VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

Autonomous institute affiliated to JNTUH

DEPARTMENT OF CIVIL ENGINEERING

COURSE COUTCOMES FOR 2015 – 2019 BATCH

Course Title with Code	Course Outcomes	
Mathematics – I A3001	CO1	Solve the first and higher order linear differential equations.
	CO2	Make use of differential equations to solve orthogonal trajectories, rate of growth/decay, Newton's law of cooling, Electrical circuits and simple harmonic motion problems..
	CO3	Examine extremum of a function of several variables and evaluate the multiple integrals.
	CO4	Apply Laplace transforms to solve differential equations.
	CO5	Evaluate line, surface and volume integrals using vector integral theorems.
Engineering Physics A3002	CO1	Analyze crystal structures in terms of lattice parameters and interpret the structures using X-ray diffraction methods.
	CO2	Apply the principles of quantum mechanics to analyze the properties of the semiconducting materials.
	CO3	Categorize Nano and dielectric materials. Discuss synthesis and react to environmental concerns due to nanotechnology.
	CO4	Categorize magnetic materials and objectivize their role in science and technology. Apply magnetism to explain superconductivity.
	CO5	Illustrate working of a laser and examine the communication systems using optical fibers.
Engineering Chemistry A3003	CO1	Apply the knowledge of standard electrode potentials of various metals and non metals to protect t hem from corrosion.
	CO2	Identify difference and similarities of three types of Batteries.
	CO3	Compare different methods of softening of hard water.
	CO4	Apply the knowledge of Materials, Fuels and Nano particles in controlling pollution.
	CO5	Compare and contrast the chemical behaviour, properties and applications of engineering substances.
Computer Programming A3501	CO1	Write algorithm and draw corresponding flowchart for simple problems besides explaining functions of computer components.
	CO2	Select the right identifiers, data types and operators for effective computation.
	CO3	Write programs, demonstrating use of control statements, arrays and strings.
	CO4	Demonstrate use of functions and pointers by writing programs.
	CO5	Write programs for simple real life problems using structures and unions.
	CO6	Illustrate use of files by writing programs.
Engineering Mechanics – I	CO1	Apply the laws of mechanics and evaluate the resultant force
	CO2	Construct free body diagrams and solve the problems using equations of

Course Title with Code	Course Outcomes	
- **A3301**		equilibrium
	CO3	Analyze the frictional forces to maintain the equilibrium of system
	CO4	Identify the centroid and centre of gravity of a body by using principle of moments
	CO5	Determine the area moment of inertia and mass moment of inertia of a body
Computer Programming through C Lab A3502	CO1	Implement programs by selecting the right identifiers, data types and operators for effective computation
	CO2	Implement programs, demonstrating use of control statements, arrays and strings
	CO3	Implement programs, demonstrating use of functions and pointers
	CO4	Implement C programs for simple real life problems using structures and unions
	CO5	Implement programs illustrating use of files
	CO6	Debug erroneous programs related to the course
Engineering Physics and Engineering Chemistry Lab A3007	CO1	Analyze the rigidity modulus of the given material to interpret the mechanical properties.
	CO2	Estimate the frequency of AC power supply and time constant of a R-C circuit.
	CO3	Apply the principles of optics to evaluate the characteristics of LED, laser and optical fibres.
	CO4	Apply different instrumental methods for the estimation of strengths of solutions and hardness of water.
	CO5	Analyze the effect of temperature on physical properties like viscosity and surface tension of liquids.
Engineering Drawing – I - **A3302**	CO1	Construct various types of scales for the design of maps and models
	CO2	Represent the objects using various types of lines and dimensioning rules
	CO3	Make use of the knowledge of geometry and engineering curves for constructions
	CO4	Analyze the objects such as points, lines and regular planes held in different orientations using conventional drawing and CAD tools
	CO5	Visualize the solids held in different orientations using conventional drawings and CAD tools
Mathematics – II A3006	CO1	Solve system of linear equations using rank of a matrix.
	CO2	Examine the nature of the Quadratic form by Eigen values and Eigen vectors.
	CO3	Classify and solve Partial differential equations.
	CO4	Develop Fourier series and Fourier transforms of a function.
	CO5	Apply Z- Transforms to solve difference equations.
Probability Theory and Numerical Methods A3004	CO1	Solve real world problems using the theory of probability.
	CO2	Identify the types of random variables involved in a given problem and calculate relevant probabilities.
	CO3	Develop appropriate Numerical methods to approximate a function..
	CO4	Make use of Numerical differentiation and integration in solving problems of engineering.
	CO5	Apply appropriate method to find numerical solution of a differential

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		equation.
Technical English A3005	CO1	Develop an understanding of the significance of humanity, love and service to mankind and be involved in community service
	CO2	Perceive the importance of technological impact on society and plan for the technological advancement
	CO3	Apply the rules of Grammar effectively (articles, prepositions, concord, tenses etc.) in writing reports, technical articles, essays and in day- to-day conversations
	CO4	Build creativity for career planning and entrepreneurship
	CO5	Develop effective written communication skills in academic writing
Engineering Mechanics – II - **A3303**	CO1	Apply the laws of mechanics and evaluate the resultant force
	CO2	Construct free body diagrams and solve the problems using equations of equilibrium
	CO3	Analyze the frictional forces to maintain the equilibrium of system
	CO4	Identify the centroid and centre of gravity of a body by using principle of moments
	CO5	Determine the area moment of inertia and mass moment of inertia of a body
Basic Electrical Electronics Engineering - **A3202**	CO1	Define basic electrical concepts like electric charge, current, electrical potential, electrical power and energy
	CO2	Apply Mesh, Nodal analysis, Network theorems and network topology concepts to solve electrical circuits
	CO3	Analyze the concepts of RMS, Average values of different periodic waveforms, power, power factors of single phase AC circuits and physical behavior of diodes and transistors
	CO4	Design regulated power supply using various rectifier and circuits
	CO5	Examine the construction, operation and characteristics of BJT, JFET AND MOSFET which can be used in the design of amplifiers
English Language Communication Skills Lab A3008	CO1	Improve their pronunciation using the rules of Phonetics.
	CO2	Take part in role-plays and interviews to perform effectively in real life situations.
	CO3	Choose appropriate words and phrases to make the telephonic conversation conveying the meaning with etiquettes.
	CO4	Minimize the stage fear and make presentations with proper body language.
	CO5	Adapt the art of debating and group discussion to present their view point convincingly.
Engineering Workshop - **A3305**	CO1	Identify the tools and equipment utilized in workshop
	CO2	Choose the required trade for the suitable operations
	CO3	Make the Wooden joints, MS fittings, house wiring, sheet metal components and simple forgings
	CO4	Explain the working of Arc Welding and Plumbing operations, uses of power tools and installation of Software in the computer systems
	CO5	Prepare the documents, data sheets and power point slides by using the Microsoft office tools
Engineering Drawing – II -	CO1	Develop the lateral surface of regular solids
	CO2	Imagine the sectional views and curves of intersections of regular solids

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A3304	CO3	Analyze isometric projections of objects such as regular planes and solids using conventional drawing and CAD tools
	CO4	Convert isometric views to orthographic views & vice versa
	CO5	Visualize the perspective projections of regular planes and solids using conventional drawing and CAD tools
MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS-A3011	CO1	Explain the concepts of Managerial Economics and Financial Accounting
	CO2	Analyze the demand, production, cost and break even to know interrelationship of among variables and their impact
	CO3	Classify the market structure to decide the fixation of suitable price
	CO4	Apply capital budgeting techniques to select best investment opportunity
	CO5	Prepare financial statements and analyze them to assess financial health of business
FLUID MECHANICS - A3101	CO1	Explain the properties of the fluids
	CO2	Classify the various types of flows
	CO3	Apply the concepts to solve problems on fluid flow
	CO4	Analyze the boundary layer effect on the fluid flows
	CO5	Categorize the various pipe networks
BUILDING MATERIALS AND CONSTRUCTION - A3102	CO1	Identify the different materials used in construction purpose
	CO2	Explain the applications of different building materials
	CO3	Classify the behavior of building components
	CO4	Distinguish between various types of masonry and foundation of buildings
	CO5	Describe the process of construction of formwork and finishing's
SURVEYING – I - A3103	CO1	Demonstrate the basic principles of surveying & levelling
	CO2	Apply the principles of surveying & levelling to measure linear angles and measurements
	CO3	Survey an area and prepare contour maps
	CO4	Determine true dimensions of the field by rectifying errors in basic surveying tools
	CO5	Estimate the quantity of earthwork required to level an area
STRENGTH OF MATERIALS-I - A3104	CO1	Interpret the engineering properties of the materials
	CO2	Identify shear force and bending moment in a member for different support conditions
	CO3	Apply theory of simple bending on various sections
	CO4	Analyze slope and deflection of beams using classical and analytical methods
	CO5	Estimate the principal stresses using graphical method
ENVIRONMENTAL SCIENCE - A3010	CO1	Identifythe important components of environment
	CO2	Identify global environmental problems and come out with best possible solutions
	CO3	Apply environmental laws for the protection of forest and wildlife
	CO4	Applytheknowledge ofEnvironmental ethicsto maintain harmonious relation between nature and human being.
	CO5	Illustrate the major environmental effects of exploiting natural resources

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STRENGTH OF MATERIALS LAB - A3105	CO1	Estimate young's modulus of different determinate beams experimentally
	CO2	Evaluate Direct and indirect stress tests on different materials
	CO3	Test for basic mechanical properties of materials
	CO4	ApplyMaxwell's reciprocal theorem on beams
	CO5	Experiment withspring with different loading conditions and identify performance
SURVEYING – I LAB - A3106	CO1	Demonstrate the use of basic surveying tools
	CO2	Apply the procedures involved in field work and to work as a surveyor in a team
	CO3	Identify types & sources of errors in all basic surveying tools
	CO4	Determine the location and levels of points on field & plotting using various methods
	CO5	Interpret survey data and compute areas and volumes
CONCRETE TECHNOLOGY - A3107	CO1	Evaluate the properties of concrete manufacturing materials to check their quality
	CO2	Measure the properties of fresh and hardened state of concrete for a given condition
	CO3	Identify properties of various types of Admixtures and their applications to field
	CO4	Assess various Concrete Mixes for field applications depending on environment
	CO5	Interpret various types of special concrete and their adaptability to field condition
STRENGTH OF MATERIALS-II - A3108	CO1	Solve the problems in various structural members subjected to combined loading, a combination of axial load, torsion and bending
	CO2	Determine the stresses developed in various structural members
	CO3	Apply classical theories of columns and failures
	CO4	Evaluate the deflection of structural members
	CO5	Estimate the stress distribution of pressure vessels
STRUCTURAL ANALYSIS – 1 - A3109	CO1	Identify determinate and indeterminate structures
	CO2	Solve perfect frames and three hinged arches under different loading conditions
	CO3	Apply energy theorems to beams and axially loaded structures
	CO4	Analyze determinate structures under different kinematic loading conditions
	CO5	Evaluate final moments for statically indeterminate flexural members using various methods
HYDRAULICS AND HYDRAULIC MACHINES - A3110	CO1	Design of hydraulic channels for different flows
	CO2	Evaluate the model and prototype relations by similarity laws
	CO3	Apply Impulse momentum equation to calculate impact of jets on plates
	CO4	Distinguish between the types of turbines based on heads, discharge and efficiencies
	CO5	Analyze the possible problems, performance and installation techniques of centrifugal pumps

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BUILDING PLANNING AND DRAWING - A3111	CO1	Infer the Bye laws and Principles of Planning for residential and other public buildings
	CO2	Plan, schedule and monitor the project effectively
	CO3	Develop parts of building such as doors and windows
	CO4	Model Plan, elevation and section for sloped and flat buildings
SURVEYING – II - A3112	CO1	Illustrate the importance& applications of remote sensing, GIS & GPS in surveying
	CO2	Measurelinear angles and measurements of ground features
	CO3	Determine the elevation and depression of ground features on, above or beneath the surface of the earth
	CO4	Survey and prepare plan for bridges, tunnels, buildings, dams, culverts etc.
	CO5	Interpret the characteristics of horizontal & vertical curves
FLUID MECHANICS AND HYDRAULIC MACHINERY LAB - A3113	CO1	Apply the Conservation of mass, momentum, energy Equations to the fluids
	CO2	Analyze flow measuring devices and their efficiency
	CO3	Examine the working principles, components, Operating characteristics of hydraulic machinery
	CO4	Choose suitable pumps and turbines for different working conditions
	CO5	Evaluate the force impacted on plates by water jets
SURVEYING – II LAB - A3112	CO1	Illustrate the importance& applications of remote sensing, GIS & GPS in surveying
	CO2	Measurelinear angles and measurements of ground features.
	CO3	Determine the elevation and depression of ground features on, above or beneath the surface of the earth
	CO4	Survey and prepare plan for bridges, tunnels, buildings, dams, culverts etc.
	CO5	Interpret the characteristics of horizontal & vertical curves
DESIGN OF REINFORCED CONCRETE STRUCTURES - A3115	CO1	Identify and compute the properties of concrete and steel
	CO2	Classify the behavior and inter relationship between the structural elements
	CO3	Analyse design loads and their action according to different field conditions
	CO4	Design reinforced concrete members according to code provisions
	CO5	Evaluatethe compression members and flexural members according to the given conditions
STRUCTURAL ANALYSIS II - A3116	CO1	Classify two hinged arches and indeterminacies
	CO2	Apply matrix methods in analysing the structures
	CO3	Determine bending moments using distribution methods
	CO4	Evaluate slope/rotation using displacement methods
	CO5	Analyse frames, arches and deformation profiles of moving loads
GEOTECHNICAL ENGINEERING – I - A3117	CO1	Demonstrate various classical theories of soil mechanics
	CO2	Classify the soil based on index properties
	CO3	Evaluate the engineering properties of soil
	CO4	Minimize the stress distributions in the founded soil with the theories of stress distribution

Course Title with Code	Course Outcomes	
	CO5	Analyze the compressibility of soils and evaluate various design parameters
ENGINEERING GEOLOGY - A3118	CO1	Outline the importance of geology in civil engineering.
	CO2	Identify the rocks and minerals based on their physical properties
	CO3	Distinguish between weathered rocks and fresh rocks
	CO4	Analyse the effects of weathering on structures
	CO5	Interpret geophysical investigations based on geophysical studies
WATER RESOURCES ENGINEERING-1 - A3119	CO1	Analyse the components of hydrologic cycle
	CO2	Develop Hydrographs for unknown storm durations and catchments
	CO3	Evaluate aquifer characteristics using aquifer parameters
	CO4	Apply various techniques to know the water requirements of the crop
	CO5	Design irrigation canals by using various theories
ESTIMATING AND COSTING - A3120	CO1	Identify various items of work in project and materials for given specifications
	CO2	Develop estimates of building and bar bending schedules
	CO3	Analyze the various types of contract documents
	CO4	Evaluate the quantity of earthwork for roads and canals and perform rate analysis
	CO5	Assess actual value of any property
ENGINEERING GEOLOGY LAB - A3121	CO1	Identify the minerals based on their physical properties by simple tests
	CO2	Solve various geological problems
	CO3	Classify rocks using basic geologic classification systems
	CO4	Interpret the geological structures in the geological maps and models
GEOTECHNICAL ENGINEERING LAB - A3122	CO1	Classify the soil based on index properties
	CO2	Evaluate the field quality control of embankments and subgrades
	CO3	Determine the engineering properties of soil
	CO4	Estimate the shear strength of soil under controlled drainage conditions
DESIGN OF STEEL STRUCTURES - A3123	CO1	Classify the different design philosophies
	CO2	Examine the different types connections
	CO3	Design the compression and tension members
	CO4	Design the members of roof truss
	CO5	Design the Plate girders
GEOTECHNICAL ENGINEERING – II - A3124	CO1	Compare the classical soil mechanics theories to new age techniques
	CO2	Summarize the need and importance of field reconnaissance in the design of major projects
	CO3	Determine the magnitude and direction of earth pressures
	CO4	Estimate the parameters for the design of foundations, earth retaining walls and hydraulic Structures
	CO5	Analyse complex geotechnical engineering problems
ENVIRONMENTAL	CO1	Identify water supply schemes, water demands and water quality parameters

Course Title with Code	Course Outcomes	
ENGINEERING - A3125	CO2	Design water treatment units along with water distribution systems
	CO3	Examine sewage, sewerage and house drainage system components
	CO4	Discuss primary and biological wastewater treatment processes and design its units
	CO5	Propose treatment and disposal methods of sewage and sludge
ENTREPRENEURSHIP DEVELOPMENT - A3076	CO1	Understand the role, characteristics, qualities and functions of entrepreneur and use this knowledge to become future entrepreneurs
	CO2	Interpret various Institutional support for setting up a business enterprise and apply this knowledge while approaching these institutions for financial support
	CO3	Illustrate role, importance and functions of women entrepreneur and use this knowledge to become future women entrepreneurs
	CO4	Infer the concept of Project Management and steps in Project development and analyse while taking future project assignments
	CO5	Indicate training programs and different training institutions to impart training and apply this knowledge to train existing and future entrepreneurs
ENVIRONMENTAL IMPACT ASSESSMENT - A3151	CO1	Explain the basic concepts and methodologies of environmental impact assessment
	CO2	Identify the impact of developmental activities on air, water, soil, biological, vegetation and wildlife
	CO3	Predict the impacts on air, water, soil, biological, vegetation and wildlife
	CO4	Assessthe impacts on air, water, soil, biological, vegetation and wildlife and select appropriate mitigation measures.
	CO5	Developenvironmental audit report by using environmental legislation to safeguard the society in relation to environmental impact assessment.
AIR POLLUTION AND CONTROL - A3157	CO1	Decide and Inspect the ambient air quality based on the analysis of air pollutants
	CO2	Apply and Compute the various techniques learnt, to remove high pollutant gases in the atmosphere
	CO3	Judgethe plume behavior and its controlling parameters in a prevailing environmental condition
	CO4	Estimate carbon emissions and its consequences for various day to day activities
	CO5	Demonstrate the air pollution standards and laws
ENVIRONMENTAL ENGINEERING LAB - A3126	CO1	Determine physical, chemical and biological characteristics of water and wastewater
	CO2	Estimate optimum dosage of coagulant
	CO3	Evaluate the quantity of Chlorine demand
	CO4	Analyze the quality of water and wastewater
	CO5	Interpret laboratorial results according to water quality standards
COMPUTER AIDED DRAFTING	CO1	Interpretand decide how to apply computer software to prepare civil engineering drawing
	CO2	Design typical reinforced concrete structural and steel members detailing

Course Title with Code	Course Outcomes	
LAB - A3127	CO3	Plan architectural floor plan
	CO4	Build geometric, multi-view, dimensioning and detail drawings of typical 2-D engineered objects
TRANSPORTATION ENGINEERING - A3128	CO1	Classify different modes of transportation and planning stages for highways
	CO2	Design various highway geometric elements using the knowledge of mechanics
	CO3	Identify the rules, regulations and different signal systems based on traffic flow
	CO4	Build knowledge on different types of intersections and their advantages
	CO5	Create awareness on highway construction material and maintenance
WATER RESOURCES ENGINEERING-II - A3129	CO1	Evaluate the failure criteria of Hydraulic Structures
	CO2	Estimate the reservoir capacity
	CO3	Design various diversion head works and spill ways
	CO4	Analyze various cross drainage works
	CO5	Solve the exit gradient problems under different flow conditions proned to seepage
REMOTE SENSING AND GIS APPLICATIONS - A3130	CO1	Identify basic concepts, processes and components of remote sensing
	CO2	Classify the photogrammetry, GIS methods and their applications
	CO3	Select different types of GIS data collection, data entry and data representationmethods
	CO4	Analyze spatial and attribute data using GIS
	CO5	Solve water resources related problems by using remote sensing & GIS techniques
ENGINEERING OPTIMIZATION - A3379	CO1	Apply optimization techniques to various Engineering problems involving single variable and multi-variables with constraints and without constraints
	CO2	Determineoptimum solution to linear programming problems using various techniques such as Simplex method, Revised Simplex method and Duality
	CO3	Evaluate the impact of various variables, constraints, resources, cost coefficients etc using Sensitivity (post-optimality) analysis
	CO4	Solve non-linear programming problems using various methods and techniques
	CO5	Analyze various systems / problems involving multi-stage decision-making processes using Dynamic programming technique based on the principle of optimality
CONSTRUCTION MANAGEMENT - A3159 (Professional Elective - III)	CO1	Apply different construction management techniques and practices
	CO2	Design construction project from begins to end of work with respect to budget, schedule, and safety specifications.
	CO3	Develop problem solving skills and decision making skills in construction management
	CO4	Adapt the principles of leadership in business and management including complex project decision making, and associated risk management
	CO5	Create a schedule for a construction project from start to completion within budget

Course Title with Code	Course Outcomes	
PAVEMENT ANALYSIS AND DESIGN - A3163	CO1	Classify the pavement types and materials used for construction
	CO2	Apply different theories in designing of pavements
	CO3	Analyze the problems related to structural design of the flexible and the rigid runway pavements
	CO4	Discussthe necessity and introduce various ground improvement methods
	CO5	Evaluate the failures of rigid and flexible pavements.
CONCRETE AND HIGHWAY ENGINEERING LABORATORY - A3131	CO1	Experimentwith highway materials and interpret results
	CO2	Examinethe properties of bitumen
	CO3	Findthe fresh and hardened properties of concrete
	CO4	Analyzethe mechanical properties of concrete
	CO5	Apply the non-destructive testing methods on RC structures
GEOGRAPHICAL INFORMATION SYSTEMS LAB - A3132	CO1	Choose different types of data inputs and data correction methods in GIS
	CO2	Design various spatial layers to produce thematic maps and base maps
	CO3	Select suitable data conversion methods
	CO4	Analyze spatial and attribute data using ArcGIS software
	CO5	Apply GIS in Water Resources Engineering & Transportation Engineering related problems
MANAGEMENT SCIENCE - A3014	CO1	Explain and infer the concepts and aspects of management
	CO2	Analyze the different organizational structures, plant layouts, work study tools for enhancement of productivity in an organization
	CO3	Apply the project management techniques to decide the optimum time and cost for completion of a project
	CO4	Apply statistical quality control techniques to know quality of product with in control limits
	CO5	Use Human resource management techniques for better people management
REHABILITATION AND RETROFITTING STRUCTURES - A3167	CO1	Develop various maintenance and repair strategies
	CO2	Categorize the causes and prevention mechanisms of corrosion in steel reinforcement and fire induced damages
	CO3	Estimate the structural damage and recommend suitable repair and strengthening methods
	CO4	Understand the usage of different techniques for structural retrofitting
	CO5	Apply various methods and techniques for damage assessment and diagnosis
SOLAR ENERGY AND APPLICATIONS - A3278	CO1	rapolate the available solar energy, solar energy conversion and utilization processes
	CO2	lyze the development of advanced storage solutions in thermal solar systems
	CO3	ntify and analyze the suitability of solar systems in different environmental conditions

Course Title with Code	Course Outcomes	
	CO4	Explore the design of standalone PVsystem and investigate the applications of solar PV cells
	CO5	Explore the cost analysis and environmental issues of solar system

Head of the Department

Principal

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE COUTCOMES FOR 2015 – 2019 BATCH

The following are the program outcomes:

PROGRAM OUTCOMES(POs):

Engineering Graduates will be able to:

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and

leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

The following are the program Specific outcomes:

PROGRAM SPECIFIC OUTCOMES(PSOs):

PSO1: Conceptualize complex electrical and electronics systems, employ control strategies for power electronics related applications to prioritize societal requirements.

