO4:** Interpret the basic hardware components and their selection method based on the characteristics and attributes of an embedded system. **CO5:** Develop the hardware /software co-design and firmware design approaches. **CO6:** Demonstrate the need of real time operating system for embedded system applications
18CS45	OBJECT ORIENTED CONCEPTS	**CO1:** Explain the object-oriented concepts and JAVA. **CO2:** Develop computer programs to solve real world problems in Java. **CO3:** Develop simple GUI interfaces for a computer program to interact with users, and to understand the event-based GUI handling principles using swings.
18CS46	DATA COMMUNICATION	**CO1:** Explain the various components of data communication. **CO2:** Explain the fundamentals of digital communication and switching. **CO3:** Compare and contrast data link layer protocols. **CO4:** Summarize IEEE 802.xx standards
18CSL47	DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY	**CO1:** Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.) **CO2:** Implement a variety of algorithms such assorting, graph related, combinatorial, etc., in a high level language. **CO3:** Analyze and compare the performance of algorithms using language features. **CO4:** Apply and implement learned algorithm design techniques and data structures to solve real-world problems.
18CSL48	MICROCONTROLLER AND EMBEDDED SYSTEMS LABORATORY	**CO1:** Develop and test program using ARM7TDMI/LPC2148 **CO2:** Conduct the following experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler.

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Third Year Course outcomes

Course Code	Course Name	Course Outcomes-On completion of this course the students will be able to
18CS51	MANAGEMENT AND ENTREPRENEURSHIP FOR IT INDUSTRY	**CO1:** Define management, organization, entrepreneur, planning, staffing, ERP and outline their importance in entrepreneurship **CO2:** Utilize the resources available effectively through ERP **CO3:** Make use of IPRs and institutional support in entrepreneurship
18CS52	COMPUTER NETWORKS AND SECURITY	**CO1:** Explain principles of application layer protocols **CO2:** Recognize transport layer services and infer UDP and TCP protocols • Classify routers, IP and Routing Algorithms in network layer **CO3:** Understand the Wireless and Mobile Networks covering IEEE 802.11 Standard **CO4:** Describe Multimedia Networking and Network Management
18CS53	DATABASE MANAGEMENT SYSTEM	**CO1:** Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS. **CO2:** Use Structured Query Language (SQL) for database manipulation. **CO3:** Design and build simple database systems **CO4:** Develop application to interact with databases.
18CS54	AUTOMATA THEORY AND COMPUTABILITY	**CO1:** Acquire fundamental understanding of the core concepts in automata theory and Theory of Computation **CO2:** Learn how to translate between different models of Computation (e.g., Deterministic and Non-deterministic and Software models). **CO3:** Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers. **CO4:** Develop skills in formal reasoning and reduction of a problem to a formal model, with an emphasis on semantic precision and conciseness. **CO5:** Classify a problem with respect to different models of Computation.
18CS55	APPLICATION DEVELOPMENT USING PYTHON	**CO1:** Demonstrate proficiency in handling of loops and creation of functions. **CO2:** Identify the methods to create and manipulate lists, tuples and dictionaries. **CO3:** Discover the commonly used operations involving regular expressions and file system. **CO4:** Interpret the concepts of Object-Oriented Programming as used in Python. **CO5:** Determine the need for scraping websites and working with CSV, JSON and other file formats.
18CS56	UNIX PROGRAMMING	**CO1:** Explain Unix Architecture, File system and use of Basic Commands **CO2:** Illustrate Shell Programming and to write Shell Scripts **CO3:** Categorize, compare and make use of Unix System Calls **CO4:** Build an application/service over a Unix system.
18CSL57	COMPUTER NETWORK LABORATORY	**CO1:** Analyze and Compare various networking protocols. **CO2:** Demonstrate the working of different concepts of networking. **CO3:** Implement, analyze and evaluate networking protocols in NS2 / NS3 and JAVA programming language

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18CSL58	DBMS LABORATORY WITH MINI PROJECT	**CO1:** Create, Update and query on the database. **CO2:** Demonstrate the working of different concepts of DBMS **CO3:** Implement, analyze and evaluate the project developed for an application.
18IS61	FILE STRUCTURES	**CO1:** Choose appropriate file structure for storage representation. **CO2:** Identify a suitable sorting technique to arrange the data. **CO3:** Select suitable indexing and hashing techniques for better performance to a given problem.
18IS62	SOFTWARE TESTING	**CO1:** Derive test cases for any given problem **CO2:** Compare the different testing techniques **CO3:** Classify the problem into suitable testing model **CO4:** Apply the appropriate technique for the design of flow graph. **CO5:** Create appropriate document for the software artefact.
18CS63	WEB TECHNOLOGY AND ITS APPLICATIONS	**CO1:** Adapt HTML and CSS syntax and semantics to build web pages. **CO2:** Construct and visually format tables and forms using HTML and CSS **CO3:** Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically. **CO4:** Appraise the principles of object oriented development using PHP **CO5:** Inspect JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core features.
18CS643	Professional Elective -1 (Cloud Computing and its Applications) (CC)	**CO1:** Explain cloud computing, virtualization and classify services of cloud computing **CO2:** Illustrate architecture and programming in cloud **CO3:** Describe the platforms for development of cloud applications and List the application of cloud.
18ISL66	SOFTWARE TESTING LABORATORY	**CO1:** List out the requirements for the given problem **CO2:** Design and implement the solution for given problem in any programming language(C,C++,JAVA) **CO3:** Derive test cases for any given problem **CO4:** Apply the appropriate technique for the design of flow graph. **CO5:** Create appropriate document for the software artefact.
18ISL67	FILE STRUCTURES LABORATORY WITH MINI PROJECT	**CO1:** Implement operations related to files **CO2:** Apply the concepts of file system to produce the given application. **CO3:** Evaluate performance of various file systems on given parameters.
18CSMP68	MOBILE APPLICATION DEVELOPMENT	**CO1:** Create, test and debug Android application by setting up Android development environment. **CO2:** Implement adaptive, responsive user interfaces that work across a wide range of devices. **CO3:** Infer long running tasks and background work in Android applications. **CO4:** Demonstrate methods in storing, sharing and retrieving data in Android applications. **CO5:** Infer the role of permissions and security for Android applications.