PSO2: Design, analyze and create energy efficient and eco-friendly power & energy systems.

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Mathematics – I A3001	CO1	Solve the first and higher order linear differential equations.
	CO2	Make use of differential equations to solve orthogonal trajectories, rate of growth/decay, Newton's law of cooling, Electrical circuits and simple harmonic motion problems..
	CO3	Examine extremum of a function of several variables and evaluate the multiple integrals.
	CO4	Apply Laplace transforms to solve differential equations.
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Probability Theory and Numerical Methods A3004	CO1	Solve real world problems using the theory of probability.
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	CO3	Apply the rules of Grammar effectively (articles, prepositions, concord, tenses etc.) in writing reports, technical articles, essays and in day- to-day conversations
	CO4	Build creativity for career planning and entrepreneurship
	CO5	Develop effective written communication skills in academic writing
Basic Electrical Engineering A3201	CO1	Apply network reduction techniques and Knowledge of Alternating quantities to calculate Current, Voltage and Power for complex circuits.
	CO2	Analyze electrical Circuits using Nodal Analysis,Mesh analysis and Network theorems
	CO3	Apply the concepts of network topology to obtain Node incidence, Tie set and Cut set matrices.

Course Title with Code	Course Outcomes	
	CO4	Design two port networks ,their equivalent circuits and obtain their parameters
Computer programming A3501	CO1	Write algorithm and draw corresponding flowchart for simple problems besides Explaining functions of computer components
	CO2	Select the right identifiers, data types and operators for effective computation.
	CO3	Write programs, demonstrating use of control statements, arrays and strings.
	CO4	Demonstrate use of functions and pointers by writing programs.
	CO5	Write C programs for simple real life problems using structures and unions.
	CO6	Illustrate use of files by writing programs
English language communication skills lab A3008	CO1	Improve their pronunciation using the rules of Phonetics
	CO2	Take part in role-plays and interviews to perform effectively in real life situations
	CO3	Choose appropriate words and phrases to make the telephonic conversation conveying the meaning with etiquettes
	CO4	Minimize the stage fear and make presentations with proper body language
	CO5	Adapt the art of debating and group discussion to present your view point convincingly
Computer Programming through C Lab A3502	CO1	Implement programs by selecting the right identifiers, data types and operators for effective computation
	CO2	Implement programs, demonstrating use of control statements, arrays and strings
	CO3	Implement programs, demonstrating use of functions and pointers
	CO4	Implement C programs for simple real life problems using structures and unions
	CO5	Implement programs illustrating use of files
	CO6	Debug erroneous programs related to the course
Engineering workshop A3305	CO1	Identify the tools and equipment utilized in workshop
	CO2	Choose the required trade for the suitable operations
	CO3	Make the Wooden joints, MS fittings, house wiring, sheet metal components and simple forgings
	CO4	Explain the working of Arc Welding and Plumbing operations, uses of power tools and Installation of Software in the computer systems.
	CO5	Prepare the documents, data sheets and power point slides by using the Microsoft office tools.
Mathematics – II A3006	CO1	Solve system of linear equations using rank of a matrix.
	CO2	Examine the nature of the Quadratic form by Eigen values and Eigen vectors.
	CO3	Classify and solve Partial differential equations.
	CO4	Develop Fourier series and Fourier transforms of a function.
	CO5	Apply Z- Transforms to solve difference equations.

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Engineering Physics A3002	CO1	Analyze crystal structures in terms of lattice parameters and interpret the structures using X-ray diffraction methods.
	CO2	Apply the principles of quantum mechanics to analyze the properties of the semiconducting materials.
	CO3	Categorize Nano and dielectric materials. Discuss synthesis and react to environmental concerns due to nanotechnology.
	CO4	Categorize magnetic materials and objectivize their role in science and technology. Apply magnetism to explain superconductivity.
	CO5	Illustrate working of a laser and examine the communication systems using optical fibers.
Engineering Chemistry A3003	CO1	Apply the knowledge of standard electrode potentials of various metals and non metals to protect t hem from corrosion.
	CO2	Identify difference and similarities of three types of Batteries.
	CO3	Compare different methods of softening of hard water.
	CO4	Apply the knowledge of Materials, Fuels and Nano particles in controlling pollution.
	CO5	Compare and contrast the chemical behaviour, properties and applications of engineering substances.
Electronic Devices and Circuits A3401	CO1	Analyze the physical behavior of diodes and transistors.
	CO2	Compare various rectifiers, filters, transistors, biasing circuits and transistor amplifier configurations.
	CO3	Apply various stabilization and compensation techniques to obtain stable operating point of transistor.
	CO4	Analyze single stage amplifier circuits using small signal low frequency transistor model.
	CO5	Design regulated power supply and amplifier circuits for given specifications.
Data structures A3503	CO1	Solve computer software problems by using recursive, non-recursive techniquesand,analyze various algorithms with respect to time and space complexity.
	CO2	Demonstrate ability to exhibit knowledge of various searching and sortingtechniques and identifythe potential benefits of each one over the other andpropose appropriate technique to solveprogramming problems.
	CO3	Illustrate the applications of linear stack and queue.
	CO4	Exhibit the skills of demonstrating use of linked lists.
	CO5	Design novel solutions for simple real life problems using the concepts of nonlinear data structures.
Engineering Physics and Engineering Chemistry Lab	CO1	Analyze the rigidity modulus of the given material to interpret the mechanical properties.
	CO2	Estimate the frequency of AC power supply and time constant of a R-C circuit.
	CO3	Apply the principles of optics to evaluate the characteristics of LED, laser

Course Title with Code	Course Outcomes	
A3007		and optical fibres.
	CO4	Apply various titrations for the estimation of strengths of solutions and hardness of water.
	CO5	Analyze the effect of temperature on physical properties like viscosity and surface tension of liquids.
Data Structures Lab A3504	CO1	Implement various searching techniques suitable to resolve data searching problems.
	CO2	Demonstrate ability to exhibit knowledge of various sorting techniques and identify the potential benefits of each one over the other.
	CO3	Illustrate about linear data structures like stacks and queues representations and operations and apply them to design and build C based real time applications.
	CO4	Design and implement novel solutions for simple real life problems using the concepts of nonlinear data structures.
	CO5	Debug erroneous programs related to the course.
Electronic Devices and Circuits Lab A3403	CO1	Identify and use various electronic components, test and measuring instruments that are frequently used in experimentation of various circuits.
	CO2	Interpret the V - I characteristics of various electronic devices so as to realize the applications like switching, regulation and amplification.
	CO3	Design a simple regulated power supply by making use of rectifiers, filters and regulators.
	CO4	Apply various biasing techniques to fix the operating point and stabilize given electronic device like BJT and FET.
	CO5	Analyze the transient and frequency response of single stage amplifier circuits.
Managerial economics and financial analysis A3011	CO1	Explain and infer the concepts of Managerial Economics and Financial Accounting
	CO2	Analyze the demand, production, cost and break even to know interrelationship of among variables and their impact.
	CO3	Classify the market structure to decide the fixation of suitable price.
	CO4	Apply capital budgeting techniques to select best investment opportunity.
	CO5	Prepare financial statements and analyze them to assess financial health of business
Digital logic design A3404	CO1	Demonstrate the importance of various number systems and to perform different arithmetic operations on them
	CO2	Make use of Boolean algebra postulates-map and tabulation method to minimize Boolean functions and to implement with logic gates
	CO3	Construct and Analyze various combinational and sequential circuits used in digital systems such as adders, sub-tractors, codeconvertors, decoders, encoders, multiplexer, flip flop, register and counters
	CO4	Design various combinational PLDs such as ROMs, PALS, PLAS and PROMs.
	CO5	Minimize the finite state machine and to construct special flow charts called

Course Title with Code	Course Outcomes	
		ASMs charts to define digital hardware algorithms
Network analysis A3203	CO1	Apply the knowledge of AC fundamentals to 1-phase coupled circuits, resonant circuits and filter circuits
	CO2	Identify various 3-phase circuits and connections in the analysis of balanced and unbalanced circuits
	CO3	Measure active, reactive power and power factor for 3-phase balanced and unbalanced loads
	CO4	Examine the behaviour of circuit elements by drawing locus diagrams, phasor diagrams and frequency response for series and parallel RLC circuits
	CO5	Analyze transient and steady state behaviour of RLC circuits for DC and AC excitations using differential equations and Laplace transform technique.
	CO6	Design various resonant, filter and attenuator networks for given design specifications.
Electro magnetic fields A3204	CO1	Apply Orthogonal coordinate systems to solve problems related Electric and magneticFields from charge distributions
	CO2	Analyse Electric and Magnetic fields due to charge configurations using Coulombs law,Guass's law, Biot-Savart's Law and Ampere's Law.
	CO3	Evaluate the capacitance, Inductances and Magnetic forces for conductors Electromagnetic fields
	CO4	Investigate the behaviour of Electric and Magnetic Fields in Static and Time VaryingFields by Maxwell's equations
Electrical machines – i A3205	CO1	Apply the knowledge of basic principles and construction of DC machines and Transformers for various applications and parallel operation
	CO2	Analyze the characteristics and performance of DC machines for a suitable application
	CO3	Apply the knowledge of armature reaction and commutation to suggest suitable method for improving commutation
	CO4	Analyse speed control techniques and starters of dc motors and suggest a suitable method for a given application
	CO5	Analyze the performance of 1-Ø and 3-Ø transformers for different loading conditions.
Mathematics – III A3009	CO1	Evaluate improper integrals using beta and gamma functions; distinguish the concepts of Bessel and Legendre functions
	CO2	Test for analyticity of complex functions using Cauchy-Riemann equations
	CO3	Identify real and imaginary parts of elementary functions; apply conformal mapping to transform complex regions into simpler regions

Course Title with Code	Course Outcomes	
	CO4	Develop analytic function in series form using Taylor's series and Laurent's series
	CO5	Evaluate integrals along a contour using Cauchy's integral formula and Residue theorem
Networks lab A3207	CO1	Apply knowledge of circuit fundamental to verify network theorems and two port parameters for different circuits using MYDAC and Multisim
	CO2	Apply ohms law, mesh and nodal analysis for different circuits using MYDAC and Multisim
	CO3	Analyze transient analysis of RL, RC and RLC circuit using MYDAC and Multisim
	CO4	Determine self, mutual inductance and coefficient of coupling of magnetic circuits
	CO5	Analyze filter circuits using MYDAC and Multisim
	CO6	Analyze diode, opamp and ac circuit using MYDAC and Multisim
Electrical machines - 1 lab A3208	CO1	Apply suitable testing method for a given DC machine or transformer to calculate efficiency
	CO2	Analyse the excitation methods and characteristics of dc generators by conducting suitable test
	CO3	Apply the suitable test to calculate the voltage regulation of a transformer
	CO4	Analyse speed control techniques of dc motors and suggest a suitable method for a given application.
Environmental science A3010	CO1	Identify the important components of environment
	CO2	Identify global environmental problems and come out with best possible solutions
	CO3	Apply environmental laws for the protection of forest and wildlife
	CO4	Apply the knowledge of Environmental ethics to maintain harmonious relation between nature andhuman being.
	CO5	Illustrate the major environmental effects of exploiting natural resources
Power system generation A3210	CO1	Apply the knowledge of conversion of energy for different energy sources to generate electrical power
	CO2	Analyze the base load and peak load conditions to select suitable generating stations

Course Title with Code	Course Outcomes	
	CO3	Develop single line diagram and layout for given substation
	CO4	Compare different types of tariffs suitable for different loads.
	CO5	Analyze power factor correction techniques and economic aspects to reduce economic losses.
Electrical machines-ii A3211	CO1	Apply the basic knowledge of AC machines in selecting appropriate motor for any specified applications.
	CO2	Analyze the characteristics and performance of AC machines.
	CO3	Evaluate the performance of AC machine for different loading conditions.
	CO4	Develop the equivalent circuit and phasor diagrams for AC machine
Control systems A3212	CO1	Develop transfer functions and state space models of dynamical systems such as electrical, electro-mechanical systems and components of control systems.
	CO2	Analyze feedback characteristics, block diagrams and signal flow graphs, transient and steady state behaviour, controllability and observability of time invariant dynamical systems.
	CO3	Apply Routh's and Nyquist stability criterions in the analysis and design of feedback control systems.
	CO4	Examine the performance of feedback control system by using graphical techniques such as root locus, Bode, polar and Nyquist plots
	CO5	Design compensators and controllers for time invariant systems.
Signals and systems A3405	CO1	Classify various types of signals and illustrate them with various examples
	CO2	Construct the block level representation of system and experiment with the periodic and non-periodic input signals.
	CO3	Analyze the system in terms of magnitude and phase spectrums with both periodic and non-periodic input signals

Course Title with Code	Course Outcomes	
	CO4	Determine the stability of the continuous and discrete time domain systems with the help of Region of Convergence.
	CO5	Design the system which is non-aliasing for transmission of the signals.
Basic mechanical engineering A3313	CO1	Develop the general energy equations for thermal systems by laws of thermodynamics.
	CO2	Compare types of fluids, fluid flows, pressure and flow measuring devices, losses in pipes, laminar and turbulent boundary layer concepts.
	CO3	Evaluate design parameters of hydraulic turbines at given efficiency and discharge.
	CO4	Analyze an expression for force, work done and efficiency of vane, turbines and pumps.
	CO5	Apply the principles of conduction, convection and radiation heat transfer to analyze natural phenomena.
Electrical machines - ii lab A3214	CO1	Compute the equivalent circuit parameters and performance of Induction motor at different loading conditions
	CO2	Assess the performance of synchronous machines by using various methods
	CO3	Analyze the synchronization methods of alternators
	CO4	Distinguish the core losses of a transformer by using Alternator.
Control systems lab A3215	CO1	Develop transfer functions of dynamical electrical systems such as series RLC second order system, DC motor
	CO2	Analyze the characteristics of OP-AMP Circuits, magnetic amplifier, AC servo motor and Synchros
	CO3	Examine the performance of feedback control system by using graphical techniques such as step response, root locus, Bode, polar and Nyquist plots using MATLAB.
	CO4	Analyze the effect of PID controller on second order systems and state space model for classical transfer function using MATLAB
	CO5	Analyze state space model for classical transfer function using MATLAB
Gender sensitizatio	CO1	Understand the significance of process of socialization and relationships between men and women on the basis of a just, equal

Course Title with Code	Course Outcomes	
n A3021		world
	CO2	Examine the decline of female sex ratio and discrimination faced by people with different gender identities
	CO3	To take part in house work in order to allow for more equal, share family spaces
	CO4	Estimate women's contribution to the nation's economy.
	CO5	Analyze the consequences of sexual violence and importance of consent in friendships and other relationships
	CO6	Perceive the invisibility of women in history and show how locating a woman in history makes them visible.
Electrical measurements and instrumentation A3216	CO1	Categorize the various electrical instruments for measuring electrical parameters.
	CO2	Determine various unknown electrical parameters by using bridges.
	CO3	Examine the unknown resistance, voltage, current using DC potentiometers.
	CO4	Identify various electrical and non-electrical transducers for suitable Applications.
	CO5	Analyse the Q meter and determine the harmonic distortion using wave analyzers
Electronic circuits & integrated circuits A3420	CO1	Apply the knowledge of Barkhausen criterion to solve the frequency of oscillation for oscillator.
	CO2	Analyze the high pass and low pass RC circuits for sine, step, pulse, exponential and ramp input
	CO3	Design different types of multivibrators for generating waveforms.
	CO4	Examine linear and nonlinear circuits using 741 IC.
Power system transmission and distribution A3217	CO1	Apply the knowledge of electromagnetic fields to calculate the transmission line parameters.
	CO2	Analyze the Voltage regulation and efficiency for different Power transmission lines.
	CO3	Analyze power loss due to corona with various factors and physical strength of transmission line by Sag calculations.
	CO4	Identify the importance of various types of insulators and string efficiency in power system transmission.

Course Title with Code	Course Outcomes	
	CO5	Analyze the voltage drop and power loss calculations for different scheme of connections in AC and DC distribution systems.
Renewable energy sources A3218	CO1	Apply the principles of Renewable energy sources for the construction of Power generating Station.
	CO2	Analyse various harvesting techniques of Renewable energy for different applications.
	CO3	Apply energy storage methods in renewable energy systems.
	CO4	Analyse Renewable energy systems for various environmental conditions.
	CO5	Categorize various energy conversion systems and their limitations.
Advanced control systems A3219	CO1	Develop the mathematical modelling of linear/non-linear systems in state space.
	CO2	Investigate the controllability/observability of a given system.
	CO3	Analyze stability of linear / Non-linear systems using various methods.
	CO4	Design state feedback controller and optimal controller for a given system.
Computer organization and architecture A3508	CO1	Analyze the computer fundamentals and computer internal organization.
	CO2	Apply the register transfer operations and instructions in programs.
	CO3	Evaluate the computer arithmetic algorithms.
	CO4	Analyze the memory access operations and memory architecture.
	CO5	Apply the multiprocessing in different inter process structures.
Electrical measurements and instrumentation lab A3220	CO1	Measure resistance, inductance and capacitance of all ranges using bridge circuits.
	CO2	Assess percentage error of various measuring instruments, LVDT, resistance strain gauge.
	CO3	Measure 3-Φ active power and reactive power of different loads.
	CO4	Measure Iron loss, transformer turns ratio and test dielectric strength of oil.
Electronic circuits and	CO1	Determine the frequency response of Voltage series and current shunt feedback amplifiers.

Course Title with Code	Course Outcomes	
integrated circuits lab A3423	CO2	Evaluate the frequency of oscillation for different types of oscillators.
	CO3	Examine the wave shaping circuits and operational Amplifers.
	CO4	Analyse various applications using op-amps and IC 555.
	CO5	Experiment with the different types of Voltage regulator
Professional ethics & human values A3012	CO1	Acquires the basic concepts of Professional ethics and human values & Students also gain the connotations of ethical theories.
	CO2	Knows the duties and rights towards the society in an engineering profession.
	CO3	Would realize the importance and necessity of intellectual property rights.
	CO4	Take all the necessary precautions while conducting the experiments, which may reduce the
	CO5	Understands the importance of risk evacuation system in reality and takes the utmost.
Power system operation and control A3221	CO1	Apply the basic knowledge for economic operation, load frequency control and reactive power compensation
	CO2	Analyze the static and dynamic performance of single and multi area Load Frequency Control
	CO3	Analyze the techniques and devices used for reactive power compensation.
	CO4	Evaluate the load scheduling among various thermal and hydrothermal plants.
	CO5	Model various components of an isolated power system.
Power electronics A3222	CO1	Apply the knowledge of thyristor in different PE converters.
	CO2	Analyse AC-DC, DC-DC, DC-AC and AC-AC convertersand commutation circuits.
	CO3	Apply the knowledge of converters to select suitable converter for a given application.
	CO4	Calculate different parameters of converters for the given requirements to investigate the
	CO5	Apply the knowledge of PWM techniques to improve the

Course Title with Code	Course Outcomes	
		performance of DC-DC and DC-AC Converters.
Microprocessors and microcontrollers A3419	CO1	Apply the fundamentals of microprocessor & controller to investigate existing designs.
	CO2	Compare & contrast the processor and controller for the implementation of real time
	CO3	Demonstrate assembly language programming proficiency to assemble and run on host machine.
	CO4	Identify the required driver circuitry to microprocessor and controller I/O ports to interface external devices.
	CO5	Design the required hardware & software modules and integrate to be a functional model.
Optimal control systems A3251	CO1	Apply principle of optimality to decision making an optimal control system.
	CO2	To design continuous and discrete linear regulator problem using pontrygins principle.
	CO3	Apply iterative numerical techniques for finding optimal controls and trajectories.
	CO4	Design of non statistical estimation with full estimator and reduced estimator.
	CO5	Design optimal regulator problem for optimal estimation problem
Special electrical machines A3252	CO1	Utilize the series booster, shunt booster, Rosenberg generator and different types of electrical machines for suitable applications.
	CO2	Choose the suitable controller for various types of stepper motor.
	CO3	Categorize the variable reluctance stepper motors by the performance characteristics and Control the position of the motor
	CO4	Select the suitable stepper motors for different applications.
	CO5	Classify the Switched reluctance motor according to the design parameter and control the motor with logic circuits.
Neural networks and fuzzy logics	CO1	Build the basic model of artificial neuron and compare the functions of both artificial neuron and biological Neuron.
	CO2	Develop different architectures of Artificial Neural Networks and apply learning laws and the learning rules associated with the neural

Course Title with Code	Course Outcomes	
A3253		networks.
	CO3	Analyze the problem of linearly separable using Perceptron model and relate to theconcept of Madaline networks.
	CO4	Explore the associative learning of the neural network, the architecture of Hopfield network and the error performance of Hopfield network.
	CO5	Analyze the fuzzy sets and evaluate the fuzzy logic system with fuzzification, rule base and defuzzification methods.
Dynamics of electrical machines A3254	CO1	Apply the knowledge of Electrical machines to understand the operational characteristics of DC and AC rotating machines.
	CO2	Apply the knowledge of DC machines dynamicsto formulate its steady state equations.
	CO3	Apply Lagrange's and electro dynamical equations to model the mechanical and electrical systems for steady state analysis.
	CO4	Analyze the steady state and transient behavior of separately excited DC generators and DC motors
	CO5	Apply the theory of machine dynamics to formulate the equations for the dynamical behaviour of induction machines and analyze its behavior during starting, braking and accelerating.
Reliability engineering A3255	CO1	Analyze the concepts of reliability, common reliability functions, parameters and methods of their modelling and prediction.
	CO2	Apply the knowledge of mathematics, statistical distributions to characterise the reliability of an item and for modelling failure data.
	CO3	Evaluate the Reliability of different engineering systems like Series, parallel and complex configurations using cutest/tie-set methods.
	CO4	Describe the reliability functions with their relationships and Markov modeling.
Digital control systems	CO1	Apply the Sampling & quantization in A/ D conversion & sampling and hold circuit in reconstruction process D/A Conversion
	CO2	Analysis of the given systemin time domain, frequency domain and Z

Course Title with Code	Course Outcomes	
A3256		domain.
	CO3	Inspect the Stability, Controllability and Observability of digital systems.
	CO4	Design an appropriate compensator, state feedback controller and observer of digital Systems.
Evolutionary computation A3257	CO1	Analyses the conventional optimization approach and heuristic methods of optimization.
	CO2	Analyses different genetic algorithm operators and their characteristics and parameter variation.
	CO3	Analyses classification, evolving agent based systems and adoptive rule based neural Networks.
	CO4	Analyses and evaluate particle swarm optimizations and its characteristics.
Power system dynamics and stability A3258	CO1	Analyzethe steady state behaviour of synchronous machine using Park's transformation
	CO2	Analyze the dynamic behaviour of synchronous generator under system conditions leading to instability.
	CO3	Analyze the generator excitation, prime mover controls and recognize their role in power system stability control
	CO4	Compare different types of power system stabilities and methods to improve overall system stability.
	CO5	Evaluate the power system behavior under small signal, transient and voltage instability conditions using PSCAD simulation
Power electronics lab A3223	CO1	Apply the knowledge of Matlab/ Simulink tool to Power electronic converters
	CO2	Analyze ACR firing and commutation circuits & the characteristics of MOSFET, IGBT, SCR.
	CO3	Analyze dc-dc, dc-ac, ac-ac and ac-dc converters for different loads.
	CO4	Evaluate the performance parameters of power electronic Converters
Microprocessors and interfacing lab	CO1	Analyze the data interaction between CPU, external memory and I/O devices in microprocessor based systems
	CO2	Compile the assembly language programming as error free to general purpose computer systems applications.

Course Title with Code	Course Outcomes	
A3422		
	CO3	Apply appropriate techniques to design circuits to interface assorted I/O devices to microprocessor.
	CO4	Design a simple microprocessor based system with functional requirements using optimal hardware and software components
Intellectual property rights A3013	CO1	Acquires the basic concepts of Professional ethics and human values & Students also gain the connotations of ethical theories.
	CO2	Knows the duties and rights towards the society in an engineering profession.
	CO3	Would realize the importance and necessity of intellectual property rights.
	CO4	Take all the necessary precautions while conducting the experiments, which may reduce the Risk.
	CO5	Understands the importance of risk evacuation system in reality and takes the utmost. Responsibility while handling the risky situations.
POWER SEMICONDUCTOR DRIVES A3224	CO1	Analyze1phase and 3phase controlled converters for speed control operation of DC Drives.
	CO2	Apply the knowledge of DC-Dc Converter and dual converter for speed and torque control of DC Drives.
	CO3	Analyze variable frequency control of Induction motor on stator side using different converters.
	CO4	Test the performance of Induction Motor by conducting different speed control methods.
	CO5	Assess different power electronic converter to control speed of synchronous motor drives.
COMPUTER METHODS IN POWER	CO1	Develop per-unit reactance diagrams, bus incidence, Ybus and Zbus matrices for modelling the actual power system
	CO2	Determine steady state power flow analysis of power system using Gauss-Seidel, Newton- Raphson and fast decoupled iterative

Course Title with Code	Course Outcomes	
SYSTEMS A3225		methods.
	CO3	Analyze symmetrical and unsymmetrical power system faults.
	CO4	Examine steady state and transient stability of power system.
	CO5	Apply the methods to improve steady state and transient stability of power system.
POWER SYSTEM SWITCHGEAR AND PROTECTION A3226	CO1	Analyze the operational aspects of different types of circuit breakers.
	CO2	Distinguish various types of relaying schemes such as differential, distance, over current /under voltage, Instantaneous, DMT and IDMT relays.
	CO3	Develop protection schemes for generators, bus-bars, feeders & transformers.
	CO4	Analyze power system transients for termination of lines with different types of conditions.
	CO5	Analyze different neutral grounding methods and protection schemes against over voltages
HIGH VOLTAGE ENGINEERING A3259	CO1	Analyze the techniques used for high voltage generation and their measurements.
	CO2	Apply various methods to find field factor for uniform and non-uniform fields.
	CO3	Discriminate the dielectric strengths usedfor all electrical apparatus and their breakdownmechanism.
	CO4	Categories the methods used for testing electrical apparatus and its insulation coordination.
	CO5	Analyze the protective devices for over voltages, surge voltages and their control.
EXTRA HIGH VOLTAGE AC TRANSMISSION	CO1	Apply the knowledge, of basics in power systems, in EHVAC Transmission for computing various parameters such as inductance, capacitance, power transfer, surge impedance loading etc.
	CO2	Analyze the voltage gradients of conductors to suit corona characteristics calculations.
	CO3	Evaluate the corona power loss, audible noise, radio interference,

Course Title with Code	Course Outcomes	
A3260		modes of propagation etc.
	CO4	Develop power circle diagrams and its use, voltage control using synchronous condensers and other compensating devices
MACHINE MODELLING AND ANALYSIS A3261	CO1	Construct the two pole machine diagram for any given machine modelling.
	CO2	Analyze the response both in transient and steady state for any DC machine
	CO3	Apply the knowledge of Machines to transform one set of variables into any other set of variables as required.
	CO4	Develop the model of an induction machine and synchronous machine
POWER QUALITY A3262	CO1	Analyze the severity of power quality problems in distribution system.
	CO2	Analyze the various causes of voltage flicker and their effects and various means to reduce flickers
	CO3	Apply the knowledge of voltage sag/swell interruptions to improve power quality.
	CO4	Apply the knowledge of harmonic sources and effects to improve the performance of system.
	CO5	Evaluate the approaches followed in power quality monitoring.
UTILIZATION OF ELECTRICAL ENGINEERING A3263	CO1	Analyze various types Electric drives and their applications.
	CO2	Identify the various modern methods of speed control & braking techniques.
	CO3	Analyze the modern circuits for generation of high frequency power for induction & electric heating
	CO4	Explain the various welding processes used in industry.
	CO5	Model the different illumination schemes for different applications.
HIGH VOLTAGE DC TRANSMISSION & FACTS	CO1	Evaluate the HVDC Transmission systems and Lines.
	CO2	Identify and analyze converter configurations used in HVDC and list the performance metrics.
	CO3	Compute the filter parameters for elimination of voltage and current harmonics in HVDC system

Course Title with Code	Course Outcomes	
A3264	CO4	Identify HVDC/FACTS devices to address a power quality issues related to power system
PROGRAMMABLE LOGIC CONTROLLERS A3265	CO1	Discriminate types of PLC programming schemes.
	CO2	Analyze ladder diagrams for process control.
	CO3	Apply suitable PLCs with drives in achieving required control.
	CO4	Analyze PLC functions and Data Handling Functions and their operations
PROCESS CONTROL A3266	CO1	Develop the mathematical modelling of dynamic systems.
	CO2	Design of Various types of controller.
	CO3	Investigate the optimum performance index by time response, frequency response and various techniques
	CO4	Analyze the different types of control elements in process control system.
	CO5	Design of different types of process control systems.
POWER SYSTEM LAB A3227	CO1	Analyze the characteristics of circuit breaker, LG, LL, LLG, LLL, LLLG faults and Ferranti effects on long transmission using PSCAD.
	CO2	Evaluate the compensation required at mid-point, end-point, line and load ends for a transmission line using PSCAD.
	CO3	Apply Gauss-Seidal method on power flow study to get optimal values using MATLAB.
	CO4	Analyze the load behaviour of short and medium transmission lines using MATLAB.
	CO5	Analyze y-bus matrix and single area load frequency of power system using MATLAB.
POWER SEMI CONDUCTOR DRIVES LAB A3228	CO1	Apply various configurations of 1phase & 3phase AC-DC Converters and DC-DC converters to control the speed of DC Motor.
	CO2	Apply various AC-AC Convertors to control the speed of Induction Motor.
	CO3	Apply various control techniques for speed control of Induction Motor drive.
	CO4	Apply closed loop technique to control the speed of PMDC Motor.
MINI PROJECT	CO1	Identify the requirements for the real world problems

Course Title with Code	Course Outcomes	
A3229	CO2	Make use of software/ hardware skills for the identified problems.
	CO3	Build the project successfully by hardware, coding, emulating and testing.
	CO4	Work in teams and manage the conduct of the research study.
	CO5	Demonstrate a commitment to life-long learning.
	CO6	Exhibit good communication and management skills.
MANAGEMENT SCIENCE A3014	CO1	Explain and infer the concepts and aspects of management and Industrial Psychology
	CO2	Analyze the different organization structures, plant layouts, work study tools for enhancement of productivity in an organization
	CO3	Apply the project management techniques to decide the optimum time and cost for completion of a project.
	CO4	Apply statistical quality control techniques to know quality of product with in control limits.
	CO5	Use human resources management and marketing techniques for better people management.
TECHNICAL SEMINAR A2251	CO1	Identify, understand and discuss current and real world problems.
	CO2	Apply fundamental technical knowledge to analyze selected seminar topic.
	CO3	Use modern tools in solving specified problems.
	CO4	Prepare comprehensive report based on literature survey as per the norms specified.
	CO5	Demonstrate a sound technical knowledge of their selected Seminar topic in the presentation
PROJECT WORK A2253	CO1	Identify the requirements for the real world problems
	CO2	Make use of software/ hardware skills for the identified problems.
	CO3	Build the project successfully by hardware, coding, emulating and testing.
	CO4	Work in teams and manage the conduct of the research study.
	CO5	Demonstrate a commitment to life-long learning.
	CO6	Exhibit good communication and management skills.

Course Title with Code	Course Outcomes	
ADVANCED SWITCHGEAR PROTECTION A3267	CO1	Apply the knowledge of static relays to different comparators.
	CO2	Analyze different protection schemes used for Generator, Motor and Transformer.
	CO3	Design differential protection schemes to transformers and bus bars.
	CO4	Apply advanced protection schemes for different electrical equipment.
POWER ELECTRONIC CONTROL OF DC DRIVES A3268	CO1	Apply the knowledge of different power electronic converters to control the speed of DC drives.
	CO2	Analyze the operation of 1-Ø and 3-Ø rectifiers during continuous and discontinuous current mode to select suitable converter for a given application.
	CO3	Analyze the effect of compensation for 3-Ø bridge converter with different loads.
	CO4	Design current and speed controllers for a closed loop operation of DC Drives
	CO5	Analyze the steady state operation of a converter fed DC Drives.
DISTRIBUTION AUTOMATION A3269	CO1	Analyze the Operational & Maintenance benefits, financial benefits and Customer related benefits.
	CO2	Apply the knowledge of supervisory control and data acquisition (SCADA) and energy management system (EMS) operations.
	CO3	Analyze automatic monitoring and control mechanisms in the distribution system.
	CO4	Identify different functions of Primary Automation Technique.
POWER SYSTEM TRANSIENTS A3270	CO1	Apply the basic knowledge to identify the sources of transients and its effects on power system
	CO2	Analyze the RL and RLC transient circuits in various cases like current suppression, chopping, capacitive switching and restriking transients of power system.
	CO3	Analyze the nature of voltage transients on closing and reclosing lines.
	CO4	Analyze the behaviour of travelling waves on transmission lines and compute transients.
	CO5	Distinguish between voltage transients on closing and reclosing lines and examine the switching surges on integrated system.
FUNDAME	CO1	Design and implement a database schema for a given problem

Course Title with Code	Course Outcomes	
NTALS OF DATABASE MANAGEMENT SYSTEMS A3576		domain.
	CO2	Construct Queries in Relational algebra, relational calculus and SQL.
	CO3	Apply Normalization techniques to reduce data redundancy in data base.
	CO4	Analyze various transaction control and recovery methods to keep data base consistent
	CO5	Construct the file of data records by using appropriate storage and access structure.
FUNDAMENTALS OF IMAGE PROCESSING A3577	CO1	Understand image formation and the fundamentals of Digital image processing and pattern recognition including the topics such as filtering, transforms and morphology, and image analysis, compression and clustering
	CO2	Able to understand and use basic image processing algorithms and techniques in image enhancement and image restoration
	CO3	Have the skill base necessary to further explore advanced topics of Digital Image Processing and pattern recognition.
	CO4	Be in a position to make a positive professional contribution in the field of Digital Image Processing and pattern recognition
OPERATING SYSTEM FUNDAMENTALS A3578	CO1	Understand the operation of process management, memory management, storage management and system calls & system programs. Demonstrate knowledge process management.
	CO2	Apply and implement process concepts, process synchronization, semaphores, readers & writer's problem and dining philosopher problem.
	CO3	Evaluate and implement deadlock avoidance, deadlock detection and deadlock recovery Mechanisms and Analyze and implement memory management schemes.
	CO4	Apply and create file system concepts for file access, directory access methods, disk storage and disk scheduling algorithms.
JAVA PROGRAMMING A3579	CO1	Construct application programs using OOP principles.
	CO2	Analyze the various concepts of OOP in problem solving.
	CO3	Develop high speed and fault tolerant applications with multi-threading and exception handling.
	CO4	Use collections framework API with reduced programming effort.

Course Title with Code	Course Outcomes	
	CO5	Perform file handling with Java IO API.
	CO6	Implement rich GUI applications.
CYBER LAWS A3676	CO1	Analyze cyber attack on different online web applications
	CO2	Apply different techniques to classify different types of cybercrimes.
	CO3	Understand different government cyber laws and cyber forensics techniques and how to protect them self and ultimately society from cyber attacks.
	CO4	Describe and analyze the hardware, software, components of a network and the
	CO5	Illustrate the concepts of confidentiality, availability and integrity in Information Assurance, including physical, software, devices, policies and people.
E-COMMERCE TRENDS A3677	CO1	Evaluate the components and roles of the E-Commerce environment.
	CO2	Explain how to sell products and services on the web as well as to meet the needs of web site visitors.
	CO3	Analyze e-commerce payment systems.
	CO4	Identify and reach customers on the web
	CO5	Understand legal and ethical issues related to E-Commerce and web marketing approaches.
PRINCIPLES OF SOFTWARE ENGINEERING A3678	CO1	Identify the right process model to develop the right software system.
	CO2	Gather requirements and analyze them scientifically in order to develop the right product, besides authoring software requirements document.
	CO3	Propose design as per functional and non-functional requirements using design principles.
	CO4	Apply testing strategies for application being developed.
	CO5	Find right set of umbrella activities for quality management and assurance.
	CO6	Understand metrics in the process and project domains.
SCRIPTING LANGUAGE	CO1	Demonstrate knowledge about the advanced concepts of Linux OS like scheduling, cloning, signals.

Course Title with Code	Course Outcomes	
S A3679	CO2	Show skills to write PHP based GUI applications connecting to MYSQL.
	CO3	Familiarize and define the programming syntax and constructs of LDAP connectivity in My SQL.
	CO4	Analyze and implement Scripting applications using tuples, dictionaries, lists using Python.
	CO5	Develop the ability to exhibit knowledge of writing packages, modules using Perl.
DIGITAL ELECTRONICS A3476	CO1	Perform arithmetic operations on different number systems and to apply the principles of Boolean algebra to minimize logic expressions.
	CO2	Use K-map and Tabulation method to minimize and optimize two-level logic functions up to five variables.
	CO3	Analyze some basic components used in digital systems such as adder and subtractor, decoder, encoder, multiplexer, flip-flops
	CO4	Design various combinational PLDs such as ROMs, PALs, PALs and PROMs.
	CO5	Develop digital systems using registers and counters such as shift registers, Ripple counters, synchronous counters.
PRINCIPLES OF ANALOG AND DIGITAL COMMUNICATIONS A3477	CO1	Know the representation of signals and random variables.
	CO2	Know the various analog modulation and demodulation techniques.
	CO3	Understand the basic concepts of digital data and pulse communication.
	CO4	Understand the basics of Digital communication system and different techniques of Digital Modulation.
	CO5	Will be able to analyze the transmission & reception processes and information coding techniques
TRANSDUCERS & MEASUREMENTS A3478	CO1	Aware the basic concepts of measurement parameters as well as instrument standards, characteristics and errors.
	CO2	Construct and design various measuring devices like voltmeters, Ammeters, Ohmmeters, analog, digital multi-meters and analyze different types of cathode ray oscilloscopes.
	CO3	Design different bridge networks and analyze balanced condition for finding out values of resistance, capacitance and inductance
	CO4	Analyze different physical parameters like pressure, force, velocity, acceleration, sound, torque, strain and stress etc. using non-electrical

Course Title with Code	Course Outcomes	
		transducers.
	CO5	Apply the principles and practice for instrument design and develop for real world problems.
INTERNET OF THINGS A3479	CO1	Explain the definition and usage of the term "The Internet of Things" in different contexts.
	CO2	Understand where the IoT concept fits within the broader ICT industry and possible future trends.
	CO3	Differentiate between the levels of the IoT stack and be familiar with the key technologies and protocols employed at each layer of the stack.
	CO4	Design a simple IoT system comprising sensors, edge devices, wireless network connections and data analytics capabilities.
	CO5	Use the knowledge and skills acquired during the course to build and test a complete, working. IoT system involving prototyping, programming and data analysis.
NANO TECHNOLOGY APPLICATIONS TO ELECTRICAL ENGINEERING A3276	CO1	Analyses the different forms of energy conversion methods conventional energy sources and sustainable renewable energy sources.
	CO2	Analyses different nano materials and characteristics and applications in electrical energy storage and electrical energy applications
	CO3	Analyses micro fluid devices, nano-engines, and energy conversion systems.
	CO4	Analyses hydrogen storage systems.
INDUSTRIAL ELECTRONICS A3277	CO1	Apply the knowledge of electronics in developing the controllers for industrial applications.
	CO2	Interpret system drawings, and design simple systems for sequential control systems involving valves and cylinders.
	CO3	Evaluate the operational characteristics the electrical and mechanical actuation systems.
	CO4	Construct a program and design a control system using microcontroller.