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Fourth Year Course outcomes

Course Code	Course Name	Course Outcomes-On completion of this course the students will be able to
18CS71	ARTIFICIAL INTELLIGENCE AND MACHINE LEAR	**CO1:** Appraise the theory of Artificial intelligence and Machine Learning. **CO2:** Illustrate the working of AI and ML Algorithms. **CO3:** Demonstrate the applications of AI and ML.
18CS72	BIG DATA AND ANALYTICS	**CO1:** Understand fundamentals of Big Data analytics. **CO2:** Investigate Hadoop framework and Hadoop Distributed File system. **CO3:** Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data. **CO4:** Demonstrate the MapReduce programming model to process the big data along with Hadoop tools. **CO5:** Use Machine Learning algorithms for real world big data. **CO6:** Analyze web contents and Social Networks to provide analytics with relevant visualization tools.
18CS734	USER INTERFACE DESIGN	**CO1:** Design the User Interface, design, menu creation, windows creation and connection between menus and windows
18CS744	CRYPTOGRAPHY	**CO1:** Define cryptography and its principles **CO2:** Explain Cryptography algorithms **CO3:** Illustrate Public and Private key cryptography **CO4:** Explain Key management, distribution and certification **CO5:** Explain authentication protocols **CO6:** Tell about IPSec
18CSL76	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY	**CO1:** Implement and demonstrate AI and ML algorithms. **CO2:** Evaluate different algorithms.
18CS81	INTERNET OF THINGS	**CO1:** Interpret the impact and challenges posed by IoT networks leading to new architectural models. **CO2:** Compare and contrast the deployment of smart objects and the technologies to connect them to network. **CO3:** Appraise the role of IoT protocols for efficient network communication. **CO4:** Elaborate the need for Data Analytics and Security in IoT. **CO5:** Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.
18CS822	STORAGE AREA NETWORKS	**CO1:** Identify key challenges in managing information and analyze different storage networking technologies and virtualization **CO2:** Explain components and the implementation of NAS **CO3:** Describe CAS architecture and types of archives and forms of virtualization **CO4:** Illustrate the storage infrastructure and management activities

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Second Year Course outcomes

Course Code	Course Name	Course Outcomes-On completion of this course the students will be able to
21MAT31	TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES	CO1. To solve ordinary differential equations using Laplace transform. CO2. Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory. CO3. To use Fourier transforms to analyze problems involving continuous-time signals and to apply Z-Transform techniques to solve difference equations CO 4. To solve mathematical models represented by initial or boundary value problems involving partial differential equations CO 5. Determine the extremals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis
21CS32	DATA STRUCTURES AND APPLICATIONS	CO 1. Identify different data structures and their applications. CO 2. Apply stack and queues in solving problems. CO 3. Demonstrate applications of linked list. CO 4. Explore the applications of trees and graphs to model and solve the real-world problem. CO 5. Make use of Hashing techniques and resolve collisions during mapping of key value pairs
21CS33	ANALOG AND DIGITAL ELECTRONICS	CO 1. Design and analyze application of analog circuits using photo devices, timer IC, power supply and regulator IC and op-amp. CO 2. Explain the basic principles of A/D and D/A conversion circuits and develop the same. CO 3. Simplify digital circuits using Karnaugh Map, and Quine-McClusky Methods CO 4. Explain Gates and flip flops and make us in designing different data processing circuits, registers and counters and compare the types. CO 5. Develop simple HDL programs
21CS34	COMPUTER ORGANIZATION AND ARCHITECTURE	CO 1. Explain the organization and architecture of computer systems with machine instructions and programs CO 2. Analyze the input/output devices communicating with computer system CO 3. Demonstrate the functions of different types of memory devices CO 4. Apply different data types on simple arithmetic and logical unit CO 5. Analyze the functions of basic processing unit, Parallel processing and pipelining
21CSL35	OBJECT ORIENTED PROGRAMMING WITH JAVA LABORATORY	CO1. Use Eclipse/NetBeans IDE to design, develop, debug Java Projects. CO2. Analyze the necessity for Object Oriented Programming paradigm over structured programming and become familiar with the fundamental concepts in OOP. CO3. Demonstrate the ability to design and develop java programs, analyze, and interpret objectoriented data and document results. CO4. Apply the concepts of multiprogramming, exception/event handling, and abstraction to develop robust programs. CO5. Develop user friendly applications using File I/O and GUI concepts.