Course Title with Code	Course Outcomes	
SOLAR ENERGY AND APPLICATIONS A3278	CO1	Extrapolate the available solar energy ,solar energy conversion and utilization processes
	CO2	Analyze the development of advanced storage solutions in thermal solar systems
	CO3	Identify and analyze the suitability of solar systems in different environmental Conditions
	CO4	Explore the design of a standalone PV system and investigate the applications of Solar PV cell
	CO5	Explore the cost analysis and environmental issues of solar system
ENERGY MANAGEMENT AND AUDIT A3279	CO1	Analyze the influence of energy availability on the development of Industries and various other organizations
	CO2	Analyze the concepts and technologies used for energy conservation.
	CO3	Develop methods for evaluating worth of project.
	CO4	Analyze schemes for demand side management.
	CO5	Evaluate the VAR requirements for effective voltage control.
ELEMENTS OF MECHANICAL ENGINEERING A3376	CO1	Explain the energy resources and environmental issues using Nonconventional energy.
	CO2	Identify the uses of turbines for power generation and Principle and working of Hydraulic and gas turbines.
	CO3	Understanding the different types of Manufacturing Process and apply the technology to fabricate different products
	CO4	Comprehend the concepts of composite, ceramic and nano materials for practical applications
	CO5	Understanding the Principle and applications of Refrigeration systems and Air-conditioners
BASIC THERMODYNAMICS AND HEAT TRANSFER A3377	CO1	Demonstrate the basic concepts and laws of thermodynamics.
	CO2	Calculate the system properties like pressure, volume, temperature, enthalpy etc. in various Thermodynamics processes
	CO3	Calculate the work and heat in various thermodynamics processes and efficiency of the air standard cycles.
	CO4	To Demonstrate the basic concepts of Heat transfer and to apply the knowledge of Conduction heat transfer or various systems
	CO5	To apply the knowledge of convection and radiation heat transfers

Course Title with Code	Course Outcomes	
		for various systems.
MECHANICAL MEASUREMENTS AND INSTRUMENTATION A3378	CO1	Explain the basics measurement system, error and transducers industrial applications.
	CO2	Identify the uses of Pressure gauges in various applications
	CO3	Understand the significance of measurement system, applications of flow measurement, speed esurient devices.
	CO4	Comprehend the fundamentals of thermocouple and strain measurement
	CO5	Interpret measurement of field variables like humidity, acceleration and vibration and pressure
ENGINEERING OPTIMIZATION A3379	CO1	Formulate optimization problems;
	CO2	Understand and apply the concept of optimality criteria for various type of optimization problems
	CO3	Solve various constrained and unconstrained problems in single variable as well as multivariable;
	CO4	Apply the methods of optimization in real life situation.
	CO5	To solve the any type of problem using principles of optimality
ENVIRONMENTAL POLLUTION AND MANAGEMENT A3176	CO1	Distinguish between various modes of air pollution and their characteristic.
	CO2	Examine air pollution sampling and classify its level.
	CO3	Evaluate water quality and propose necessary measures.
	CO4	List different standards laid by governing authorities.
	CO5	Summarize functions carried out by controlling bodies.
REMOTE SENSING AND GIS A3177	CO1	Describe the working principle of interpretation of Aerial photographs and satellite.
	CO2	Summarize the data types, data storage and carry out the analysis of spatial and attribute data.
	CO3	Explain basics of Aerial Photography, Remote sensing and GIS.
	CO4	Utilize knowledge about the principles and physics of Remote sensing and data acquisition.
	CO5	List out and apply applications of remote sensing and Gis in various

Course Title with Code	Course Outcomes	
		fields
DISASTER MANAGEMENT A3178	CO1	List out different causes of Environmental hazards.
	CO2	Classify environmental hazards and disasters, Endogenous hazards, exogenous hazards, infrequent events - Cumulative atmospheric hazards / disasters.
	CO3	Explain different characteristics of hazards.
	CO4	Develop Emerging approaches in Disaster management.
CONSTRUCTING PLANNING AND MANAGEMENT A3179	CO1	Improve business and management skills in positions within the construction industry
	CO2	Adapt technical skills and knowledge in mathematics, science, construction, and technology in support of planning, analyzing, and solving construction problems.
	CO3	Utilize industry resources including associations and organizations, professional publications and governmental data to analyze, evaluate, and apply current trends within the industry.
	CO4	Make use of decision-making in personal and professional endeavors.
	CO5	Design a quality construction project from start to completion while maintaining budget, schedule ,and safety requirements.
ENTREPRENEURSHIP DEVELOPMENT A3076	CO1	Understand the role, characteristics, qualities and functions of entrepreneur and use this knowledge to become future entrepreneurs.
	CO2	Various Institutional supports for setting up a business enterprise.
	CO3	Role, importance and functions of women entrepreneur and women entrepreneur development.
	CO4	Concept of Project Management and steps in Project development.
	CO5	Training programs to inculcate entrepreneurial spirit and different training institutions to impart training to entrepreneurs.
HUMAN RESOURCE MANAGEMENT A3077	CO1	Understand HR functions effectively and apply this knowledge to manage the employees in the organizations.
	CO2	Explain Job Analysis, Recruitment and Employee Retention practices and strategies and apply this knowledge to hire and retain the right people for the right jobs in organizations
	CO3	Indicate different training methods and performance appraisal systems and apply this knowledge to impart appropriate training

Course Title with Code	Course Outcomes	
		method as well as appraise the performance of the employees by using different appraisal methods.
	CO4	Analyze decisions relating to compensation and factors influencing the employee compensation.
	CO5	Apply knowledge on different techniques to resolve industrial disputes in the organization
ORGANIZATION BEHAVIOUR A3078	CO1	Understand approaches, opportunities and challenges of OB and use this knowledge to understand behaviour people in organizations.
	CO2	Explain the importance of diversity in organizations as well as personality and perception of individual and apply this knowledge for better understanding of human beings in organizations.
	CO3	Indicate the group behaviour and leadership styles exhibit by the managers and apply this knowledge to get the things done through subordinates efficiently and effectively
	CO4	Illustrate motivation theories and different Organization structures and apply this knowledge to create suitable organization structure for business as well as to get better work from employees
	CO5	Interpret the role of Conflict management, Stress management, Organization change and Self management and apply this knowledge for solving different problems of organizations
LOGISTICS AND SUPPLY CHAIN MANAGEMENT A3079	CO1	Understand Supply chain management functions, drivers and different types of Logistics and apply this knowledge in business environment.
	CO2	Illustrate the importance of Supply chain customer service and bench mark practices and apply them in business environment.
	CO3	Explain the role of Sourcing and Distribution in supply chain and apply the knowledge in decision making process of organization
	CO4	Interpret the importance of Co-ordination in supply chain and role of Information Technology in supply chain and use this knowledge to run the organization successfully
	CO5	Classify Global logistics & Global supply chain processes and strategies and use this knowledge to understand Global supply chain and logistics environment.
NATIONAL SERVICE SCHEME (NSS)	CO1	Contrast the different types of NSS activities and financial pattern of expenditure in Community service.
	CO2	Enhance the concept of youth, as an agent in social change.
	CO3	Classify and explain the working of organizational functionaries of

Course Title with Code	Course Outcomes	
A3080		NSS
	CO4	Design a system, component or process to meet the desired needs applicable to society, with realistic constraints such as economic, safety, manufacturability and sustainability etc., by youth –adult partnership
	CO5	Recognize the need for, and an ability to engage in society with lifelong learning capabilities with the concepts of volunteerism and its functions

Head,EEE

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

Autonomous institute affiliated to JNTUH

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE COUTCOMES FOR 2014 - 2018 BATCH

Course Title with Code	Course Outcomes	
Mathematics – I A2001	CO1	Solve the first and higher order linear differential equations.
	CO2	Make use of differential equations to solve orthogonal trajectories, rate of growth/decay, Newton's law of cooling, Electrical circuits and simple harmonic motion problems.
	CO3	Examine extremum of a function of several variables and evaluate the multiple integrals.
	CO4	Apply Laplace transforms to solve differential equations.
	CO5	Evaluate line, surface and volume integrals using vector integral theorems.
Engineering Physics A2002	CO1	Analyze crystal structures in terms of lattice parameters and interpret the structures using X-ray diffraction methods.
	CO2	Apply the principles of quantum mechanics to analyze the properties of the semiconducting materials.
	CO3	Categorize Nano and dielectric materials. Discuss synthesis and react to environmental concerns due to nanotechnology.
	CO4	Categorize magnetic materials and objectivize their role in science and technology. Apply magnetism to explain superconductivity.
	CO5	Illustrate working of a laser and examine the communication systems using optical fibers.
Engineering Chemistry A2003	CO1	Apply the knowledge of standard electrode potentials of various metals and non metals to protect t hem from corrosion.
	CO2	Identify difference and similarities of three types of Batteries.
	CO3	Compare different methods of softening of hard water.
	CO4	Apply the knowledge of Materials, Fuels and Nano particles in controlling pollution.
	CO5	Compare and contrast the chemical behaviour, properties and applications of engineering substances.
Computer Programming A2501	CO1	Write algorithm and draw corresponding flowchart for simple problems besides explaining functions of computer components.
	CO2	Select the right identifiers, data types and operators for effective computation.
	CO3	Write programs, demonstrating use of control statements, arrays and strings.
	CO4	Demonstrate use of functions and pointers by writing programs.
	CO5	Write programs for simple real life problems using structures and unions.
	CO6	Illustrate use of files by writing programs.
Basic Electrical Engineering A2201	CO1	Apply network reduction techniques and Knowledge of Alternating quantities to calculate Current, Voltage and Power for complex circuits.
	CO2	Analyze electrical Circuits using Nodal Analysis, Mesh analysis and Network theorems
	CO3	Apply the concepts of network topology to obtain Node incidence, Tie set and Cut set matrices.
	CO4	Design two port networks ,their equivalent circuits and obtain their parameters
Engineering Physics and Engineering Chemistry Lab A2008	CO1	Analyze the rigidity modulus of the given material to interpret the mechanical properties.
	CO2	Estimate the frequency of AC power supply and time constant of a R-C circuit.
	CO3	Apply the principles of optics to evaluate the characteristics of LED, laser and optical fibres.
	CO4	Apply different instrumental methods for the estimation of strengths of solutions and hardness of water.
	CO5	Analyze the effect of temperature on physical properties like viscosity and surface tension of liquids.

Course Title with Code	Course Outcomes	
Computer Programming through C Lab A2502	CO1	Implement programs by selecting the right identifiers, data types and operators for effective computation
	CO2	Implement programs, demonstrating use of control statements, arrays and strings
	CO3	Implement programs, demonstrating use of functions and pointers
	CO4	Implement C programs for simple real life problems using structures and unions
	CO5	Implement programs illustrating use of files
	CO6	Debug erroneous programs related to the course
Computer Aided Engineering Drawing Lab A2306	CO1	Use AUTO CAD commands for Computer Aided Drafting and Designing.
	CO2	Represent the objects using different types of lines and dimensioning rules.
	CO3	Analyze the objects such as points, lines and planes held in different orientations using CAD tools.
	CO4	Convert isometric projections to orthographic projections and vice-versa.
	CO5	Analyze regular solids held in different orientations using CAD tools.
Technical English A2005	CO1	Develop an understanding of the significance of humanity, love and service to mankind and be involved in community service
	CO2	Perceive the importance of technological impact on society and plan for the technological advancement
	CO3	Apply the rules of Grammar effectively (articles, prepositions, concord, tenses etc.) in writing reports, technical articles, essays and in day- to-day conversations
	CO4	Build creativity for career planning and entrepreneurship
	CO5	Develop effective written communication skills in academic writing
Mathematics – II A2006	CO1	Solve system of linear equations using rank of a matrix.
	CO2	Examine the nature of the Quadratic form by Eigen values and Eigen vectors.
	CO3	Classify and solve Partial differential equations.
	CO4	Develop Fourier series and Fourier transforms of a function.
	CO5	Apply Z- Transforms to solve difference equations.
Numerical Methods A2007	CO1	Develop appropriate Numerical methods to approximate a function.
	CO2	Compute interpolating polynomials, derivatives ,integrals for a given function from a given data
	CO3	Make use of Numerical differentiation and integration in solving problems of engineering.
	CO4	Apply appropriate method to find numerical solution of a differential equation.
	CO5	Employ techniques to solve partial differential equations with appropriate boundary conditions
Data Structures through C A2503	CO1	Solve computer software problems by using recursive, non-recursive techniques and, analyze various algorithms with respect to time and space complexity.
	CO2	Demonstrate ability to exhibit knowledge of various searching and sorting techniques and identify potential benefits of each one over the other and propose appropriate technique to solve programming problems.
	CO3	Illustrate the application of linear stack and queue.
	CO4	Exhibit the skills of demonstrating use of linked list.
	CO5	Design novel solutions for simple real life problems using the concept of non-linear data structures.
Electronic Devices A2401	CO1	Classify semiconductors and analyze the conduction behavior of semiconductors.
	CO2	Analyze the physical behavior of diodes and transistors.
	CO3	Compare various rectifiers, filters, transistors and biasing circuits.
	CO4	Apply various stabilization and compensation techniques to obtain stable operating point of transistor.
English Language Communication	CO1	Improve their pronunciation using the rules of Phonetics.
	CO2	Take part in role-plays and interviews to perform effectively in real life situations.

Course Title with Code	Course Outcomes	
Skills Lab A2009	CO3	Choose appropriate words and phrases to make the telephonic conversation conveying the meaning with etiquettes.
	CO4	Minimize the stage fear and make presentations with proper body language.
	CO5	Adapt the art of debating and group discussion to present their view point convincingly.
Data Structures through C Lab A2504	CO1	Implement various searching techniques suitable to resolve data searching problems.
	CO2	Demonstrate ability to exhibit knowledge of various sorting techniques and identify the potential benefits of each one over the other.
	CO3	Illustrate about linear data structures like stacks and queues representations and operations and apply them to design and build C based real time applications.
	CO4	Design and implement novel solutions for simple real life problems using the concepts of nonlinear data structures.
	CO5	Debug erroneous programs related to the course.
Electronic Devices Lab A2404	CO1	Identify and use various electronic components, test and measuring instruments that are frequently used in experimentation of various circuits.
	CO2	Interpret the V - I characteristics of various electronic devices so as to realize the applications like switching, regulation and amplification.
	CO3	Design a simple regulated power supply by making use of rectifiers, filters and regulators.
	CO4	Apply various biasing techniques to fix the operating point and stabilize the given transistor.
Mathematics - III A2010	CO1	Evaluate improper integrals using beta and gamma functions; distinguish the concepts of Bessel and Legendre functions
	CO2	Test for analyticity of complex functions using Cauchy-Riemann equations
	CO3	Identify real and imaginary parts of elementary functions; apply conformal mapping to transform complex regions into simpler regions
	CO4	Develop analytic function in series form using Taylor's series and Laurent's series
	CO5	Evaluate integrals along a contour using Cauchy's integral formula and Residue theorem
Environmental Science A2011	CO1	Identify the important components of environment.
	CO2	Identify global environmental problems and come out with best possible solutions.
	CO3	Apply environmental laws for the protection of forest and wildlife.
	CO4	Apply the knowledge of Environmental ethics to maintain harmonious relation between nature and human being.
	CO5	Illustrate the major environmental effects of exploiting natural resources.
Digital Logic Design A2406	CO1	Demonstrate the importance of various number systems and to perform different arithmetic operations on them.
	CO2	Make use of Boolean algebra postulates-map and tabulation methods to minimize Boolean functions and to implement with logic gates.
	CO3	Construct and Analyze various combinational and sequential circuits used in digital systems such as adders, subtractors, code-convertors, decoders, encoders, multiplexers, flip flops, registers and counters.
	CO4	Design various PLDs such as ROMs, PALs, PLAs and PROMs
	CO5	Minimize the finite state machine and to construct special flow charts called ASM charts to define digital hardware algorithms.
Signals and Systems A2407	CO1	Classify various types of signals and illustrate them with various examples
	CO2	Construct the block level representation of system and experiment with the periodic and non-periodic input signals
	CO3	Analyze the system in terms of magnitude and phase spectrums with both periodic and non-periodic input signals
	CO4	Determine the stability of the continuous and discrete time domain systems with the help of Region of Convergence
	CO5	Design the system which is non-aliasing for transmission of the signals
Probability Theory and Stochastic	CO1	Recall various probability concepts and apply the knowledge of probability to find cumulative distribution function and Probability density functions of random variables.

Course Title with Code	Course Outcomes	
Processes A2408	CO2	Extend the concept of single random variable to multiple random variables so as to tackle practical statistical communication problems.
	CO3	Classify the different types of random processes to apply to real physical world problems.
	CO4	Identify the importance of correlation function and its relation to power spectral density
	CO5	Estimate the performance of linear time invariant systems in terms of noise factor, noise band width noise temperature and extend each to cascaded systems.
Electronic Circuit Analysis A2409	CO1	Classify various amplifiers based on the applications and compare its characteristics
	CO2	Analyze amplifier circuits using small signal low frequency and high frequency transistor models
	CO3	Compare the concepts of positive and negative feedback and analyze its effects on the performance of amplifier circuits
	CO4	Identify the need and compare the performance of various power amplifiers and tuned amplifiers
	CO5	Design analog circuits such as voltage amplifiers, oscillators, power amplifiers and tuned amplifiers using discrete components
Simulation Lab A2410	CO1	Understand the Basics of MATLAB thereby analyze the generation and transformations of Various Signals and Sequences
	CO2	Determine the Convolution and Correlation between Signals and sequences in real time scenario using MATLAB.
	CO3	Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System using MATLAB
	CO4	Design various number systems conversions and digital logic design circuits using LabVIEW.
	CO5	An Analyze the functionality of Combinational circuits and Sequential Circuits using LabVIEW.
Electronic Circuit Analysis Lab A2411	CO1	Design small signal amplifiers for given specifications using discrete components and verify using Multisim circuit design software.
	CO2	Interpret different types of negative feedback amplifiers using discrete components and compare with Multisim software.
	CO3	Make use of Multisim circuit design software and discrete components for the implementation of oscillators like RC, LC for given specifications.
	CO4	Compare the conversion efficiency of power amplifiers using discrete components and Multisim circuit design software.
Managerial Economics and Financial Analysis A2012	CO1	Explain and infer the concepts of Managerial Economics and Financial Accounting
	CO2	Analyze the demand, production, cost and break even to know interrelationship of among variables and their impact
	CO3	Classify the market structure to decide the fixation of suitable price
	CO4	Apply capital budgeting techniques to select best investment opportunity
	CO5	Prepare financial statements and analyze them to assess financial health of business
Computer Organization and Architecture A2510	CO1	Analyze the computer fundamentals and computer internal organization
	CO2	Apply the register transfer operations and instructions in programs
	CO3	Analyze the microprogram control formats and evaluate the computer arithmetic algorithms
	CO4	Analyze the memory access operations and memory architecture
	CO5	Apply the multiprocessing in different inter process structures
Principles of Electrical Engineering A2212	CO1	Apply the knowledge of magnetic circuits to different electrical machines.
	CO2	Analyze the DC and AC transient behavior of series, parallel circuits.
	CO3	Calculate losses and efficiencies of different electrical machines.
	CO4	Evaluate the performance of different electrical machines with the help of suitable tests.
Pulse and Digital Circuits A2412	CO1	Apply the knowledge of Kirchhoff's voltage and Current laws to design various linear and nonlinear circuits
	CO2	Analyze Quantitatively and qualitatively the physical behavior of active and passive elements and relate the theory to the evolution of analog and digital circuits.

Course Title with Code	Course Outcomes	
	CO3	Design different multivibrators, time base generators and sampling gates by making use of semiconductor diodes and transistors.
	CO4	Compare and contrast different types of logic families and interpret their use in various applications.
Electromagnetic Theory and Transmission Lines A2413	CO1	Apply Vector calculus to static electric – Magnetic fields in different engineering situation.
	CO2	Apply the concepts of time varying EM fields to obtain Maxwell equations and analyze its application in EM wave propagation
	CO3	Examine the phenomena of wave propagation through boundaries of different media.
	CO4	Design the stub elements for impedance matching and analyze the characteristics of transmission line using smith chart.
Analog Communications A2414	CO1	Analyze linear and non - linear modulators and demodulators in time as well as frequency domain.
	CO2	Design a linear and non-linear modulators and demodulators.
	CO3	Determine the fundamental communication system parameters like power and bandwidth etc.
	CO4	Evaluate the communication system performance in presence of the noise.
Electrical Engineering Lab A2215	CO1	Verify network theorems practically by conducting suitable experiment.
	CO2	Verify basics of electrical circuits like KCL,KVL and series and parallel resonant circuits.
	CO3	Calculate different two port network parameters for circuits.
	CO4	Analyze the performance of different electrical machines by conducting suitable tests.
Pulse and Digital Circuits Lab A2416	CO1	Interpret the output response of linear circuits and nonlinear circuits so as to realize the applications like High pass RC circuits, Low pass RC circuit, Clippers, Clampers and etc.
	CO2	Conduct experiments to design and demonstrate various multivibrators and sampling gates using analog components.
	CO3	Implement and Examine logic gates and flip flops using discrete components.
	CO4	Demonstrate the use of Multisim software and Realize analog and digital circuits using PSPICE tool.
Object Oriented Programming through JAVA A2508	CO1	Analyze the necessity for Object Oriented Programming paradigm over structured programming and become familiar with the fundamental concepts in OOP like encapsulation, Inheritance and Polymorphism.
	CO2	Demonstrate an ability to design high speed, fault tolerant applications using multi threading and exception handling concepts.
	CO3	Excel in contemporary Java based integrated development environments to develop rich GUI applications.
	CO4	Develop confidence for self-education and ability for life-long learning needed for advanced java technologies.
	CO5	Prepare for competitive examinations like GATE, Engineering services, recruitment interviews etc.
Digital Design through Verilog HDL A2417	CO1	Apply the knowledge of HDL concepts to FPGA and ASIC design flow.
	CO2	Develop all digital electronic circuits using different HDL abstraction level.
	CO3	Test for the functionality of combinational and sequential circuits using EDA tools
	CO4	Evaluate the performance of digital electronic circuits in view of real time scenario.
Entrepreneurship A2017	CO1	Understand the role, characteristics, qualities and functions of entrepreneur and use this knowledge to become future entrepreneurs.
	CO2	Interpret various Institutional support for setting up a business enterprise and apply this knowledge while approaching these institutions for financial support.
	CO3	Illustrate role, importance and functions of women entrepreneur and use this knowledge to become future women entrepreneurs.
	CO4	Infer the concept of Project Management and steps in Project development and analyse while taking future project assignments.
	CO5	Indicate training programs and different training institutions to impart training and apply this knowledge to train existing and future entrepreneurs.
Integrated Circuits	CO1	Apply the knowledge of Kirchoff's Voltage and Current Law for solving Linear and Non-Linear Applications.