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21CS382	C++ PROGRAMMING	CO1. Able to understand and design the solution to a problem using object-oriented programming concepts. CO2. Able to reuse the code with extensible Class types, User-defined operators and function Overloading. CO3. Achieve code reusability and extensibility by means of Inheritance and Polymorphism CO4. Identify and explore the Performance analysis of I/O Streams. CO5. Implement the features of C++ including templates, exceptions and file handling for providing programmed solutions to complex problems.
21CS41	MATHEMATICAL FOUNDATIONS FOR COMPUTING	CO 1. Apply the concepts of logic for effective computation and relating problems in the Engineering domain. CO 2. Analyse the concepts of functions and relations to various fields of Engineering. Comprehend the concepts of Graph Theory for various applications of Computational sciences. CO 3. Apply discrete and continuous probability distributions in analysing the probability models arising in the engineering field. CO 4. Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data. CO 5. Construct joint probability distributions and demonstrate the validity of testing the hypothesis.
21CS42	DESIGN AND ANALYSIS OF ALGORITHMS	CO 1. Analyse the running times of algorithms and state the performance using asymptotic notations and also to analyse mathematically for the complexity of the algorithm. CO 2. Apply divide and conquer approaches and decrease and conquer approaches in solving the problems. Derive and solve recurrences describing the performance of divide-and-conquer algorithms. CO 3. Able to choose the appropriate algorithmic design technique like greedy method, transform and conquer approaches and compare the efficiency of algorithms to solve the given problem. CO 4. Apply and analyse dynamic programming approaches. Synthesize dynamic-programming algorithms, and analyse them and improve an algorithm time efficiency by sacrificing space. CO 5. Apply and analyse backtracking, branch and bound, and to describe P, NP and NP-Complete problems.
21CS43	MICROCONTROLLER AND EMBEDDED SYSTEMS	CO 1: Describe the ARM microcontroller's architectural features and program module. CO2: Apply the knowledge gained from programming on ARM to different applications. CO3: Program the basic hardware components and their application selection method. CO4: Demonstrate the need for a real-time operating system for embedded system applications.
21CS44	OPERATING SYSTEMS	CO 1. Identify the structure of an operating system and its scheduling mechanism. CO 2. Demonstrate the allocation of resources for a process using scheduling algorithm. CO 3. Identify root causes of deadlock and provide the solution for deadlock elimination CO 4. Explore about the storage structures and learn about the Linux Operating system. CO 5. Analyse Storage Structures and Implement Customized Case study

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21CSL46	PYTHON PROGRAMMING LABORATORY	CO 1. Demonstrate proficiency in handling of loops and creation of functions. CO 2. Identify the methods to create and manipulate lists, tuples and dictionaries. CO 3. Discover the commonly used operations involving regular expressions and file system. CO 4. Interpret the concepts of Object-Oriented Programming as used in Python. CO 5. Determine the need for scraping websites and working with PDF, JSON and other file formats.

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SAPTHAGIRI COLLEGE OF ENGINEERING

Department of Mechanical Engineering

COURSE OUTCOMES AND COURSE ARTICULATION MATRIX

2021 SCHEME

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
	PROGRAM OUTCOMES												PROGRAM SPECIFIC OUTCOMES		
	Apply Knowledge	Problem Analysis	Design Solution	Investigation	Modern Tools	Society,Health, Safety, Legal	Environment & Sustainability	Ethics	Individual & Team Work	Report, Document,Presentation, Communication	Proj Mgmt Finance	Life Long Learn	Design,Thermal, Manufacturing	Analytical, Experimental, Creativity	Modern Tools, Management, Product Development
					3	2	1	-							
					High	Medium	Low	No							

21EME15/25-Elements of Mechanical Engineering	
CO1	Describe different sources of energy and calculcate steam properties.
CO2	Summarize the Properties, Composition, and Industrial Application of Engineering Materials
CO3	Paraphraze the automobile technology in transport application and demonstrate basics of Refrigeration and Air-Conditioning
CO4	Analyze the Power transmission systems and describe basics of robotics.
CO5	Describe the concepts of manufacturing and machine tools and latest trends

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	2	-	-	-	-	-	-		-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-		-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	3	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	3	3	-	-
Average	2.00	2.00	-	-	-	-	2.00	-	-	-	-	3.00	3.00	-	-

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21EVN15/25-Engineering Visualization

CO1	Visualize and analyze the objects and Demonstrate the usage of CAD software
CO2	Identify the interdisciplinary engineering components or systems through its graphical representation
CO3	Draw orthographic projections of points, lines, planes and solids
CO4	Generate the development of lateral surfaces of solids and isometric projections of solids

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	3	-	-	-	-	3	-	3	-	-	3
CO2	3	-	-	-	3	-	-	-	-	3	-	3	-	-	3
CO3	3	3	-	-	3	-	-	-	-	3	-	3	-	-	3
CO4	3	3	-		3	-	-	-	-	-	-	3	-	-	-
Average	3.00	3.00	-	-	3.00	-	-	-	-	3.00	-	3.00	-	-	3.00

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SECOND YEAR

Metal Casting Forming & Joining Process-21ME32

CO1	Select appropriate primary manufacturing process and related parameters for obtaining initial shape and size of components.
CO2	Design and develop adequate tooling linked with casting, welding and forming operations.
CO3	Appreciate the effect of process parameters on quality of manufactured components
CO4	Demonstrate various skills in preparation of molding sand for conducting tensile, shear and compression tests using Universal sand testing machine.
CO5	Demonstrate skills in preparation of forging models involving upsetting, drawing and bending operations.
CO6	Demonstrate skills in preparation of Welding models.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	3	3	3	-
CO2	3	3	-	-	-	-	-	-	-	-	-	3	3	3	-
CO3	3	3	-	-	-	-	-	-	-	-	-	2	3	3	-
CO4	3	3	-	-	-	-	-	-	-	-	-	3	3	3	-
CO5	3	3	-	-	-	-	-	-	-	-	-	3	3	3	-
CO6	3	3	-	-	-	-	-	-	-	-	-	3	3	3	-
Average	3.00	2.75	-	-	-	-	-	-	-	-	-	2.75	3.00	3.00	-

Material Science and Engineering 21ME33

CO1	Understand the atomic arrangement in crystalline materials and describe the periodic arrangement of atoms in terms of unit cell parameters.
CO2	Understand the importance of phase diagrams and the phase transformations.
CO3	Know various heat treatment methods for controlling the microstructure.
CO4	Correlate between material properties with component design and identify various kinds of defects.
CO5	Apply the method of materials selection, material data and knowledge sources for computer-aided selection of materials.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	2	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	2	3	-	-
CO3	3	-	-	-	-	-	2	-	-	-	-	2	3	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	2	3	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	2	3	-	-
-	3.00	-	2.00	-	-	-	2.00	-	-	-	-	2.00	3.00	-	-

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Thermodynamics 21ME34															
CO1	Determine heat and work interactions in different thermodynamic Processes And first law of thermodynamics.														
CO2	Analyze thermodynamic systems based on Second law of thermodynamics & Entropy concepts														
CO3	Analyze the behavior of the ideal and real gases using gas laws. Compute combustion thermodynamics property.														
CO4	Compute available energy in thermodynamic systems and Pure substances utilization.														
CO5	Analyze the performance parameters of Vapour Power and Gas power Cycles.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	-	-	-	-	2	-	-	-	-	2	3	3	-
CO2	3	2	-	-	-	-	2	-	-	-	-	3	3	3	-
CO3	3	3	-	-	-	-	2	-	-	-	-	2	3	3	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	3	2
CO5	3	2	-	-	-	-	2	-	-	-	-	2	3	3	2
Average	3.00	2.20	-	-	-	-	2.00	-	-	-	-	2.20	3.00	3.00	2.00

Machine Drawing GD&T- 21ME35															
CO1	Interpret the Machining and surface finish symbols on the component drawings														
CO2	Apply limits and tolerances to assemblies and choose appropriate fits for given assemblies.														
CO3	Illustrate various machine components through drawings														
CO4	Create assembly drawings as per the conventions.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	-	-	-	-	-	-	-	-	-	-	2	2	-	3
CO2	-	-	-	-	-	-	-	-	-	-	-	2	2	-	3
CO3	-	-	-	-	-	-	-	-	-	-	-	2	2	-	3
CO4	-	-	-	-	-	-	-	-	-	-	-	2	2	-	3
CO5	-	-	-	-	-	-	-	-	-	-	-	2	2	-	3
Average	-	-	-	-	-	-	-	-	-	-	-	2.00	3.00	-	3

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Machining Science and Jigs & Fixtures-21ME42															
CO1	Demonstrate the Conventional CNC machines and advanced manufacturing process operations														
CO2	Determine tool life, cutting force, and economy of the machining process.														
CO3	Analyze the influence of various parameters on machine tools' performance														
CO4	Select the appropriate machine tools and process, the Jigs, and fixtures for various applications.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-	2	-	2
CO4	3	-	-	-	-	-	-	-	-	-	-	-	2	-	2
Average	2.20	-	-	-	-	-	-	-	-	-	-	-	2.00	-	2.00

Fluid Mechanics-21ME43															
CO1	Calculate the Fluid properties, Stability of floating bodies and hydrostatic forces on surfaces														
CO2	Apply the principles of fluid kinematics and dynamics for fluid flow problems														
CO3	Analyze the fluid flows.														
CO4	Formulate the relations of fluid properties by using dimensional analysis.														
CO5	Describe the boundary layer concept														
CO6	Explain the thermodynamics of compressible flow and basics of CFD.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	-	-	-	-	-	-	-	-	-	3	2	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	3	2	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	3	2	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	3	3	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	3	2	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	3	2	-	-
Average	2.75	2.75	-	-	-	-	-	-	-	-	-	3.00	2.25	-	-

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Mechanics of Materials-21ME44

CO1	Understand simple, compound, thermal stresses and strains their relations and strain energy
CO2	Analyse structural members for stresses, strains and deformations.
CO3	Analyse the structural members subjected to bending and shear loads.
CO4	Analyse shafts subjected to twisting loads.
CO5	Analyse the short columns for stability.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	2	2	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	2	3	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	2	3	-	-
CO4	2	3	-	-	-	-	-	-	-	-	-	2	3	-	-
CO5	2	3	-	-	-	-	-	-	-	-	-	2	3	-	-
Average	2.00	3.00	-	-	-	-	-	-	-	-	-	2.00	2.80	-	-

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THIRD YEAR

Management & Economics 18ME51

CO1	Describe the Overview and functions of Management.
CO2	Discuss Decision making, Organizing, Staffing, Directing and Controlling
CO3	Estimate the interest by various Methods.
CO4	Estimate Present, future and annual worth and rate of returns
CO5	Determine the Cost and Depreciation of Product.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	2	2	-	2	2	-	-	3
CO2	-	-	-	-	-	-	-	2	2	-	2	2	-	-	3
CO3	2	2	-	-	-	-	-	-	-	-	3	2	-	-	-
CO4	2	3	-	2	-	-	-	-	-	-	3	2	-	-	-
CO5	2	3	-	-	-	-	-	2	-	-	3	3	-	-	3
Average	2.00	2.67	-	2.00	-	-	-	2.00	2.00	-	2.60	2.20	-	-	3.00