Course Title with Code	Course Outcomes	
Applications A2418	CO2	Design various mathematical operation circuits using IC741 Integrated Circuits.
	CO3	Analyze various applications constructed using Integrated Circuits such IC 741 Op-Amp and IC 555 & 565 Timers and also regulator ICs 78XX, 79XX and 723.
	CO4	Design various timing applications using IC555 Timer & IC565 Phase Locked Loop Integrated Circuits.
Microprocessors and Interfacing A2419	CO1	Apply the fundamentals of microprocessor & controller to investigate existing designs.
	CO2	Compare & contrast the processor and controller for the implementation of real time applications.
	CO3	Demonstrate assembly language programming proficiency to assemble and run on host machine.
	CO4	Identify the required driver circuitry to microprocessor and controller I/O ports to interface external devices.
	CO5	Design the required hardware & software modules and integrate to be a functional model.
Digital Communications A2420	CO1	Develop the basic concepts of modulation, sampling, need for digital data transmission with an insight into practical applications.
	CO2	Compare and contrast ask, fsk, psk digital carrier modulation schemes in terms of occupied bandwidth, complexity etc., and extend these into qpsk, mpsk, qam for improved spectral efficiency.
	CO3	Apply the basics of information theory to calculate channel capacity and other measures.
	CO4	Analyze the differences between the usage of systematic linear block codes and convolutional codes for non-burst and burst channel applications
	CO5	Distinguish between source coding and channel coding for optimization of discrete memory less source and for error-free transmission of data over channel.
Antennas and Wave Propagation A2421	CO1	Analyze various antennas like wire antennas, Aperture, Array and Microstrip.
	CO2	Develop the basic skills necessary for designing a wide variety of practical antennas and antennas arrays.
	CO3	Test the designed and fabricated antennas for their specifications.
	CO4	Evaluate different wave propagation techniques to explain the wireless communication mechanism / modes.
Integrated Circuits Applications Lab A2422	CO1	Interpret the output response of linear Operational Amplifiers so as to realize the applications like Adders, Subtractions, Integrators, filters and etc.
	CO2	Design and implement various applications using Analog ICs to demonstrate a given application / problem statement.
	CO3	Demonstrate the use of Xilinx software and Realize basic digital Circuits using Verilog HDL.
	CO4	Program and synthesize a given application / problem statement using EDA tools.
Microprocessors and Interfacing Lab A2424	CO1	Describe the interaction between CPU, memory and I/O ports in various applications.
	CO2	Master the assembly level programming language using 8086 instruction set.
	CO3	Analyze how different I/O devices can be interfaced to processor and will explore several techniques of interfacing.
	CO4	Design a simple microprocessor based system with functional requirements for hardware and software components for few input and output devices.
Professional Ethics and Intellectual Property Rights A2015	CO1	Acquires the basic concepts of Professional ethics and human values &Students also gain the connotations of ethical theories.
	CO2	Knows the duties and rights towards the society in an engineering profession
	CO3	Would realize the importance and necessity of intellectual property rights.
	CO4	Can take all the necessary precautions while conducting the experiments, which may reduce the risk.
	CO5	Understands the importance of risk evacuation system in reality and takes the utmost responsibility while handling the risky situations.
Control Systems A2209	CO1	Develop the fundamentals of various types of control systems and also to determine the transfer function of mechanical and electrical systems.
	CO2	Evaluate the transfer function by using block diagram reduction technique and masons gain formula and also to analyze the transfer function of servomotors.
	CO3	Analyze the time response of first, second-order systems and concept of stability and also apply the different methods to find the stability of system like R-H criteria and

Course Title with Code	Course Outcomes	
		root locus.
	CO4	Examine the stability of control system by using different techniques like bode, polar and nyquist plot.
	CO5	Design a lag, lead and lead-lag compensators and PID controllers and also to solve state transition matrices, state space models of time invariant systems.
Embedded Systems A2425	CO1	Design of an embedded system with functional requirements for hardware and software components including processor, networking components, and sensors, along with applications, subsystem interfaces, networking, and firmware.
	CO2	Apply and implement software systems to provide an interface between hardware peripheral sensors and systems.
	CO3	Summarize the applications, benefits, and limitations of networked embedded systems for environmental science, health, and safety, industrial, and consumer usage objectives.
	CO4	Determine the both promote systematic methods as well as reinforcing core knowledge. This also includes Midterm and Final project presentations.
	CO5	Decide a subsystem and integrate this with a complete system to perform a complex task involving networked, mobile, embedded systems.
VLSI Design A2426	CO1	Construct circuits in NMOS design and CMOS design style and analyze the DC characteristics and switching characteristics of CMOS.
	CO2	Identify the various IC fabrication methods.
	CO3	Develop the stick diagrams and layouts of CMOS circuits and Estimate the Resistance, Inductance and Capacitance in CMOS circuits.
	CO4	Design different types if CMOS logic structures.
	CO5	Analyze/Distinguish various methods available for the testing of combinational and sequential circuits.
Digital Signal Processing A2427	CO1	Interpret Digital Signal Processing using concepts of Discrete time signals and systems, LSI, stability and causality, discrete time systems described by difference equations
	CO2	Interpret Frequency domain representation of discrete time signals and systems using Fourier series and Fourier transforms, Discrete Fourier transforms, Fast Fourier transforms (FFT).
	CO3	Interpret applications of Z-Transform: Stability, Realization of Digital Filters: Structures for FIR systems: Direct form structure, Cascade form structures.
	CO4	Interpret design of FIR digital filters: Symmetric and anti symmetric FIR filters, Design of linear phase FIR Digital Filters using Windows, Design of linear phase FIR Digital Filters
	CO5	Interpret design of IIR Digital Filters: IIR filter design by Approximation of Derivatives, IIR filter design by impulse invariance, IIR filter design by bilinear transformation
Embedded Systems Lab A2428	CO1	Identify the functionality of development boards to implement embedded applications.
	CO2	Compile bug free assembly or C language programs for microcontrollers to a required task.
	CO3	Design an electronic circuit for diverse I/O devices used in real time embedded applications.
	CO4	Develop a product with all sub systems of functional requirements in optimal hardware and software components.
Analog and Digital Communications Lab A2429	CO1	Generate time domain waveforms and Evaluate fundamental communication system parameters such as modulation index, bandwidth, and frequency deviation for analog communication system.
	CO2	Design pre-emphasis and de-emphasis filters to improve the efficiency of a frequency modulation system.
	CO3	Apply the knowledge of basic mathematical background for communication signal analysis.
	CO4	Design and understand the generation of various digital modulations and demodulation techniques.
	CO5	Evaluate the performance of various digital communication systems.
Computer Networks A2602	CO1	Distinguish the terminology and concepts of OSI reference model and the TCP/IP reference model and functions of each layer.
	CO2	Experiment the different types of network topologies, protocols, network devices and their functions within a network.

Course Title with Code	Course Outcomes	
	CO3	Compare the concepts of protocols, network interfaces and design/performance issues in LAN and WAN.
	CO4	Understand and building the skills of sub netting and routing mechanisms, familiarity with basic protocols of computer networks and how they can be used to assist in network design and implementation.
	CO5	Discriminate deficiencies in existing protocols and then go on to formulate new and better protocols.
Electronic Measurements and Instrumentation A2430	CO1	Apply the acquired knowledge of measuring instruments to design various measuring devices.
	CO2	Identify different Oscilloscopes for the measurement of various signals.
	CO3	Analyze various bridge circuits for the measurement of physical quantities to minimize errors in measurements.
	CO4	Classify different Transducers based on their principles and apply them in Mini Projects.
	CO5	Inspect Data Acquisition Systems and to apply for Instrumentation in industrial applications.
Microwave Engineering A2431	CO1	Apply the concepts of electromagnetic field theory to analyze different types of microwave transmission lines
	CO2	Estimate the S-Matrix of various microwave components from the knowledge of microwave measurement techniques
	CO3	Compare the performance characteristics of various microwave tubes and solid state devices
	CO4	Design the cavity resonators for a given Q-factor at various microwave frequencies
Cellular and Mobile Communications A2432	CO1	Summarize the concepts pertained to cellular and mobile communications.
	CO2	Identify different methods for reducing the interference.
	CO3	Analyze various mobile radio propagation models and antennas for cell site and mobile.
	CO4	Interpret different channel assignment strategies and handoffs.
	CO5	Discuss the technical features of emerging cellular communication systems.
VLSI Lab A2439	CO1	Apply the knowledge of advanced concepts of circuit design to optimize digital/analog circuits.
	CO2	Analyze the characteristics of CMOS based analog and digital circuits.
	CO3	Construct the layouts for complex CMOS logic circuits by following design rules.
	CO4	Evaluate the performance of analog/digital circuits in terms of power, speed and area.
Digital Signal Processing Lab A2440	CO1	Identity properties of discrete-time systems such as time-invariance and linearity and compute the linear convolution and correlations of discrete-time sequences.
	CO2	Evaluate the discrete Fourier transform (DFT) of a sequence, relate it to the DTFT, and use the DFT to compute the linear convolution of two sequences.
	CO3	Develop small projects based on signal processing concepts using MATLAB and CC Studio
	CO4	Solve state of the art problems and answer questions using and applying algorithms and programs on a DSP and analyze the changes in the signal after interpolation, decimation and L/M rate conversion
	CO5	Examine digital signal processing algorithms like convolution, design of digital filters using CC Studio on DSP processors.
Mini Project A2441	CO1	Apply relevant engineering principles and theories to design, built, operate, simulate and analyze the development of an engineering product, system or concept.
	CO2	Design and perform investigations/experiments to collect data and analyze result in order to make relevant decision on the performance of an engineering product, system or concept.
	CO3	Demonstrate the social, cultural and environmental responsibilities of an engineer.
	CO4	Practice ethical and professional norms for the implementation of engineering projects.
	CO5	Organize and present technical and scientific findings effectively through written and oral mode with the aid of multimedia tools.
Satellite and Radar	CO1	Identify the architectures of space and earth segments as related to satellite communications and analyze the various applications of satellites.

Course Title with Code	Course Outcomes	
Communications A2442	CO2	Evaluate satellite link budgets and utilize various multiple access schemes for communication satellites.
	CO3	Analyze the performance of radar systems and plan the subsystem performance requirements in a typical radar system design.
	CO4	Examine the various tracking mechanisms as applicable to radar systems.
Database Management Systems A2514	CO1	Design and implement a database schema for a given problem domain
	CO2	Construct Queries in Relational algebra, relational calculus and SQL.
	CO3	Apply Normalization techniques to reduce data redundancy in database.
	CO4	Analyze various transaction control and recovery methods to keep database consistent.
	CO5	Construct the file of data records by using appropriate storage and access structure
Digital Image Processing A2435	CO1	Understand image formation model and low level process, mid level process and high level process
	CO2	Apply the concepts of fundamental image enhancement algorithms and restoration techniques to improve the quality of image
	CO3	Analyze the images by applying various transformation techniques.
	CO4	Estimate the shape and the pattern of an image using segmentation techniques and color image processing.
	CO5	Identify a practical solution to common image processing problems like storage space and channel bandwidth in communication by using compression
Low Power VLSI A2443	CO1	Recognize the importance of low power circuit design and identify related limits.
	CO2	Analyze power dissipation using various approaches in low power circuit design.
	CO3	Examine the effect of different modeling techniques on power dissipation of a CMOS circuit.
	CO4	Estimate the sources of energy dissipation in CMOS logic circuits and SRAM cells.
	CO5	Develop power efficient logic circuits using latest techniques.
Wireless Communication Networks A2444	CO1	Apply the knowledge of various systems, techniques and technologies for effective wireless communication.
	CO2	Analyze the different types of protocols and standards for the enhancement (development) of wireless networking.
	CO3	Make use of various design considerations to utilize the spectrum effectively
	CO4	Identify the ways for data transfer to achieve higher data rates in wireless networks.
DSP Processors and Architectures A2445	CO1	Develop basic DSP algorithms using DSP processors.
	CO2	Analyze the effects of quantization and aliasing in a real-time DSP system.
	CO3	Apply interfacing concepts to programmable DSP devices so as to connect the memory and I/O devices.
	CO4	Correlate execution control and pipelining as applicable to programmable DSP processors.
Speech Signal Processing A2451	CO1	Examine Levinson recursion algorithm and its properties
	CO2	Determine minimum mean square error and pole-zero model in the context of speech signals.
	CO3	Apply various filtering techniques on speech signals.
	CO4	Analyze and synthesize the cepstrum of voiced and unvoiced speech signals.
Advanced Communications and Virtual Instrumentation Laboratory A2455	CO1	Apply the concepts of computational electromagnetic techniques necessary to characterize and solve antenna and microwave related design problems.
	CO2	Simulate various types of antennas and microwave components using commercial CAD tool Ansys HFSS and extend this experience into frontiers of mm-wave technologies.
	CO3	Apply knowledge gained in software and hardware integration in LabVIEW environment.
	CO4	Design and implement software systems to provide an interface between hardware peripheral sensors and systems.
Technical Seminar	CO1	Understand recent trends and technologies in their interested topic after literature survey

Course Title with Code	Course Outcomes	
A2456	CO2	Apply fundamental technical knowledge to analyze selected seminar topic.
	CO3	Develop skill in presentation and communicate effectively to diverse audience.
	CO4	Maintain proper body language.
	CO5	An ability to write technical documents related to their topic as per the norms specified
Comprehensive Viva-Voce A2457	CO1	Apply the knowledge of engineering principles and theories to design and analyze the development of an engineering product, system or concept.
	CO2	Choose specializations in higher studies by applying fundamental technical knowledge.
	CO3	Take part in interviews for employability.
	CO4	Improve the fundamental engineering knowledge for writing the competitive examinations.
	CO5	Develop communication skills to meet technical competency.
Project Work A2458	CO1	Apply relevant engineering principles and theories to design, built, operate, simulate and analyze the development of an engineering product, system or concept.
	CO2	Design and perform investigations/experiments to collect data and analyze result in order to make relevant decision on the performance of an engineering product, system or concept.
	CO3	Demonstrate the social, cultural and environmental responsibilities of an engineer.
	CO4	Practice ethical and professional norms for the implementation of engineering projects.
	CO5	Organize and present technical and scientific findings effectively through written and oral mode with the aid of multimedia tools.

HEAD, EC

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE COUTCOMES FOR 2015 – 2019 BATCH

Course Title with Code	Course Outcomes	
Mathematics – I A3001	CO1	Solve the first and higher order linear differential equations.
	CO2	Make use of differential equations to solve orthogonal trajectories, rate of growth/decay, Newton's law of cooling, Electrical circuits and simple harmonic motion problems..
	CO3	Examine extremum of a function of several variables and evaluate the multiple integrals.
	CO4	Apply Laplace transforms to solve differential equations.
	CO5	Evaluate line, surface and volume integrals using vector integral theorems.
Engineering Physics A3002	CO1	Analyze crystal structures in terms of lattice parameters and interpret the structures using X-ray diffraction methods.
	CO2	Apply the principles of quantum mechanics to analyze the properties of the semiconducting materials.
	CO3	Categorize Nano and dielectric materials. Discuss synthesis and react to environmental concerns due to nanotechnology.
	CO4	Categorize magnetic materials and objectivize their role in science and technology. Apply magnetism to explain superconductivity.
	CO5	Illustrate working of a laser and examine the communication systems using optical fibers.
Engineering Chemistry A3003	CO1	Apply the knowledge of standard electrode potentials of various metals and non metals to protect t hem from corrosion.
	CO2	Identify difference and similarities of three types of Batteries.
	CO3	Compare different methods of softening of hard water.
	CO4	Apply the knowledge of Materials, Fuels and Nano particles in controlling pollution.
	CO5	Compare and contrast the chemical behaviour, properties and applications of engineering substances.
Computer Programming A3501	CO1	Write algorithm and draw corresponding flowchart for simple problems besides explaining functions of computer components.
	CO2	Select the right identifiers, data types and operators for effective computation.
	CO3	Write programs, demonstrating use of control statements, arrays and strings.
	CO4	Demonstrate use of functions and pointers by writing programs.
	CO5	Write programs for simple real life problems using structures and unions.
	CO6	Illustrate use of files by writing programs.
Basic Electrical Engineering A3201	CO1	Apply network reduction techniques and Knowledge of Alternating quantities to calculate Current, Voltage and Power for complex circuits.
	CO2	Analyze electrical Circuits using Nodal Analysis, Mesh analysis and Network theorems
	CO3	Apply the concepts of network topology to obtain Node incidence, Tie set and Cut set matrices.

Course Title with Code	Course Outcomes	
	CO4	Design two port networks ,their equivalent circuits and obtain their parameters
Engineering Physics and Engineering Chemistry Lab A3007	CO1	Analyze the rigidity modulus of the given material to interpret the mechanical properties.
	CO2	Estimate the frequency of AC power supply and time constant of a R-C circuit.
	CO3	Apply the principles of optics to evaluate the characteristics of LED, laser and optical fibres.
	CO4	Apply different instrumental methods for the estimation of strengths of solutions and hardness of water.
	CO5	Analyze the effect of temperature on physical properties like viscosity and surface tension of liquids.
Computer Programming through C Lab A3502	CO1	Implement programs by selecting the right identifiers, data types and operators for effective computation
	CO2	Implement programs, demonstrating use of control statements, arrays and strings
	CO3	Implement programs, demonstrating use of functions and pointers
	CO4	Implement C programs for simple real life problems using structures and unions
	CO5	Implement programs illustrating use of files
	CO6	Debug erroneous programs related to the course
Computer Aided Engineering Drawing Lab A3306	CO1	Use AUTO CAD commands for Computer Aided Drafting and Designing.
	CO2	Represent the objects using different types of lines and dimensioning rules.
	CO3	Analyze the objects such as points, lines and planes held in different orientations using CAD tools.
	CO4	Convert isometric projections to orthographic projections and vice-versa.
	CO5	Analyze regular solids held in different orientations using CAD tools.
Technical English A3005	CO1	Develop an understanding of the significance of humanity, love and service to mankind and be involved in community service
	CO2	Perceive the importance of technological impact on society and plan for the technological advancement
	CO3	Apply the rules of Grammar effectively (articles, prepositions, concord, tenses etc.) in writing reports, technical articles, essays and in day- to-day conversations
	CO4	Build creativity for career planning and entrepreneurship
	CO5	Develop effective written communication skills in academic writing
Mathematics – II A3006	CO1	Solve system of linear equations using rank of a matrix.
	CO2	Examine the nature of the Quadratic form by Eigen values and Eigen vectors.
	CO3	Classify and solve Partial differential equations.
	CO4	Develop Fourier series and Fourier transforms of a function.
	CO5	Apply Z- Transforms to solve difference equations.
Probability Theory and Numerical	CO1	Solve real world problems using the theory of probability.
	CO2	Identify the types of random variables involved in a given problem and calculate relevant probabilities.

Course Title with Code	Course Outcomes	
Methods A3004	CO3	Develop appropriate Numerical methods to approximate a function..
	CO4	Make use of Numerical differentiation and integration in solving problems of engineering.
	CO5	Apply appropriate method to find numerical solution of a differential equation.
Data Structures A3503	CO1	Solve computer software problems by using recursive, non-recursive techniques and, analyze various algorithms with respect to time and space complexity.
	CO2	Demonstrate ability to exhibit knowledge of various searching and sorting techniques and identify potential benefits of each one over the other and propose appropriate technique to solve programming problems.
	CO3	Illustrate the application of linear stack and queue.
	CO4	Exhibit the skills of demonstrating use of linked list.
	CO5	Design novel solutions for simple real life problems using the concept of non-linear data structures.
Electronic Devices and Circuits A3401	CO1	Analyze the physical behavior of diodes and transistors.
	CO2	Compare various rectifiers, filters, transistors, biasing circuits and transistor amplifier configurations.
	CO3	Apply various stabilization and compensation techniques to obtain stable operating point of transistor.
	CO4	Analyze single stage amplifier circuits using small signal low frequency transistor model.
	CO5	Design regulated power supply and amplifier circuits for given specifications.
English Language Communication Skills Lab A3008	CO1	Improve their pronunciation using the rules of Phonetics.
	CO2	Take part in role-plays and interviews to perform effectively in real life situations.
	CO3	Choose appropriate words and phrases to make the telephonic conversation conveying the meaning with etiquettes.
	CO4	Minimize the stage fear and make presentations with proper body language.
	CO5	Adapt the art of debating and group discussion to present their view point convincingly.
Data Structures Lab A3504	CO1	Implement various searching techniques suitable to resolve data searching problems.
	CO2	Demonstrate ability to exhibit knowledge of various sorting techniques and identify the potential benefits of each one over the other.
	CO3	Illustrate about linear data structures like stacks and queues representations and operations and apply them to design and build C based real time applications.
	CO4	Design and implement novel solutions for simple real life problems using the concepts of nonlinear data structures.
	CO5	Debug erroneous programs related to the course.
Electronic Devices and Circuits Lab A3403	CO1	Identify and use various electronic components, test and measuring instruments that are frequently used in experimentation of various circuits.
	CO2	Interpret the V - I characteristics of various electronic devices so as to realize the applications like switching, regulation and amplification.
	CO3	Design a simple regulated power supply by making use of rectifiers, filters and regulators.