Design of Machine Elements-I 18ME52

CO1	Describe and apply various codes and standards in design process.
CO2	Analyze the behaviour of machine elements subjected to static, impact and fatigue loading.
CO3	Design shafts, couplings and joints for power transmission
CO4	Design riveted and welded joints
CO5	Design threaded fasteners and power screws

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	3	-	-	-	-	-	-	-	-	3	3	-	-
CO2	3	3	3	2	-	2	-	-	-	-	-	3	3	3	2
CO3	3	3	3	2	-	2	-	-	-	-	-	2	3	3	2
CO4	3	3	3	2	-	2	-	-	-	-	-	2	3	3	2
CO5	3	3	3	2	-	2	-	-	-	-	-	2	3	3	2
Average	3.00	3.00	3.00	2.00	-	2.00	-	-	-	-	-	2.40	3.00	3.00	2.00

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Dynamics of Machines 18ME53															
CO1	Examine simple mechanisms for static and dynamic equilibrium.														
CO2	Investigate the balancing of rotating and reciprocating masses.														
CO3	Evaluate various characteristics of the governor and gyroscope.														
CO4	Analyze free vibration of single degree of freedom systems.														
CO5	Analyze forced vibration of single degree of freedom system and transverse vibration of the shaft														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	-	-	-	-	-	-	-	-	3	3	3	-
CO2	3	3	2	-	-	-	2	-	-	-	-	2	3	3	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	3	-
CO4	3	3	-	-	-	-	-	-	-	-	-	2	3	3	-
CO5	3	3	2	-	-	-	-	-	-	-	-	2	3	3	-
Average	3.00	2.80	2.00	-	-	-	2.00	-	-	-	-	2.25	3.00	3.00	-

Turbo Machines 18ME54															
CO1	Determine the fluid flow parameters by using model studies.														
CO2	Determine efficiency of turbo machines by using thermodynamic principles.														
CO3	Analyze energy transfer in turbo machines.														
CO4	Determine performance parameters of steam turbine.														
CO5	Design and determine performance parameters of hydraulic turbines.														
CO6	Evaluate performance parameters of centrifugal pump, centrifugal and axial compressor.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	-	-	-	-	-	-	-	-	2	3	3	-
CO2	3	2	-	-	-	-	-	-	-	-	-	3	3	3	-
CO3	3	3	-	-	-	-	-	-	-	-	-	3	3	3	-
CO4	3	3	2	-	-	-	2	-	-	-	-	2	3	3	-
CO5	3	3	3	-	-	-	-	-	-	-	-	2	3	3	-
CO6	3	3	2	-	-	-	-	-	-	-	-	2	3	3	-
Average	3.00	2.83	2.25	-	-	-	2.00	-	-	-	-	2.33	3.00	3.00	-

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Fluid Power Engg 18ME55															
CO1	Describe structural components and working of hydraulic systems.														
CO2	Distinguish different types of pumps and actuators and Determine performance parameters.														
CO3	Apply the design of hydraulic circuit using control components for given applications.														
CO4	Describe pneumatic power system and its components.														
CO5	Apply the design of pneumatic control circuit.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	2	3	-	-
CO3	2	2	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-
CO5	2	2	2	-	-	-	-	-	-	-	-	-	3	-	-
Average	2.00	2.00	2.00	-	-	-	-	-	-	-	-	2.00	3.00	-	-

OPERATIONS MANAGEMENT (18ME56)															
CO1	Able to describe Production Management Functions and Interpret Decision making Process.														
CO2	Able to explain the forecasting process.														
CO3	Able to recognize the Capacity and location Planning.														
CO4	Able to explain the Aggregate Planning and Master Scheduling.														
CO5	Able to identifythe Material Requirement Planningand Supply Chain Management.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	-	-	-	-	-	-	2	-	2	2	2	1	-	2
CO2	2	-	-	-	-	-	-	-	-	2	2	2	1	-	2
CO3	2	-	-	-	-	-	-	-	-	2	2	2	1	-	2
CO4	2	-	-	-	2	-	-	-	-	2	2	2	1	2	2
CO5	2	-	-	-	2	-	-	-	-	2	2	2	1	2	2
Average	2.00	-	-	-	2.00	-	-	2.00	-	2.00	2.00	2.00	1.00	2.00	2.00

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Environmental Studies (18CIV59)															
CO1	Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale,														
CO2	Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.														
CO3	Demonstrate ecology knowledge of a complex relationship between biotic and a biotic components.														
CO4															
CO5															
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	-	-	-	-	3	3	-	-	-	-	3	-	-	-
CO2	-	-	-	-	-	3	3	-	-	-	-	3	-	-	-
CO3	-	-	-	-	-	3	3	-	-	-	-	3	-	-	-
CO4													-	-	-
CO5															
Average	-	-	-	-	-	3.00	3.00	-	-	-	-	3.00	-	-	-

Fluid Mechanics & Machines Lab 18MEL57															
CO1	Analyze the performance of power developing and Power absorbing machines.														
CO2	Calibrate and determine the flow properties of flow measuring devices.														
CO3	Analyze major and minor losses for flow through pipes.														
CO4	Analyze the impact of jet on vanes.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	3	-	2	-	-	1	-	3	3	-	3	3	3	-
CO2	-	3	-	2	-	-	1	-	3	3	-	-	3	3	-
CO3	-	3	-	2	-	-	1	-	3	3	-	2	3	3	-
CO4	-	3	-	2	-	-	1	-	3	3	-	-	3	3	-
Average	-	3.00	-	2.00	-	-	1.00	-	3.00	3.00	-	2.50	3.00	3.00	-

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Energy Conversion Lab 18MEL58															
CO1	Analyze the properties of fuels and oils.														
CO2	Analyze performance of IC engines and draw its characteristics.														
CO3	Investigate performance on Air Compressors and draw its characteristics.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	3	-	3	-	3	3	-	2	3	-	2	3	3	-
CO2	-	3	-	3	-	2	3	-	3	3	-	2	3	3	-
CO3	-	3	-	3	-	2	3	-	3	3	-	2	3	3	-
Average	-	3.00	-	3.00	-	2.33	3.00	-	2.67	3.00	-	2.00	3.00	3.00	-

Finite Element Analysis 18ME61															
CO1	Apply basics of finite element formulation methods.														
CO2	Derive interpolation functions for structural elements.														
CO3	Apply finite element formulation to determine structural behavior of bar, truss, beam and shaft.														
CO4	Formulate 1D heat transfer and fluid flow problems.														
CO5	Determine numerical solution for axisymmetric triangular element subjected to point load.														
CO6	Formulate ID bar and truss element subjected to dynamic loading.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	2	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	3	1	-
CO3	3	3	3	2	-	-	-	-	-	-	-	3	3	3	-
CO4	3	3	3	2	-	-	-	-	-	-	-	2	3	3	-
CO5	3	3	3	2	-	-	-	-	-	-	-	2	3	3	-
CO6	3	3	3	2	-	-	-	-	-	-	-	2	3	3	-
Average	2.83	2.80	3.00	2.00	-	-	-	-	-	-	-	2.25	3.00	2.50	-

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Design of Machine Elements-II 18ME62															
CO1	Design springs, clutches and brakes.														
CO2	Design belts and wire ropes for power transmission.														
CO3	Design different types of gears.														
CO4	Design and analyze bearings for engineering applications														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	2	-	2	2	-	-	-	-	3	3	3	-
CO2	3	3	3	2	-	2	2	-	-	-	-	3	3	3	2
CO3	3	3	3	3	-	2	2	-	-	-	-	3	3	3	2
CO4	3	3	3	2	-	2	2	-	-	-	-	3	3	3	2
Average	3.00	3.00	3.00	2.25	-	2.00	2.00	-	-	-	-	3.00	3.00	3.00	2.00

Heat Transfer 18ME63															
CO1	Apply concept of the conduction heat transfer of steady and unsteady state.														
CO2	Analyze one-dimensional and two-dimensional steady and unsteady state heat conduction using numerical methods.														
CO3	Analyze the radiation heat transfer by applying fundamental laws														
CO4	Determine convective heat transfer using non-dimensional numbers.														
CO5	Evaluate performance parameters using LMTD and NTU methods.														
CO6	Determine heat transfer co-efficient of boiling and condensation.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	2	-	-	2	-	-	-	-	2	3	3	-
CO2	3	3	3	-	-	-	1	-	-	-	-	2	3	3	-
CO3	3	3	3	-	-	-	2	-	-	-	-	2	3	3	-
CO4	3	2	3	2	-	-	-	-	-	-	-	-	3	3	-
CO5	3	2	2	2	-	-	2	-	-	-	-	2	3	3	-
CO6	3	2	3	2	-	-	2	-	-	-	-	2	3	3	-
Average	3.00	2.33	2.67	2.00	-	-	1.80	-	-	-	-	2.00	3.00	3.00	-

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Heat Transfer Lab 18MEL67															
CO1	Estimate the thermal conductivity of metal rod, composite wall and effectiveness of extended surfaces.														
CO2	Analyze convective heat transfer coefficient for free and forced convection														
CO3	Investigate the surface emmissivity of a test plate and Stefan Boltzman constant validation.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	3	-	3	-	2	2	-	3	3	-	2	3	3	-
CO2	-	3	-	3	-	2	2	-	3	3	-	2	3	3	-
CO3	-	3	-	3	-	2	2	-	3	3	-	2	3	3	-
Average	-	3.00	-	3.00	-	2.00	2.00	-	3.00	3.00	-	2.00	3.00	3.00	-

Modeling & Analysis Lab 18MEL68															
CO1	Demonstrate the finite element analysis software.														
CO2	Analyze 1-D and 2-D Structural Problems.														
CO3	Analyze 1-D and 2-D Heat Transfer Problems.														
CO4	Evaluate the dynamic behavior for Bars and Beams Problems														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	-	-	-	3	-	-	-	-	-	-	3	3	3	3
CO2	-	3	2	2	3	-	-	-	2	3	-	3	3	3	3
CO3	-	3	2	2	3	-	-	-	2	3	-	3	3	3	3
CO4	-	3	2	2	3	-	-	-	2	3	-	3	3	3	3
Average	-	3.00	2.00	2.00	3.00	-	-	-	2.00	3.00	-	3.00	3.00	3.00	3.00

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FOURTH YEAR															
Control Engineering 18ME71															
CO1	Describe the Basic Principles of control system and controllers														
CO2	Determine the system governing equations for physical models of mechanical, hydraulic,Pneumatic and electrical system.														
CO3	Illustrate the response of 1st and 2nd order systems														
CO4	Determine the transfer function of a control system using Block diagram reduction technique and Signal flow graphs														
CO5	Solve the stability of the control system using Nyquist, Polar, Bode and root locus methods														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	-	2	-	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	2	3	3	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	3	3	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	3	3	-
Average	3.00	3.00	2.00	-	-	-	-	-	-	-	-	2.00	3.00	3.00	-