Course Title with Code	Course Outcomes	
	CO4	Apply various biasing techniques to fix the operating point and stabilize the given transistor.
	CO5	Analyze the transient and frequency response of single stage amplifier circuits.
Mathematics – III A3009	CO1	Evaluate improper integrals using beta and gamma functions; distinguish the concepts of Bessel and Legendre functions
	CO2	Test for analyticity of complex functions using Cauchy-Riemann equations
	CO3	Identify real and imaginary parts of elementary functions; apply conformal mapping to transform complex regions into simpler regions
	CO4	Develop analytic function in series form using Taylor's series and Laurent's series
	CO5	Evaluate integrals along a contour using Cauchy's integral formula and Residue theorem
Environmental Science A3010	CO1	Identify the important components of environment.
	CO2	Identify global environmental problems and come out with best possible solutions.
	CO3	Apply environmental laws for the protection of forest and wildlife.
	CO4	Apply the knowledge of Environmental ethics to maintain harmonious relation between nature and human being.
	CO5	Illustrate the major environmental effects of exploiting natural resources.
Digital Logic Design A3404	CO1	Demonstrate the importance of various number systems and to perform different arithmetic operations on them.
	CO2	Make use of Boolean algebra postulates-map and tabulation methods to minimize Boolean functions and to implement with logic gates.
	CO3	Construct and Analyze various combinational and sequential circuits used in digital systems such as adders, subtractors, code-convertors, decoders , encoders, multiplexers, flip flops, registers and counters.
	CO4	Design various PLDs such as ROMs, PALs, PLAs and PROMs
	CO5	Minimize the finite state machine and to construct special flow charts called ASM charts to define digital hardware algorithms.
Signals and Systems A3405	CO1	Classify various types of signals and illustrate them with various examples
	CO2	Construct the block level representation of system and experiment with the periodic and non-periodic input signals
	CO3	Analyze the system in terms of magnitude and phase spectrums with both periodic and non-periodic input signals
	CO4	Determine the stability of the continuous and discrete time domain systems with the help of Region of Convergence
	CO5	Design the system which is non-aliasing for transmission of the signals
Random Signals and Stochastic Processes A3406	CO1	Recall various probability concepts and apply the knowledge of probability to find cumulative distribution function and Probability density functions of random variables.
	CO2	Extend the concept of single random variable to multiple random variables so as to tackle practical statistical communication problems.
	CO3	Classify the different types of random processes to apply to real physical world problems.
	CO4	Identify the importance of correlation function and its relation to power spectral density
	CO5	Estimate the performance of linear time invariant systems in terms of noise factor, noise band width noise temperature and extend each to cascaded systems.

Course Title with Code	Course Outcomes	
Electronic Circuit Analysis A3407	CO1	Classify various amplifiers based on the applications and compare its characteristics
	CO2	Analyze amplifier circuits using small signal low frequency and high frequency transistor models
	CO3	Compare the concepts of positive and negative feedback and analyze its effects on the performance of amplifier circuits
	CO4	Identify the need and compare the performance of various power amplifiers and tuned amplifiers
	CO5	Design analog circuits such as voltage amplifiers, oscillators, power amplifiers and tuned amplifiers using discrete components
Simulation Lab A3408	CO1	Apply the Basics of MATLAB thereby analyze the generation and transformations of Various Signals and Sequences.
	CO2	Determine the Convolution and Correlation between Signals and sequences in real time scenario using MATLAB.
	CO3	Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System using MATLAB
	CO4	Design various number systems conversions and digital logic design circuits using LabVIEW.
	CO5	Analyze the functionality of Combinational circuits and Sequential Circuits using LabVIEW.
Electronic Circuit Analysis Lab A3409	CO1	Design small signal amplifiers for given specifications using discrete components and verify using Multisim circuit design software.
	CO2	Interpret different types of negative feedback amplifiers using discrete components and compare with Multisim software.
	CO3	Make use of Multisim circuit design software and discrete components for the implementation of oscillators like RC, LC for given specifications.
	CO4	Compare the conversion efficiency of power amplifiers using discrete components and Multisim circuit design software.
Managerial Economics and Financial Analysis A3011	CO1	Explain and infer the concepts of Managerial Economics and Financial Accounting
	CO2	Analyze the demand, production, cost and break even to know interrelationship of among variables and their impact
	CO3	Classify the market structure to decide the fixation of suitable price
	CO4	Apply capital budgeting techniques to select best investment opportunity
	CO5	Prepare financial statements and analyze them to assess financial health of business
Computer Organization and Architecture A3508	CO1	Analyze the computer fundamentals and computer internal organization
	CO2	Apply the register transfer operations and instructions in programs
	CO3	Analyze the microprogram control formats and evaluate the computer arithmetic algorithms
	CO4	Analyze the memory access operations and memory architecture
	CO5	Apply the multiprocessing in different inter process structures
Principles of Electrical Engineering A3213	CO1	Apply the knowledge of magnetic circuits to different electrical machines.
	CO2	Analyze the DC and AC transient behavior of series, parallel circuits.
	CO3	Calculate losses and efficiencies of different electrical machines.
	CO4	Evaluate the performance of different electrical machines with the help of suitable tests.
Electromagnetic Theory	CO1	Apply Vector calculus to static electric – Magnetic fields in different engineering situation.

Course Title with Code	Course Outcomes	
and Transmission Lines A3410	CO2	Apply the concepts of time varying EM fields to obtain Maxwell equations and analyze its application in EM wave propagation
	CO3	Examine the phenomena of wave propagation through boundaries of different media.
	CO4	Design the stub elements for impedance matching and analyze the characteristics of transmission line using smith chart.
Pulse and Digital Circuits A3411	CO1	Apply the knowledge of Kirchhoff's voltage and Current laws to design various linear and nonlinear circuits
	CO2	Analyze Quantitatively and qualitatively the physical behavior of active and passive elements and relate the theory to the evolution of analog and digital circuits.
	CO3	Design different multivibrators, time base generators and sampling gates by making use of semiconductor diodes and transistors.
	CO4	Compare and contrast different types of logic families and interpret their use in various applications.
Analog Communications A3412	CO1	Analyze linear and non - linear modulators and demodulators intime as well as frequency domain.
	CO2	Design a linear and non-linear modulators and demodulators.
	CO3	Determine the fundamental communication system parameters like power and bandwidth etc.
	CO4	Evaluate the communication system performance in presence of the noise.
Pulse and Digital Circuits Lab A3413	CO1	Interpret the output response of linear circuits and nonlinear circuits so as to realize the applications like High pass RC circuits, Low pass RC circuit, Clippers, Clampers and etc.
	CO2	Conduct experiments to design and demonstrate various multivibrators and sampling gates using analog components.
	CO3	Implement and Examine logic gates and flip flops using discrete components.
	CO4	Demonstrate the use of Multisim software and Realize analog and digital circuits using PSPICE tool.
Analog Communications Lab A3414	CO1	Generate time domain waveforms and Evaluate fundamental communication system parameters such as modulation index, bandwidth, and frequency deviation for analog communication system.
	CO2	Design pre-emphasis and de-emphasis filters to improve the efficiency of a frequency modulation system.
	CO3	Analyze Automatic gain control mechanism and realize squelch action using AGC.
	CO4	Implement phase locked loop concept to construct frequency multiplier.
	CO5	Implement the fundamental communication system blocks using MATLAB.
Gender Sensitization A3021	CO1	Build the significance of the process of socialization and relationships between men and women on the basis of a just and equal world.
	CO2	Examine the decline of female sex ratio and discrimination faced by people with different gender identities.
	CO3	Take part in house work, in order to allow for equality and share equal family spaces.
	CO4	Estimate women's contribution to the nation's economy.
	CO5	Analyze the consequences of sexual violence and importance of consent in friendship and other relationships.
	CO6	Perceive the invisibility of women in history and show how locating a women in history makes them visible.
Control Systems	CO1	Develop the fundamentals of various types of control systems and also to determine the transfer function of mechanical and electrical systems.

Course Title with Code	Course Outcomes	
A3212	CO2	Evaluate the transfer function by using block diagram reduction technique and masons gain formula and also to analyze the transfer function of servo motors.
	CO3	Analyze the time response of first, second-order systems and concept of stability and also apply the different methods to find the stability of system like R-H criteria and root locus.
	CO4	Examine the stability of control system by using different techniques like bode, polar and nyquist plot.
	CO5	Design a lag, lead and lead-lag compensators and PID controllers and also to solve state transition matrices, state space models of time invariant systems.
Digital Communications A3415	CO1	Develop the basic concepts of modulation, sampling, need for digital data transmission with an insight into practical applications.
	CO2	Compare and contrast ASK, FSK, PSK digital carrier modulation schemes in terms of occupied bandwidth, complexity etc., and extend these into qpsk, mpsk, qam for improved spectral efficiency.
	CO3	Apply the basics of information theory to calculate channel capacity and other measures.
	CO4	Analyze the differences between the usage of systematic linear block codes and convolutional codes for non-burst and burst channel applications
	CO5	Distinguish between source coding and channel coding for optimization of discrete memory less source and for error-free transmission of data over channel.
Digital Design through Verilog HDL A3416	CO1	Apply the knowledge of HDL concepts to FPGA and ASIC design flow.
	CO2	Develop all digital electronic circuits using different HDL abstraction level.
	CO3	Test for the functionality of combinational and sequential circuits using EDA tools
	CO4	Evaluate the performance of digital electronic circuits in view of real time scenario.
Antennas and Wave Propagation A3417	CO1	Analyze various antennas like wire antennas, Aperture, Array and Microstrip.
	CO2	Develop the basic skills necessary for designing a wide variety of practical antennas and antennas arrays.
	CO3	Test the designed and fabricated antennas for their specifications.
	CO4	Evaluate different wave propagation techniques to explain the wireless communication mechanism / modes.
Integrated Circuit Analysis A3418	CO1	Apply the knowledge of Kirchoff's Voltage and Current Law for solving Linear and Non-Linear Applications.
	CO2	Design various mathematical operation circuits using IC741 Integrated Circuits.
	CO3	Analyze various applications constructed using Integrated Circuits such IC 741 Op-Amp and IC 555 & 565 Timers and also regulator ICs 78XX, 79XX and 723.
	CO4	Design various timing applications using IC555 Timer & IC565 Phase Locked Loop Integrated Circuits.
Microprocessors and Microcontrollers A3419	CO1	Apply the fundamentals of microprocessor & controller to investigate existing designs.
	CO2	Compare & contrast the processor and controller for the implementation of real time applications.
	CO3	Demonstrate assembly language programming proficiency to assemble and run on host machine.
	CO4	Identify the required driver circuitry to microprocessor and controller I/O ports to interface external devices.

Course Title with Code	Course Outcomes	
Integrated Circuit Analysis and HDL Lab A3421	CO5	Design the required hardware & software modules and integrate to be a functional model.
	CO1	Interpret the output response of linear Operational Amplifiers so as to realize the applications like Adders, Subtractions, Integrators, filters and etc.
	CO2	Design and implement various applications using Analog ICs to demonstrate a given application / problem statement.
	CO3	Demonstrate the use of Xilinx software and Realize basic digital Circuits using Verilog HDL.
	CO4	Program and synthesize a given application / problem statement using EDA tools.
Microprocessors and Interfacing Lab A3422	CO1	Describe the interaction between CPU, memory and I/O ports in various applications.
	CO2	Master the assembly level programming language using 8086 instruction set.
	CO3	Analyze how different I/O devices can be interfaced to processor and will explore several techniques of interfacing
	CO4	Design a simple microprocessor based system with functional requirements for hardware and software components for few input and output devices.
Professional Ethics and Human Values A3012	CO1	Adapt engineering ethics to overcome various moral dilemmas after choosing engineering as profession.
	CO2	Develop awareness on different human values, such aslove, empathy, honesty, etc. to lead a successful life.
	CO3	Know the responsibilities of the engineer towards the society.
	CO4	List out and practice the safety procedures to avert the risks at work place.
	CO5	Determine various roles of engineer and help them to make the world a better place.
Computer Networks A3519	CO1	Distinguish the terminology and concepts of OSI reference model and the TCP/IP reference model and functions of each layer.
	CO2	Experiment the different types of network topologies, protocols, network devices and their functions within a network.
	CO3	Compare the concepts of protocols, network interfaces and design/performance issues in LAN and WAN.
	CO4	Understand and building the skills of sub netting and routing mechanisms, familiarity with basic protocols of computer networks and how they can be used to assist in network design and implementation.
	CO5	Discriminate deficiencies in existing protocols and then go on to formulate new and better protocols.
Embedded Systems A3424	CO1	Apply an appropriate software tools to provide an interface between hardware peripherals and systems.
	CO2	Interpret the need for RISC type computing system for advanced embedded applications.
	CO3	Design the subsystems and integrate for a complete system to perform complex tasks.
	CO4	Develop a product with functional requirements using optimal hardware and software components.
	CO5	Identify a suitable firmware to meet real time computing constraints of an embedded system.
CMOS VLSI Design A3425	CO1	Understand electrical properties of transistors and make use of fabrication steps to build CMOS circuits.
	CO2	Analyze the characteristics of CMOS circuits to examine electrical behavior of digital circuits.
	CO3	Experiment with various CMOS logic structures to model any digital circuit.

Course Title with Code	Course Outcomes	
	CO4	Determine the leakage issues in CMOS logic structures to assess the performance of a CMOS circuit.
JAVA Programming A3579	CO1	Construct application programs using OOP principles.
	CO2	Analyze the various concepts of OOP in problem solving.
	CO3	Develop high speed and fault tolerant applications with multi-threading and exception handling.
	CO4	Use collections framework API with reduced programming effort.
	CO5	Perform file handling with Java IO API.
	CO6	Implement rich GUI applications
Digital System Design A3451	CO1	Analyze the timing concepts of combinational and sequential circuits.
	CO2	Develop and synthesis the HDL code for combinational and sequential circuits.
	CO3	Design the CPLD and FPGA based combinational and sequential circuits.
	CO4	Apply various test algorithms for diagnosing faults in combinational and memory.
	CO5	Make use of the diverse combinational and sequential logics implementation in real time.
Data Communications A3452	CO1	Develop basic concepts of data communications and compare digital data transmission techniques in terms of data rate, probability of error.
	CO2	Compare diverse modulation techniques to develop a communication system model to increase the spectral efficiency.
	CO3	Apply the fundamentals of data link layer for error detection, correction and flow control techniques on a Communication system
	CO4	Analyze the application of network topologies for current and future applications to support the Quality of Service requirements
	CO5	Design a functional setup of network environment with all the necessary data communication components, procedures and techniques
Low Power VLSI Design A3454	CO1	Recognize the importance of low power circuit design and identify related limits.
	CO2	Analyze power dissipation using various approaches in low power circuit design.
	CO3	Examine the effect of different modeling techniques on power dissipation of a CMOS circuit.
	CO4	Estimate the sources of energy dissipation in CMOS logic circuits and SRAM cells.
	CO5	Develop power efficient logic circuits using latest techniques.
Satellite CommunicationsA3455	CO1	Identify different types of satellites and analyze the orbital mechanics, launching methods.
	CO2	Classify different satellite subsystems and evaluate link budget for a satellite
	CO3	Compare and contrast the radio propagation channels for Earth station - satellite and various multiple access techniques used for satellite communication applications
	CO4	Analyze the principles of low earth orbit and geo stationary satellite systems.
	CO5	Interpret the impact of GPS Navigation, NGSO constellation design for tracking and launching
Real Time Operating Systems	CO1	Compare and contrast a Real Time Operating System & other Operating System and also rectify the Real Time Design Issues
	CO2	Design the applications to run in parallel either using Process or Threads

Course Title with Code	Course Outcomes	
A3456	CO3	Develop a Practical Real Time System by using optimal core elements
	CO4	Identify the Scheduling Schemes for Packet Switching Networks and Protocols for the Broadcast Networks
	CO5	Test for the Performance Analysis of different Real Time Systems which are available in market
Embedded Systems Lab A3426	CO1	Identify the functionality of development boards to implement embedded applications.
	CO2	Compile bug free assembly or C language programs for microcontrollers to a required task.
	CO3	Design an electronic circuit for diverse I/O devices used in real time embedded applications.
	CO4	Develop a product with all sub systems of functional requirements in optimal hardware and software components.
CMOS VLSI Lab A3427	CO1	Apply the knowledge of advanced concepts of circuit design to optimize digital/analog circuits.
	CO2	Analyze the characteristics of CMOS based analog and digital circuits.
	CO3	Construct the layouts for complex CMOS logic circuits by following design rules.
	CO4	Evaluate the performance of analog/digital circuits in terms of power, speed and area.
Intellectual Property Rights A3013	CO1	Enumerate the basics of the four primary forms of intellectual property rights.
	CO2	Infer the basic principles and sources of intellectual property rights as well as examine how these have changed and are changing as a result of globalization.
	CO3	Explain the different forms of intellectual property protection in terms of their key differences and similarities.
	CO4	Sketch the process to acquire different intellectual property rights i.e., trademarks, copy rights, patents, and trade secrets.
	CO5	Examine the new developments in IPR.
Electronic Measurements and Instrumentation A3428	CO1	Apply the acquired knowledge of measuring instruments to design various measuring devices.
	CO2	Identify different Oscilloscopes for the measurement of various signals.
	CO3	Analyze various bridge circuits for the measurement of physical quantities to minimize errors in measurements.
	CO4	Classify different Transducers based on their principles and apply them in Mini Projects.
	CO5	Inspect Data Acquisition Systems and to apply for Instrumentation in industrial applications.
Microwave Engineering A3429	CO1	Apply the concepts of electromagnetic field theory to analyze different types of microwave transmission lines
	CO2	Estimate the S-Matrix of various microwave components from the knowledge of microwave measurement techniques
	CO3	Compare the performance characteristics of various microwave tubes and solid state devices
	CO4	Design the cavity resonators for a given Q-factor at various microwave frequencies
Digital Signal Processing A3430	CO1	Interpret Digital Signal Processing using concepts of Discrete time signals and systems, LSI, stability and causality, discrete time systems described by difference equations
	CO2	Interpret Frequency domain representation of discrete time signals and systems using Fourier series and Fourier transforms, Discrete Fourier transforms, Fast Fourier transforms (FFT).

Course Title with Code	Course Outcomes	
	CO3	Interpret applications of Z-Transform: Stability, Realization of Digital Filters: Structures for FIR systems: Direct form structure, Cascade form structures.
	CO4	Interpret design of FIR digital filters: Symmetric and anti symmetric FIR filters, Design of linear phase FIR Digital Filters using Windows, Design of linear phase FIR Digital Filters
	CO5	Interpret design of IIR Digital Filters: IIR filter design by Approximation of Derivatives, IIR filter design by impulse invariance, IIR filter design by bilinear transformation
Fundamentals of Database Management Systems A3576	CO1	Design and implement a database schema for a given problem domain
	CO2	Construct Queries in Relational algebra, relational calculus and SQL.
	CO3	Apply Normalization techniques to reduce data redundancy in database.
	CO4	Analyze various transaction control and recovery methods to keep database consistent.
	CO5	construct the file of data records by using appropriate storage and access structure
CPLD and FPGA Architectures and Applications A3457	CO1	Classify various PLDs based on the applications and compare its architectures.
	CO2	Identify the technical problem and apply the knowledge to formulate the solutions in various engineering fields related to PLDs.
	CO3	Distinguish between the concept of SRAM and Anti-fuse based FPGA architectures.
	CO4	Make use of various techniques to implement the digital logic circuits using different FPGA architectures.
	CO5	Experiment with the EDA tools to meet the major goals like size, speed and power consumption.
Radar Systems A3458	CO1	Describes about radar fundamentals..
	CO2	Classify pulsed and continuous types of radars Doppler Effect and the concepts of continuous wave radars
	CO3	Discuss the operation of MTI and pulse Doppler radar. Examine the various tracking mechanisms as applicable to radar systems
	CO4	Analyze the detection of radar signals in noise. Demonstrate the noise figure and radar receiver
Cellular and Mobile Communications A3462	CO1	Summarize the concepts pertained to cellular and mobile communications.
	CO2	Identify different methods for reducing the interference.
	CO3	Analyze various mobile radio propagation models and antennas for cell site and mobile.
	CO4	Interpret different channel assignment strategies and handoffs.
	CO5	Discuss the technical features of emerging cellular communication systems.
Digital Image Processing A3463	CO1	Understand image formation model and low level process, mid level process and high level process.
	CO2	Apply the concepts of fundamental image enhancement algorithms and restoration techniques to improve the quality of image.
	CO3	Analyze the images by applying various transformation techniques.
	CO4	Estimate the shape and the pattern of an image using segmentation techniques and color image processing.
	CO5	Identify a practical solution to common image processing problems like storage space and channel bandwidth in communication by using compression.