Computer Aided Design and Manufacturing-18ME72															
CO1	Describe the basics of automated manufacturing systems and mathematical model to analyze the different types of automated flowlines.														
CO2	Explain the different types of manufacturing planning and control system using graphics software.														
CO3	Discuss the Flexible manufacturing system														
CO4	Write CNC part program and programs for Robots.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	-	-	-	-	-	-	-	-	-	-	3	3	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	3	3	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	3	3	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	3	3	-	-
Average	-	-	-	-	-	-	-	-	-	-	-	3.00	3.00	-	-

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Design Lab -18MEL76															
CO1	Analyse the vibration characteristics in a single degree of freedom vibrating systems														
CO2	Analyse the rotating elements for balancing, critical speed of shaft.														
CO3	Compute the fringe constant of photo elastic material for different loading conditions.														
CO4	Analyse the characteristics of governors														
CO5	Evaluate the stresses for combined loading in straight and curved beam using strain gauges														
CO6	Analyse pressure distribution in journal bearing														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	3	-	3	-	-	-	-	3	3	-	3	3	3	-
CO2	-	3	-	3	-	-	-	-	3	3	-	3	3	2	-
CO3	-	3	-	3	-	-	-	-	3	3	-	-	3	2	-
CO4	-	3	-	3	-	-	-	-	3	3	-	-	3	2	-
CO5	-	3	-	3	-	-	-	-	3	3	-	3	3	2	-
CO6	-	3	-	3	-	-	-	-	3	3	-	2	3	2	-
Average	-	3.00	-	3.00	-	-	-	-	3.00	3.00	-	2.75	3.00	2.17	-

CIM Lab-18MEL77															
CO1	Demonstrate the Simulation softwares in Manufacturing														
CO2	Simulate Turning Operations using CNC software														
CO3	Simulate Milling operations using CNC software														
CO4	Demonstrate flexible manufacturing and Robots.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	-	-	-	3	-	-	-	-	3	-	2	3	-	3
CO2	-	3	-	-	3	-	-	-	2	3	-	2	3	2	3
CO3	-	3	-	-	3	-	-	-	2	3	-	2	3	2	3
CO4	-	-	-	-	3	-	-	-	-	-	-	2	2	-	2
Average	-	3.00	-	-	3.00	-	-	-	2.00	3.00	-	2.00	2.75	2.00	2.75

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Project Phase 1 18MEP78															
CO1	Identify, formulate and analyze engineering problems for the need of society.														
CO2	Design solutions for engineering problems using modern tool/technology to investigate with interpretation of data														
CO3	Analyze the impact of the engineering solutions in societal and environmental contexts for sustainable development with commit to professional ethics														
CO4	Work individually and in team, Communicate effectively through reports and presentations.														
CO5	Apply engineering, management and ethical principles for Project management and finance														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	-	3	-	3	3	-	-	-	-	3	3	3	-
CO2	3	3	3	3	3	3	3	-	-	-	-	3	3	3	3
CO3	3	3	-	3	-	3	3	-	-	-	-	3	3	3	-
CO4	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
CO5	3	-	-	-	-	-	-	3	-	-	3	3	-	-	3
Average	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Operations Research-18ME735															
CO1	Describe the basics of operations research and Analyze linear programming problems														
CO2	Formulate and optimize transportation and assignment problems.														
CO3	Evaluate project completion time using PERT and CPM techniques and formulate strategies of game.														
CO4	Evaluate job sequencing and queuing theory models.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	-	-	-	-	-	-	-	2	2	-	3	-
CO2	3	3	2	2	-	-	-	-	-	-	2	2	-	3	-
CO3	3	3	3	2	-	-	-	-	-	-	3	2	-	3	-
CO4	3	3	2	2	-	-	-	-	-	-	3	2	-	3	-
Average	3.00	3.00	2.25	2.00	-	-	-	-	-	-	2.50	2.00	-	3.00	-

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Additive Manufacturing-18ME741															
CO1	Describe the different process of additive manufacturing														
CO2	Illustrate the working of different types of actuators														
CO3	Outline the different process of polymerization and powder metallurgy techniques.														
CO4	Describe the different characterization techniques.														
CO5	Demonstrate the various NC, CNC machine programming and Automation techniques														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	-	-	-	-	-	-	-	-	-	-	3	3	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	3	3	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	3	3	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	3	3	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	3	3	2	-
Average	3.00	2.00	-	-	-	-	-	-	-	-	-	3.00	3.00	2.00	-

Total Quality Management-18ME734															
CO1	Discuss the Principle and Application of Total Quality Management in Organizations.														
CO2	Describe the Quality, Roles of Leaders and Principles of Leadership.														
CO3	Discuss customers satisfactions and involvement in Service and Products.														
CO4	Analyze the use of Statistical Tools for Continuous Improvement of Processes.														
CO5	Apply Tools and Techniques of Total Quality Management.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	-	-	-	-	-	-	3	2	-	-	3	-	-	3
CO2	-	-	-	2	-	-	-	3	2	-	2	3	-	-	3
CO3	-	-	-	-	-	-	-	3	-	-	2	3	-	-	3
CO4	-	2	-	2	-	-	-	2	-	-	2	3	-	-	3
CO5	3	-	-	2	-	-	-	2	-	-	2	3	-	-	3
Average	3.00	2.00	-	2.00	-	-	-	2.60	2.00	-	2.00	3.00	-	-	3.00