Course Title with Code	Course Outcomes	
Digital Communications and Microwave Engineering Lab A3431	CO1	Understand the concepts of digital modulation schemes and microwave measurement techniques
	CO2	Apply the knowledge of basic mathematical background for communication signal analysis and scattering parameters to understand the operation of various microwave components
	CO3	Analyze the signal flow in a digital communication system and wave propagation in the microwave transmission lines
	CO4	Design and understand the generation of various digital modulations and microwave Transmission techniques using different sources
	CO5	Evaluate the performance of various digital communication systems and characteristics of microwave components and devices.
Digital Signal Processing-Lab A3432	CO1	Identity properties of discrete-time systems such as time-invariance and linearity and compute the linear convolution and correlations of discrete-time sequences.
	CO2	Evaluate the discrete Fourier transform (DFT) of a sequence, relate it to the DTFT, and use the DFT to compute the linear convolution of two sequences.
	CO3	Develop small projects based on signal processing concepts using MATLAB and CC Studio
	CO4	Solve state of the art problems and answer questions using and applying algorithms and programs on a DSP and analyze the changes in the signal after interpolation, decimation and I./M rate conversion
	CO5	Examine digital signal processing algorithms like convolution, design of digital filters using CC Studio on DSP processors.
Mini Project A3433	CO1	Apply relevant engineering principles and theories to design, built, operate, simulate and analyze the development of an engineering product, system or concept.
	CO2	Design and perform investigations/experiments to collect data and analyze result in order to make relevant decision on the performance of an engineering product, system or concept.
	CO3	Demonstrate the social, cultural and environmental responsibilities of an engineer.
	CO4	Practice ethical and professional norms for the implementation of engineering projects.
	CO5	Organize and present technical and scientific findings effectively through written and oral mode with the aid of multimedia tools.
Management Science A3014	CO1	Explain and infer the concepts and aspects of management
	CO2	Analyze the different organizational structures, plant layouts, work study tools for enhancement of productivity in an organization.
	CO3	Apply the project management techniques to decide the optimum time and cost for completion of a project.
	CO4	Apply statistical quality control techniques to know quality of product with in control limits
	CO5	Use Human resource management techniques for better people management.
Operating System Fundamentals A3578	CO1	Understand the difference between different types of modern operating systems, virtual machines and their structure of implementation and applications.
	CO2	Identify the rationale behind various memory management techniques along with issues and challenges of main memory, virtual memory and file system.
	CO3	Understand the concepts of deadlock in operating systems and how they can be managed / avoided and implement them in multiprogramming system.
	CO4	Illustrate different protection and security mechanisms in operating system

Course Title with Code	Course Outcomes	
Wireless Communications and Networks A3464	CO1	Apply the knowledge of various systems, techniques and technologies for effective wireless communication.
	CO2	Analyze the different types of protocols and standards for the enhancement (development) of wireless networking.
	CO3	Make use of various design considerations to utilize the spectrum effectively
	CO4	Identify the ways for data transfer to achieve higher data rates in wireless networks.
DSP Processors and Architectures A3466	CO1	Develop basic DSP algorithms using DSP processors.
	CO2	Analyze the effects of quantization and aliasing in a real-time DSP system.
	CO3	Apply interfacing concepts to programmable DSP devices so as to connect the memory and I/O devices.
	CO4	Correlate execution control and pipelining as applicable to programmable DSP processors.
Technical Seminar A3434	CO1	Understand recent trends and technologies in their interested topic after literature survey
	CO2	Apply fundamental technical knowledge to analyze selected seminar topic.
	CO3	Develop skill in presentation and communicate effectively to diverse audience.
	CO4	Maintain proper body language.
	CO5	An ability to write technical documents related to their topic as per the norms specified
Project Work A3435	CO1	Apply relevant engineering principles and theories to design, built, operate, simulate and analyze the development of an engineering product, system or concept.
	CO2	Design and perform investigations/experiments to collect data and analyze result in order to make relevant decision on the performance of an engineering product, system or concept.
	CO3	Demonstrate the social, cultural and environmental responsibilities of an engineer.
	CO4	Practice ethical and professional norms for the implementation of engineering projects.
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COURSE COUTCOMES FOR 2018 – 2022 BATCH

Course Title with Code	Course Outcomes	
Linear Algebra and Ordinary Differential EquationsA4001	CO1	Solve system of linear equations using rank of a matrix.
	CO2	Examine the nature of Quadratic form using eigen values and eigen vectors.
	CO3	Solve the first and higher order linear differential equations.
	CO4	Make use of differential equations to solve orthogonal trajectories, rate of growth/decay, Newton's law of cooling, Electrical circuits and simple harmonic motion problems.
	CO5	Apply Laplace transforms to solve differential equations.
Semiconductor Physics A4003	CO1	Apply knowledge of three - dimensional arrangements of atoms, molecules and their effects on chemical reactions.
	CO2	Evaluate the behavior, and interactions between matter and energy at both the atomic and molecular levels.
	CO3	Identify differences and similarities of the Batteries.
	CO4	Apply major chemical reactions in the synthesis of various drugs.
	CO5	Make use of different methods for softening hardness of water.
Basic Electrical Engineering A4201	CO1	Apply the network reduction techniques and Knowledge of Alternating quantities to calculate Current, Voltage and Power for complex circuits.
	CO2	Analyze electrical Circuits using Nodal Analysis ,Mesh analysis and Network theorems
	CO3	Study and Analyze the different types of DC Machines, Transformers.
	CO4	Test the performance of DC Generator, DC Motor, transformer and Induction Motor.
	CO5	Apply the knowledge of protection devices during electrical Installations.
Engineering Graphics &Computer Aided Drafting A4301	CO1	Construct various types of scales and curves commonly used in engineering practice.
	CO2	Distinguish between first, second, third and fourth angle projections of systems.
	CO3	Estimate sheet metal requirement for making regular solids.
	CO4	Compare isometric and orthographic views of an object.
	CO5	Select CAD tools for modelling regular solids
Semiconductor Physics Laboratory A4004	CO1	Determination of Planck's constant and work function of a metal.
	CO2	Evaluation of band gap of a semiconductor and understand the temperature dependence function of resistivity.
	CO3	Analyze the diode characteristics.

Course Title with Code	Course Outcomes	
	CO4	Analyze the I-V characteristics of solar cell and LED.
	CO5	Apply the principles of laser light and estimate the losses in the propagation of light in optical fibers.
Basic Electrical Engineering Laboratory A4202	CO1	Verify Ohms law, Kirchhoff laws and Impedance & Current of Series RL, RC and RLC Circuits.
	CO2	Analyze the transient response of Series RL, RC and RLC series circuits.
	CO3	Calculate the Voltage, Current Real power in a single phase Transformer.
	CO4	Test the performance of DC Motor, 1- phase transformer, Alternator and 3 phase Induction Motor.
Engineering Exploration A4022	CO1	Identify multi-disciplinary approach required in solving an engineering problem.
	CO2	Analyze a given problem using process of engineering problem analysis as an engineer/problem solver.
	CO3	Relate basics of engineering project management skills in doing projects.
	CO4	Make use of ethical and sustainability perspectives to propose best engineering solutions.
	CO5	Develop simple systems of basic need of society using engineering design process.
Advanced Calculas A4002	CO1	Evaluate improper integrals and examine the extremum of a function of several variables.
	CO2	Make use of multiple integrals to find the area and volume of a solid.
	CO3	Determine scalar potential function for irrotational force fields.
	CO4	Evaluate line, surface and volume integrals using vector integral theorems.
	CO5	Develop Fourier series and Fourier transforms of a function
Engineering Chemistry A4007	CO1	Apply knowledge of three - dimensional arrangements of atoms, molecules and their effects on chemical reactions.
	CO2	Evaluate the behavior, and interactions between matter and energy at both the atomic and molecular levels.
	CO3	Identify differences and similarities of the Batteries.
	CO4	Apply major chemical reactions in the synthesis of various drugs.
	CO5	Make use of different methods for softening hardness of water.
Programming for Problem Solving A4501	CO1	Select right identifiers, data types and operators for effective computation.
	CO2	Write programs using control statements.
	CO3	Write programs demonstrating use of arrays, strings and their applications.
	CO4	Demonstrate the applications of function and recursion.
	CO5	Write programs for simple real life problems using pointers and structures.
Functional English	CO1	Demonstrate an understanding of the significance of humanity, love and service to mankind

Course Title with Code	Course Outcomes	
A4009	CO2	Utilize appropriate vocabulary in the given contexts.
	CO3	Build competence in grammar.
	CO4	Develop effective academic reading skills.
	CO5	Develop effective academic writing skills.
Engineering Workshop A4302	CO1	Demonstrate the applications of manufacturing tools & joining process.
	CO2	Produce basic components using workshop trades.
	CO3	Identify and apply the tools for different trades of engineering workshop practice.
	CO4	Recognize the circuit and its operational features in house wiring.
	CO5	Explain the different materials that are used in workshop trades.
Engineering Chemistry Laboratory A4008	CO1	Measure molecular/system properties such as surface tension, viscosity, conductance of solutions and redox potentials.
	CO2	Apply various titrations for the estimation of strengths of solutions and hardness of water.
	CO3	Identify different samples from a mixture by using various separation techniques.
	CO4	Estimate rate constants of reactions from concentration of reactants/products as a function of time.
	CO5	Evaluate the percentage of yield of chemical substances by organic synthesis.
Programming for Problem Solving Laboratory A4502	CO1	Demonstrating use of control statements, arrays and strings.
	CO2	Demonstrating use of functions and recursive functions.
	CO3	Design and implement C programs for simple real life problems using pointers and structures.
	CO4	Debug erroneous programs related to the course.
English Language Communication Skills Laboratory A4010	CO1	Improve his/her pronunciation.
	CO2	Take part in role-plays and perform effectively in real-life situations.
	CO3	Choose appropriate words and phrases to make effective telephonic conversations.
	CO4	Minimize stage fear and make effective presentations.
	CO5	Build sustained conversations.
Social Innovation A4021	CO1	Develop awareness on social issues faced by local regions.
	CO2	Interpret and classify societal issues as simple, complicated and complex problems.
	CO3	Identify the core problems, its main causes and effects, and propose a novel idea

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Program Outcomes

POs are statements about the knowledge, skills and attributes the graduated of a formal engineering program should have. POs deal with the general aspect of graduation for a particular program and the competencies and expertise a graduated will possess after completion of the program. These are broader and cover a wider area than of Cos.

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Lifelong learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO1: Apply the knowledge of domain-specific skill set for the design and analysis of components in VLSI and Embedded systems.

PSO2: Demonstrate the technical competency and use appropriate techniques in the realization of advanced communication systems.

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3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
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12. **Lifelong learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO1: Competent in Emerging Trends: Apply software design and development practices to develop software applications in emerging areas such as Cloud and High-performance computing, Data analytics and Cyber security.
PSO2: Successful Career and Entrepreneurship: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur and a zest for higher studies.

COURSE COUTCOMES FOR 2015 – 2019 BATCH

Course Title with Code	Course Outcomes	
Mathematics – I A3001	CO1	Solve the first and higher order linear differential equations.
	CO2	Make use of differential equations to solve orthogonal trajectories, rate of growth/decay, Newton's law of cooling, Electrical circuits and simple harmonic motion problems..
	CO3	Examine extremum of a function of several variables and evaluate the multiple integrals.
	CO4	Apply Laplace transforms to solve differential equations.
	CO5	Evaluate line, surface and volume integrals using vector integral theorems.
Probability Theory and Numerical Methods A3004	CO1	Solve real world problems using the theory of probability.
	CO2	Identify the types of random variables involved in a given problem and calculate relevant probabilities.
	CO3	Develop appropriate Numerical methods to approximate a function..
	CO4	Make use of Numerical differentiation and integration in solving problems of engineering.
	CO5	Apply appropriate method to find numerical solution of a differential equation.
Technical English A3005	CO1	Develop an understanding of the significance of humanity, love and service to mankind and be involved in community service
	CO2	Perceive the importance of technological impact on society and plan for the technological advancement
	CO3	Apply the rules of Grammar effectively (articles, prepositions, concord, tenses etc.) in writing reports, technical articles, essays and in day- to-day conversations
	CO4	Build creativity for career planning and entrepreneurship

Course Title with Code	Course Outcomes	
	CO5	Develop effective written communication skills in academic writing
Basic Electrical Engineering A3201	CO1	Apply network reduction techniques and Knowledge of Alternating quantities to calculate Current, Voltage and Power for complex circuits.
	CO2	Analyze electrical Circuits using Nodal Analysis,Mesh analysis and Network theorems
	CO3	Apply the concepts of network topology to obtain Node incidence, Tie set and Cut set matrices.
	CO4	Design two port networks ,their equivalent circuits and obtain their parameters
Computer Programming A3501	CO1	Write algorithm and draw corresponding flowchart for simple problems besides explaining functions of computer components.
	CO2	Select the right identifiers, data types and operators for effective computation.
	CO3	Write programs, demonstrating use of control statements, arrays and strings.
	CO4	Demonstrate use of functions and pointers by writing programs.
	CO5	Write programs for simple real life problems using structures and unions.
	CO6	Illustrate use of files by writing programs.
English Language Communication Skills Lab A3008	CO1	Improve their pronunciation using the rules of Phonetics.
	CO2	Take part in role-plays and interviews to perform effectively in real life situations.
	CO3	Choose appropriate words and phrases to make the telephonic conversation conveying the meaning with etiquettes.
	CO4	Minimize the stage fear and make presentations with proper body language.
	CO5	Adapt the art of debating and group discussion to present their view point convincingly.
Computer Programming through C Lab A3502	CO1	Implement programs by selecting the right identifiers, data types and operators for effective computation
	CO2	Implement programs, demonstrating use of control statements, arrays and strings
	CO3	Implement programs, demonstrating use of functions and pointers
	CO4	Implement C programs for simple real life problems using structures and unions
	CO5	Implement programs illustrating use of files
	CO6	Debug erroneous programs related to the course
Mathematics – II A3006	CO1	Solve system of linear equations using rank of a matrix.
	CO2	Examine the nature of the Quadratic form by Eigen values and Eigen vectors.
	CO3	Classify and solve Partial differential equations.
	CO4	Develop Fourier series and Fourier transforms of a function.
	CO5	Apply Z- Transforms to solve difference equations.
Engineering Physics	CO1	Analyze crystal structures in terms of lattice parameters and interpret the structures using X-ray diffraction methods.
	CO2	Apply the principles of quantum mechanics to analyze the properties of the

Course Title with Code	Course Outcomes	
A3002		semiconducting materials.
	CO3	Categorize Nano and dielectric materials. Discuss synthesis and react to environmental concerns due to nanotechnology.
	CO4	Categorize magnetic materials and objectivize their role in science and technology. Apply magnetism to explain superconductivity.
	CO5	Illustrate working of a laser and examine the communication systems using optical fibers.
Engineering Chemistry A3003	CO1	Apply the knowledge of standard electrode potentials of various metals and non metals to protect t hem from corrosion.
	CO2	Identify difference and similarities of three types of Batteries.
	CO3	Compare different methods of softening of hard water.
	CO4	Apply the knowledge of Materials, Fuels and Nano particles in controlling pollution.
	CO5	Compare and contrast the chemical behaviour, properties and applications of engineering substances.
Electronic Devices and Circuits A3401	CO1	Analyze the physical behavior of diodes and transistors.
	CO2	Compare various rectifiers, filters, transistors, biasing circuits and transistor amplifier configurations.
	CO3	Apply various stabilization and compensation techniques to obtain stable operating point of transistor.
	CO4	Analyze single stage amplifier circuits using small signal low frequency transistor model.
	CO5	Design regulated power supply and amplifier circuits for given specifications.
Data Structures A3503	CO1	Solve computer software problems by using recursive, non-recursive techniques and, analyze various algorithms with respect to time and space complexity.
	CO2	Demonstrate ability to exhibit knowledge of various searching and sorting techniques and identify potential benefits of each one over the other and propose appropriate technique to solve programming problems.
	CO3	Illustrate the application of linear stack and queue.
	CO4	Exhibit the skills of demonstrating use of linked list.
	CO5	Design novel solutions for simple real life problems using the concept of non-linear data structures.
Engineering Physics and Engineering Chemistry Lab A3007	CO1	Analyze the rigidity modulus of the given material to interpret the mechanical properties.
	CO2	Estimate the frequency of AC power supply and time constant of a R-C circuit.
	CO3	Apply the principles of optics to evaluate the characteristics of LED, laser and optical fibres.
	CO4	Apply different instrumental methods for the estimation of strengths of solutions and hardness of water.
	CO5	Analyze the effect of temperature on physical properties like viscosity and surface tension of liquids.

Course Title with Code	Course Outcomes	
Data Structures Lab A3504	CO1	Implement various searching techniques suitable to resolve data searching problems.
	CO2	Demonstrate ability to exhibit knowledge of various sorting techniques and identify the potential benefits of each one over the other.
	CO3	Illustrate about linear data structures like stacks and queues representations and operations and apply them to design and build C based real time applications.
	CO4	Design and implement novel solutions for simple real life problems using the concepts of nonlinear data structures.
	CO5	Debug erroneous programs related to the course.
Electronic Devices and Circuits Lab A3403	CO1	Identify and use various electronic components, test and measuring instruments that are frequently used in experimentation of various circuits.
	CO2	Interpret the V - I characteristics of various electronic devices so as to realize the applications like switching, regulation and amplification.
	CO3	Design a simple regulated power supply by making use of rectifiers, filters and regulators.
	CO4	Apply various biasing techniques to fix the operating point and stabilize the given transistor.
	CO5	Analyze the transient and frequency response of single stage amplifier circuits.
Managerial Economics and Financial Analysis A3011	CO1	Explain and infer the concepts of Managerial Economics and Financial Accounting
	CO2	Analyze the demand, production, cost and break even to know interrelationship of among variables and their impact
	CO3	Classify the market structure to decide the fixation of suitable price
	CO4	Apply capital budgeting techniques to select best investment opportunity
	CO5	Prepare financial statements and analyze them to assess financial health of business
Digital Logic Design A3404	CO1	Demonstrate the importance of various number systems and to perform different arithmetic operations on them.
	CO2	Make use of Boolean algebra postulates-map and tabulation methods to minimize Boolean functions and to implement with logic gates.
	CO3	Construct and Analyze various combinational and sequential circuits used in digital systems such as adders, subtractors, code-convertors, decoders ,encoders, multiplexers, flip flops, registers and counters.
	CO4	Design various PLDs such as ROMs, PALs, PLAs and PROMs
	CO5	Minimize the finite state machine and to construct special flow charts called ASM charts to define digital hardware algorithms.
Discrete Mathematical Structures A3505	CO1	Simplify logic statements including implications using truth tables and express logic statements in terms of predicates, quantifiers, and logical connectives.
	CO2	Understand relations, functions and determine their properties

Course Title with Code	Course Outcomes	
	CO3	Apply elementary counting techniques such as permutations, combinations and binomial expansion to solve counting problems
	CO4	Solve recurrence relations to analyze problems such as finding Fibonacci numbers, merge sort and Towers of Hanoi
	CO5	Distinguish, identify and prove the properties of groups and subgroups
	CO6	Demonstrate graph theory concept such as Euler path, Hamiltonian Cycle, Chromatic number etc
Design and Analysis of Algorithms A3506	CO1	Demonstrate the importance of various algorithmic notations and their usage to give asymptotic upper, lower bounds on time and space complexity of algorithms.
	CO2	Apply divide and conquer strategy to solve various computing problems
	CO3	Estimate all feasible solutions using greedy strategy and recite an algorithm that employs this strateg
	CO4	Construct algorithms for solving real world problems using dynamic programming.
	CO5	Apply fundamental graph traversal techniques to solve various applications using backtracking
	CO6	Analyze Branch and Bound techniques and explain the significance of NP Completeness
DataBase Management Systems A3516	CO1	Apply the concepts to the real world applications to design and development of database application systems
	CO2	Analyze the relational database theory, and be able to write relational algebra expressions for queries
	CO3	Generate a set of relational schemas that allows us to store information without redundancy
	CO4	Apply structure query language to construct queries
	CO5	Manage the concurrent execution of transaction by using query evaluation techniques
	CO6	Organize the file of data records using indexes
Object Oriented Programming A3509	CO1	Use various constructs of Object Oriented Programming language
	CO2	Apply principles of Object Oriented Programming to model/design real world problems
	CO3	Use Exception Handling Mechanism to develop fault tolerant applications
	CO4	Apply the concepts of Multithreaded Programming and Synchronization
	CO5	Use GUI controls and Event handling mechanism to develop interactive Window/Desktop applications
	CO6	Analyze need of Applets, Swings to develop simple web application
Object Oriented	CO1	Identify classes, objects, members of a class and the relationships among

Course Title with Code	Course Outcomes	
Programming through JAVA LAB A3511		them needed for solving a specific problem
	CO2	Illustrate how to achieve reusability using inheritance, interfaces and packages
	CO3	Implement concurrent applications using multithreading
	CO4	Apply exception handling mechanism to overcome run time errors
	CO5	Design interactive GUI applications using AWT classes.
	CO6	Design web applications using applets
DataBase Management Systems Lab A3518	CO1	Understand, appreciate and effectively explain the underlying concepts of database technology
	CO2	Design and Implement a database scheme for a given problem domain
	CO3	Apply Normalization to reduce redundancies.
	CO4	Populate and query a database using SQL DML/DDL commands.
	CO5	Declare and enforce integrity constraints on a database using a state of art of RDBMS
Gender Sensitization A3021	CO1	Build the significance of the process of socialization and relationships between men and women on the basis of a just and equal world.
	CO2	Examine the decline of female sex ratio and discrimination faced by people with different gender identities.
	CO3	Take part in house work, in order to allow for equality and share equal family spaces.
	CO4	Estimate women's contribution to the nation's economy.
	CO5	Analyze the consequences of sexual violence and importance of consent in friendship and other relationships.
	CO6	Perceive the invisibility of women in history and show how locating a women in history makes them visible.
Microprocessors and MicroControllers (A3419)	**CO1**	tand the importance of statements and predicate calculus in deriving valid inferences. Understand the fundamentals of 8086 microprocessor & 8051 microcontroller internal architecture, pin description, memory organization and instruction set.
	CO2	the knowledge of various addressing modes, data transfer instructions, stack, program counter, registers and their operations to enable writing assembly language programs.
	CO3	strate assembly language programming proficiency, assemble into machine cross assembler utility and download and run their program on the training boards.
	CO4	microprocessor based systems using chips like 8259, 8257 and 8254.
	CO5	e knowledge on both hardware and software aspects of a microprocessor/microcontroller -based system by implementing real time projects.
Compiler Design (A3520)	**CO1**	Design and implement lexical analyzer for a simple programming language.
	CO2	Design and implement syntax analyzer using top down or bottom up techniques.
	CO3	Analyze semantic analyzer for a simple programming language.