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Design for Manufacturing-18ME731															
CO1	Outline the different phases and concepts of DFM and Process capabilities.														
CO2	Describe the Theories of assembly and Dimensioning parameters.														
CO3	Review and Modify the Design of a component for Manufacturing Process														
CO4	Review and Modify consideration for Casting and Welding.														
CO5	Illustrate the Design consideration for forging, powder metallurgy and injection moulding.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	-	-	-	-	-	-	-	-	-	-	2	3	-	2
CO2	2	-	-	-	-	-	-	-	-	-	-	2	3	-	2
CO3	-	-	-	3	-	-	-	-	-	-	-	2	3	2	2
CO4	-	-	-	3	-	-	-	-	-	-	-	2	3	2	2
CO5	-	-	-	3	-	-	-	-	-	-	-	2	3	2	2
Average	2.00	-	-	3.00	-	-	-	-	-	-	-	2.00	3.00	2.00	2.00

Mechatronics-18ME744															
CO1	Summarise the Components of Mechatronics Systems														
CO2	Describe the basic, architecture of Microprocessor and Microcontroller														
CO3	Examine the Programmable Logic Controller														
CO4	Describe the principles of Actuation System and its classification, application														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	-	-	-	2	-	-	-	-	-	-	3	3	1	2
CO2	-	-	-	-	2	-	-	-	-	-	-	3	3	1	2
CO3	3	-	-	2	2	-	-	-	-	-	-	3	3	1	2
CO4	-	-	-	-	2	2	-	-	-	-	-	3	3	1	2
Average	3.00	-	-	2.00	2.00	2.00	-	-	-	-	-	3.00	3.00	1.00	2.00

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Energy Engineering 18ME81

CO1	Summarize the concepts of steam power plant.
CO2	Describe the solar and Biomass energy conversion technology
CO3	Outline the tidal, wind and geo thermal energy conversion technology
CO4	Illustrate the concepts of Ocean energy extraction and Analyze parameters of Hydroelectric power plant.
CO5	Summarize the Nuclear Energy conversion methods.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	3	-	-	-	-	2	2	-	-
CO2	-	-	-	-	-	-	3	-	-	-	-	2	2	-	-
CO3	-	-	-	-	-	-	3	-	-	-	-	2	2	-	-
CO4	-	-	-	-	-	-	3	-	-	-	-	2	2	-	-
CO5	-	-	-	-	-	-	3	-	-	-	-	2	2	-	-
Average	-	-	-	-	-	-	3.00	-	-	-	-	2.00	2.00	-	-

Tribology-18ME822

CO1	Recognize and describe the fundamentals of tribology and associated parameters.
CO2	Analyze performance and design of components experiencing relative motion.
CO3	Analyze the requirements and design hydrodynamic journal and plane slider bearings for a given application.
CO4	Select proper bearing materials and lubricants for a given tribological application
CO5	Apply the principles of surface engineering for different applications of tribology.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	-	2	3	-	2
CO2	3	3	3	2	-	2	2	-	-	-	-	2	3	3	2
CO3	3	3	3	2	-	2	2	-	-	-	-	2	3	3	2
CO4	3	3	3	2	-	2	2	-	-	-	-	2	3	3	2
CO5	3	3	3	2	-	2	2	-	-	-	-	2	3	3	2
Average	3.00	2.80	2.60	2.00	-	2.00	2.00	-	-	-	-	2.00	3.00	3.00	2.00

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Internship/Professional Bodies 18MEI85															
CO1	Apply gained knowledge and skills in engineering practice														
CO2	Analyze and design solutions for engineering problems.														
CO3	Work individually, in team and communicate effectively through reports and presentations														
CO4	Demonstrate apt workplace attitude and ethics														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	-	3	2	-	-	-	-	3	2	2	3
CO2	3	3	3	3	2	3	-	-	-	-	2	3	2	2	3
CO3	-	-	-	-	-	-	-	3	3	3	-	3	-	-	3
CO4	-	-	-	-	-	-	-	3	3	-	2	3	-	-	-
Average	3.00	3.00	3.00	3.00	2.00	3.00	2.00	3.00	3.00	3.00	2.00	3.00	2.00	2.00	3.00
Project Phase- II 18MEP83															
CO1	Identify, formulate and analyze engineering problems for the need of society.														
CO2	Design solutions for engineering problems using modern tool/technology to investigate with interpretation of data														
CO3	Analyze the impact of the engineering solutions in societal and environmental contexts for sustainable development with commit to professional ethics														
CO4	Work individually and in team, Communicate effectively through reports and presentations.														
CO5	Apply engineering, management and ethical principles for Project management and finance														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	-	3	-	3	3	-	-	-	-	3	3	3	-
CO2	3	3	3	3	3	3	3	-	-	-	-	3	3	3	3
CO3	3	3	-	3	-	3	3	-	-	-	-	3	3	3	-
CO4	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
CO5	3	-	-	-	-	-	-	3	-	-	3	3	-	-	3
Average	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
18MES84 Technical Seminar															
CO1	Identify and explore recent trends in mechanical engineering														
CO2	Prepare effective report on the selected topic														
CO3	Prepare power point presentation (PPT), communicate and answer the queries on the topic														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	-	3	3	2	2	3	3	3	-	3	3	3	-
CO2	-	-	-	-	3	-	-	3	3	3	-	3	3	3	-
CO3	-	-	-	-	3	-	-	3	3	3	-	3	3	3	-
Average	3.00	3.00	-	3.00	3.00	2.00	2.00	3.00	3.00	3.00	-	3.00	3.00	3.00	-

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