Course Title with Code	Course Outcomes	
	CO4	Compare different intermediate code generation forms.
	CO5	Analyze machine dependent and independent code optimizer techniques
Computer Networks(A3519)	**CO1**	Distinguish the terminology and concepts of OSI reference model and the TCP/IP reference model and functions of each layer.
	CO2	Experiment the different types of network topologies, protocols, network devices and their functions within a network.
	CO3	Compare the concepts of protocols, network interfaces and design/performance issues in LAN and WAN.
	CO4	Understand and building the skills of sub netting and routing mechanisms, familiarity with basic protocols of computer networks and how they can be used to assist in network design and implementation.
	CO5	Discriminate deficiencies in existing protocols and then go on to formulate new and better protocols.
Open Source Technologies (A3604)	**CO1**	Solve computer software problems by using PHP andMySQL
	CO2	Familiarize and define the programming syntax and constructs of different open source programminglanguages
	CO3	Analyze and implement Scripting applications usingPython.
	CO4	Demonstrate ability to exhibit knowledge of developing applications usingPython
	CO5	Develop scripts using AngularJS andJquery.
E-Commerce (A3605)	**CO1**	Understand the components and roles of the e-commerce environment and basic electronic commerce functions.
	CO2	Analyze E-Commerce payment systems, EFT and EDI.
	CO3	Explain how business sell products and services on the web.
	CO4	Explain how to meet the needs of web site visitors
	CO5	Identify and reach customers on the web.
	CO6	Evaluate web marketing approaches and elements of branding and legal and ethical issues related to E-commerce
Software Engineering (A3514)	**CO1**	Illustrate the right process model to develop the right software system.
	CO2	Choose requirements and analyze them scientifically in order to develop the right product, besides authoring software requirements document.
	CO3	Design as per functional and non-functional requirements using design principles.
	CO4	Evaluate testing strategies for application being developed.
	CO5	Classify right set of umbrella activities for quality management and assurance.
MicroProcessors and Interfacing Lab (A3422)	**CO1**	Describe the interaction between CPU, memory and I/O ports in various applications.
	CO2	Master the assembly level programming language using 8086 instruction set.
	CO3	Analyze how different I/O devices can be interfaced to processor and will explore several techniques of interfacing.
	CO4	Design a simple microprocessor based system with functional requirements for hardware and software components for few input and

Course Title with Code	Course Outcomes	
		output devices.
	CO5	Completed a subsystem and integrate this with a complete system to perform a complex task involving networked, mobile, embedded systems.
Open Source Technologies Labb(A3606)	CO1	Demonstrate an ability to design and develop Web based programs, analyze, and interpret object oriented data and reportresults.
	CO2	Develop confidence for self-education and ability for life-long learning needed for other open source languages and can participate and succeed in competitive examinations like Engineering services, exit interviewsetc.
	CO3	Solve computer software problems by writing customized programs in an efficient way using pythonLanguage
	CO4	Demonstrate an ability to design and develop PHP based novelproducts
	CO5	Exhibit profound knowledge to create, debug, and execute scripting programs using JQuery, AngularJS.
Professional Ethics and Human Values (A3012)	CO1	Develop awareness on ethics and humanvalues.
	CO2	Become morally and sociallyresponsible
	CO3	Find engineering solutions from the ethicalplatform.
	CO4	Motivate others on moralvalues.
Object Oriented Analysis and Design (A3607)	CO1	Choose appropriate modeling concepts principles which can helps users to understand the software system.
	CO2	Demonstrate understanding of ideas to design and develop software systems based on object-oriented thinking.
	CO3	Apply knowledge of object-oriented analysis and design methods with a clear emphasis on UML to model software systems**.**
	CO4	Analyze and explore the conceptual model into various scenarios and applications.
	CO5	Design software systems to meet desired needs of user.
DataWarehousing and Data Mining (A3522)	CO1	Apply preprocessing techniques on various data sets.
	CO2	Develop data warehouse using various schemas for enterprise applications.
	CO3	Apply supervised learning techniques on various data sets.
	CO4	Apply unsupervised techniques on various data type.
	CO5	Analyze various web mining techniques.
Information Security (A3608)	CO1	Analyze the different Security Attacks, Services, and Mechanisms work security models.
	CO2	Apply classical encryption algorithms (Substitution and Transposition ciphers) and DES algorithms to encrypt plaintext.
	CO3	Distinguish the modern Cryptography algorithm such as DES, AES, double DES, Triple DES, RC4 algorithm and analyze modern cryptanalysis techniques.

Course Title with Code	Course Outcomes	
	CO4	Solve the problem on Number theory, public key cryptography techniques (RSA) and key management algorithms (Diffie-Hellman).
	CO5	Compare and contrast message authentication algorithms (SHA-512, MAC, HMAC), symmetric and asymmetric encryption and authentication standards and protocols.
	CO6	Examine the different network security protocols (IPSec, TLS/SSL, SET, S/MIME, PGP) and Firewall types and principles.
Image Processing (A3554)	**CO1**	Know and understand the basics and fundamentals of digital signal and image processing, such as digitization, sampling, quantization, and2D-transforms.
	CO2	Operate on images using the processing techniques of smoothing, sharpening, enhancing, reconstructing geometrical alterations, filtering, restoration, segmentation, features extraction, compression, encoding and color/multichannel.
	CO3	Manipulate images using the computer: reading, writing, printing, and operating onthem.
	CO4	Apply and relate the basic imaging techniques to practical cases, such as, multimedia, videoconferencing, pattern and objectrecognition.
	CO5	Aware of the ethical and legal issues related to image processing, such as, copyright, security, privacy, pornography, electronic distribution,etc.
Python for Machine Learning (A3681)	**CO1**	Explore Machine learning and Python language fundamentals
	CO2	Usage of lists, functions and packages
	CO3	Apply data analysis over various data sets.
	CO4	Develop Basic mathematics, C programming Fundamentals classification and prediction models addressable by python language.
	CO5	Analyze various clustering, text mining techniques
DataWarehousing and Data Mining Lab (A3524)	**CO1**	Develop skills required to work with WEKA and KETTLE Pentaho tools
	CO2	Develop various data transformations and flow controls using Kettle Pentaho tool.
	CO3	Build data Cubes and perform OLAP Operations using Kettle Pentaho tool.
	CO4	Apply various association rule mining and classification Techniques on given datasets and analyze their results.
	CO5	Compare the clustering Techniques on given datasets and analyze their results.
Case Tools Lab (A3609)	**CO1**	Understand the overall concepts of software system by using UML modeling.
	CO2	To Model real time software applications.
	CO3	To develop object-based models in real world projects.
	CO4	Analyze the basic design principles in solving real life problem

Course Title with Code	Course Outcomes	
	CO5	To construct real world system using UML diagrams
Intellectual Property Rights (A3013)	**CO1**	Understand different types of IntellectualProperty
	CO2	List the International organizations and its functions to protect IntellectualProperty
	CO3	Explain in detail about agencies and treaties related to Intellectual Property Rights and importance of Intellectual PropertyRights
	CO4	Explain the Trademark Evaluation, Registration Processes and describe the fundamentals of Copyright Law & patentlaw
	CO5	Explain the New International Developments in Trademarks Law and Copyright Law and PatentLaw
Entrepreneurship Development (A3076)	**CO1**	Understand the role, characteristics, qualities and functions of entrepreneur and use this knowledge to become futureentrepreneurs.
	CO2	Interpret various Institutional support for setting up a business enterprise and apply this knowledge while approaching these institutions for financialsupport.
	CO3	Illustrate role, importance and functions of women entrepreneur and use this knowledge to become future womenentrepreneurs.
	CO4	Infer the concept of Project Management and steps in Project development and analyse while taking future projectassignments.
	CO5	Indicate training programs and different training institutions to impart training and apply this knowledge to train existing and futureentrepreneurs.
Cloud Computing &Big Data (A3610)	**CO1**	Describe the architecture, service, deployment models, and pros and cons of cloud computing, vendors offering cloud services.
	CO2	ehend the technical capabilities and business benefits by accessing cloud and virtualization.
	CO3	Develop application on cloud platform such as Google, Azure, AWS and so on.
	CO4	te open source cloud computing software, and free/commercial cloud services
	CO5	Understand the basic computing environment of BigData, Hadoop distributed file structure and MapReduce and Develop a MapReduce application and run it on locally and clusters
Mobile Application Development (A3611)	**CO1**	Develop mobile applications using android development application tools
	CO2	Design, customize and enhance mobile applications
	CO3	Modify existing mobile apps for better performance
	CO4	Design various mobile applications for real time problems
	CO5	Create effective user interfaces that leverage evolving mobile device capabilities
	CO6	Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship
Software Testing	**CO1**	Understand various basic concepts, test processes, continuous quality improvement, types of errors and fault models.

Course Title with Code	Course Outcomes	
Methodologies (A3612)	CO2	Review various test techniques proposed
	CO3	Analyze different kinds of testing techniques like path testing, transaction flow testing, data flow testing, domain testing, etc their application in different scenarios and their limitations.
	CO4	Assessing the complexity of the testing by using various techniques like regular expression, kv maps, graphs and matrices
	CO5	Demonstrate the usage of testing tools for different types of testing
Design Patterns (A3655)	CO1	Identify the appropriate design patterns to solve object oriented design problems.
	CO2	Develop design solutions using creational patterns.
	CO3	Apply structural patterns to solve design problems.
	CO4	Construct design solutions by using behavioral patterns.
Information Retrieval Systems (A3559)	CO1	1. Understand the functional processes and effectiveness of information storage and retrieval systems.
	CO2	Implement different data structures and indexing techniques for information retrieval systems.
	CO3	Analyze different clustering and visualization techniques to generate classification among the web pages.
	CO4	Apply appropriate user search techniques and text search algorithms for different database systems.
	CO5	Analyze new models based on existing challenges over multimedia web search and modern digital libraries.
Cloud Computing & Big Data Lab (A3613)	CO1	Implement a data center with two hosts using Virtualbox and MapReduce applications
	CO2	Implement cloud Services using Windows Azure, GCP, AWS etc.
	CO3	Write case studies on real time implementation of AmazonEC2, AmazonS3 and windows Azure etc.
	CO4	Evaluate various vendor offerings in the cloud.
Mobile Application Development Lab (A3614)	CO1	Install and configure Android application development tools, Apply Java programming concepts to Android applicationdevelopment
	CO2	Design and develop user Interfaces for the Androidplatform
	CO3	Understand the technical challenges posed by current mobile devices and wireless communications; be able to evaluate and select appropriatesolutions
	CO4	Select and evaluate suitable software tools and APIs for the development of a particular mobile application and understand their strengths, scope andlimitations
	CO5	The students will be able to develop mobile applications with underlying databasesupports
	CO6	Develop and apply current standard-compliant scripting/programming techniques for the successful deployment of mobile applications targeting a variety of android supporteddevices

Course Title with Code	Course Outcomes	
Human Resource Management (A3077)	**CO1**	Understand HR functions effectively and apply this knowledge to manage the employees in the organizations.
	CO2	Explain Job Analysis, Recruitment and Employee Retention practices and strategies and apply this knowledge to hire and retain the right people for the right jobs inorganizations.
	CO3	Indicate different training methods and performance appraisal systems and apply this knowledge to impart appropriate training method as well as appraise the performance of the employees by using different appraisalmethods.
	CO4	Analyze decisions relating to compensation and factors influencing the employeecompensation
	CO5	Apply knowledge on different techniques to resolve industrial disputes in theorganization
Management Science A3014	CO1	Explain and infer the concepts and aspects of management
	CO2	Analyze the different organizational structures, plant layouts, work study tools for enhancement of productivity in an organization.
	CO3	Apply the project management techniques to decide the optimum time and cost for completion of a project.
	CO4	Apply statistical quality control techniques to know quality of product with in control limits
	CO5	Use Human resource management techniques for better people management.
Software Project Management (A3661)	**CO1**	Understand different models for development of the software.
	CO2	Describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
	CO3	Analyze organizational structure and project structure.
	CO4	Implement a project to manage project schedule, expenses and resources with the application of suitable application management tools.
Disaster Management (A3178)	**CO1**	List out different causes of Environmentalhazards.
	CO2	Classify environmental hazards and disasters, Endogenous hazards, exogenous hazards, infrequent events - Cumulative atmospheric hazards /disasters
	CO3	Explain different characteristics ofhazards.
	CO4	Develop Emerging approaches in Disastermanagement

COURSE COUTCOMES FOR 2018 – 2022 BATCH

Course Title with Code	Course Outcomes	
Linear Algebra and Ordinary Differential EquationsA4001	CO1	Solve system of linear equations using rank of a matrix.
	CO2	Examine the nature of Quadratic form using eigen values and eigen vectors.
	CO3	Solve the first and higher order linear differential equations.
	CO4	Make use of differential equations to solve orthogonal trajectories, rate of growth/decay, Newton's law of cooling, Electrical circuits and simple harmonic motion problems.
	CO5	Apply Laplace transforms to solve differential equations.
Engineering Chemistry A4007	CO1	Apply knowledge of three - dimensional arrangements of atoms, molecules and their effects on chemical reactions.
	CO2	Evaluate the behavior, and interactions between matter and energy at both the atomic and molecular levels.
	CO3	Identify differences and similarities of the Batteries.
	CO4	Apply major chemical reactions in the synthesis of various drugs.
	CO5	Make use of different methods for softening hardness of water.
Programming for Problem Solving A4501	CO1	Select right identifiers, data types and operators for effective computation.
	CO2	Write programs using control statements.
	CO3	Write programs demonstrating use of arrays, strings and their applications.
	CO4	Demonstrate the applications of function and recursion.
	CO5	Write programs for simple real life problems using pointers and structures.
Engineering Workshop A4302	CO1	Demonstrate the applications of manufacturing tools & joining process.
	CO2	Produce basic components using workshop trades.
	CO3	Identify and apply the tools for different trades of engineering workshop practice.
	CO4	Recognize the circuit and its operational features in house wiring.
	CO5	Explain the different materials that are used in workshop trades.
Engineering Chemistry Laboratory A4008	CO1	Measure molecular/system properties such as surface tension, viscosity, conductance of solutions and redox potentials.
	CO2	Apply various titrations for the estimation of strengths of solutions and hardness of water.
	CO3	Identify different samples from a mixture by using various separation techniques.
	CO4	Estimate rate constants of reactions from concentration of reactants/products as a function of time.
	CO5	Evaluate the percentage of yield of chemical substances by organic synthesis.
Programming for Problem Solving Laboratory A4502	CO1	Demonstrating use of control statements, arrays and strings.
	CO2	Demonstrating use of functions and recursive functions.
	CO3	Design and implement C programs for simple real life problems using pointers and structures.
	CO4	Debug erroneous programs related to the course.

Course Title with Code	Course Outcomes	
Social Innovation A4021	CO1	Develop awareness on social issues faced by local regions.
	CO2	Interpret and classify societal issues as simple, complicated and complex problems.
	CO3	Identify the core problems, its main causes and effects, and propose a novel idea
Advanced Calculas A4002	CO1	Evaluate improper integrals and examine the extremum of a function of several variables.
	CO2	Make use of multiple integrals to find the area and volume of a solid.
	CO3	Determine scalar potential function for irrotational force fields.
	CO4	Evaluate line, surface and volume integrals using vector integral theorems.
	CO5	Develop Fourier series and Fourier transforms of a function
Semiconductor Physics A4003	CO1	Apply knowledge of three - dimensional arrangements of atoms, molecules and their effects on chemical reactions.
	CO2	Evaluate the behavior, and interactions between matter and energy at both the atomic and molecular levels.
	CO3	Identify differences and similarities of the Batteries.
	CO4	Apply major chemical reactions in the synthesis of various drugs.
	CO5	Make use of different methods for softening hardness of water.
Basic Electrical Engineering A4201	CO1	Apply the network reduction techniques and Knowledge of Alternating quantities to calculate Current, Voltage and Power for complex circuits.
	CO2	Analyze electrical Circuits using Nodal Analysis ,Mesh analysis and Network theorems
	CO3	Study and Analyze the different types of DC Machines, Transformers.
	CO4	Test the performance of DC Generator, DC Motor, transformer and Induction Motor.
	CO5	Apply the knowledge of protection devices during electrical Installations.
Functional English A4009	CO1	Demonstrate an understanding of the significance of humanity, love and service to mankind
	CO2	Utilize appropriate vocabulary in the given contexts.
	CO3	Build competence in grammar.
	CO4	Develop effective academic reading skills.
	CO5	Develop effective academic writing skills.
Engineering Graphics &Computer Aided Drafting A4301	CO1	Construct various types of scales and curves commonly used in engineering practice.
	CO2	Distinguish between first, second, third and fourth angle projections of systems.
	CO3	Estimate sheet metal requirement for making regular solids.
	CO4	Compare isometric and orthographic views of an object.
	CO5	Select CAD tools for modelling regular solids
Semiconductor Physics Laboratory A4004	CO1	Determination of Planck's constant and work function of a metal.
	CO2	Evaluation of band gap of a semiconductor and understand the temperature dependence function of resistivity.
	CO3	Analyze the diode characteristics.

Course Title with Code	Course Outcomes	
	CO4	Analyze the I-V characteristics of solar cell and LED.
	CO5	Apply the principles of laser light and estimate the losses in the propagation of light in optical fibers.
Basic Electrical Engineering Laboratory A4202	CO1	Verify Ohms law, Kirchhoff laws and Impedance & Current of Series RL, RC and RLC Circuits.
	CO2	Analyze the transient response of Series RL, RC and RLC series circuits.
	CO3	Calculate the Voltage, Current Real power in a single phase Transformer.
	CO4	Test the performance of DC Motor, 1- phase transformer, Alternator and 3 phase Induction Motor.
English Language Communication Skills Laboratory A4010	CO1	Improve his/her pronunciation.
	CO2	Take part in role-plays and perform effectively in real-life situations.
	CO3	Choose appropriate words and phrases to make effective telephonic conversations.
	CO4	Minimize stage fear and make effective presentations.
	CO5	Build sustained conversations.
Engineering Exploration A4022	CO1	Identify multi-disciplinary approach required in solving an engineering problem.
	CO2	Analyze a given problem using process of engineering problem analysis as an engineer/problem solver.
	CO3	Relate basics of engineering project management skills in doing projects.
	CO4	Make use of ethical and sustainability perspectives to propose best engineering solutions.
	CO5	Develop simple systems of basic need of society using engineering design process.

VARDHAMAN COLLEGE OF ENGINEERING

Shamshabad-501218, Hyderabad
(Approved by AICTE, Affiliated to JNTUH and Accredited by NBA)

Department of Mechanical Engineering

List of POs, PSOs and COs

Programme Outcomes (POs):

Engineering Graduates will be able to:

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Objectives (PSOs):

PSO1
Demonstrate knowledge in the area of design, analysis and fabrication of mechanical systems.

PSO2
Apply learned concepts and management skills to associate professionally in industry or as an entrepreneur.

Course Outcomes (COs):

I – SEMESTER	
Course Name (Code)	**Course Outcomes**
Mathematics – I (3001)	1. Solve the first and higher order linear differential equations. 2. Apply differential equations to solve orthogonal trajectories, rate of growth/decay, Newton's law of cooling, Electrical circuits and simple harmonic motion problems. 3. Examine extremum of a function of several variables and evaluate the multiple integrals. 4. Apply Laplace transforms to solve differential equations. 5. Evaluate line, surface and volume integrals using vector integral theorems
Engineering Physics (A3002)	1. Analyze crystal structures in terms of lattice parameters and interpret the structures using X-ray diffraction methods. 2. Apply the principles of quantum mechanics to analyze the properties of the semiconducting materials. 3. Categorize nano and dielectric materials. Discuss synthesis and react to environmental concerns due to nanotechnology. 4. Categorize magnetic materials and objective their role in science and technology. Apply magnetism to explain superconductivity. 5. Illustrate working of a laser and examine the communication systems using optical fibers.
Engineering Chemistry (A3003)	1. Apply the knowledge of standard electrode potentials of various metals and nonmetals to protect them from corrosion. 2. Identify difference and similarities of three types of Batteries. 3. Compare different methods of softening of hard water. 4. Apply the knowledge of Materials, Fuels and Nano particles in controlling pollution. 5. Compare and contrast the chemical behavior, properties and applications of engineering substances.

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Shamshabad-501218, Hyderabad

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Department of Mechanical Engineering

Engineering Mechanics-I (A3301)	1. Apply the laws of mechanics and evaluate the resultant force. 2. Construct free body diagrams and solve the problems using equations of equilibrium. 3. Analyze the frictional forces to maintain the equilibrium of system. 4. Identify the centroid and centre of gravity of a body by using principle of moments. 5. Determine the area moment of inertia and mass moment of inertia of a body.
Computer Programming (A3501)	1. Write algorithm and draw corresponding flowchart for simple problems besides explaining functions of computer components 2. Select the right identifiers, data types and operators for effective computation. 3. Write programs, demonstrating use of control statements, arrays and strings. 4. Demonstrate use of functions and pointers by writing programs. 5. Write programs for simple real life problems using structures and unions.
Engineering Physics and Engineering Chemistry Lab (A3007)	1. Analyze the rigidity modulus of the given material to interpret the mechanical properties. 2. Estimate the frequency of AC power supply and time constant of a R-C circuit. 3. Apply the principles of optics to evaluate the characteristics of LED, laser and optical fibres. 4. Analyze the strength of a solution by conductometric and potentiometric titrations. 5. Estimate the hardness of water. 6. Determine the surface tension and viscosity of liquids. 7. Synthesize an organic compound-Aspirin.
Engineering Drawing-I (A3302)	1. Construct various types of scales for the design of maps and models. 2. Represent the objects using various types of lines and dimensioning rules. 3. Apply the knowledge of geometry and engineering curves for constructions. 4. Analyze the objects such as points, lines and regular planes held in different orientations using conventional drawing and CAD tools. 5. Visualize the solids held in different orientations using conventional drawings and CAD tools.
Computer Programming Through C Lab (A3502)	1. Implement programs by selecting the right identifiers, data types and operators for effective computation. 2. Implement programs, demonstrating use of control statements, arrays and strings. 3. Implement programs, demonstrating use of functions and pointers. 4. Implement C programs for simple real life problems using structures and unions. 5. Implement programs illustrating use of files. 6. Debug erroneous programs related to the course.

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II – SEMESTER	
Mathematics – II (A3006)	1. Solve system of linear equations using rank of a matrix. 2. Examine the nature of the Quadratic form by eigen values and eigen vectors.3 3. Classify and solve Partial differential equations. 4. Develop Fourier series and Fourier transforms of a function. 5. Apply Z-Transforms to solve difference equations.
Technical English (A3005)	1. Develop an understanding of the significance of humanity, love and service to mankind and be involved in community service 2. Perceive the importance of technological impact on society and plan for the technological advancement 3. Apply the rules of Grammar effectively (articles, prepositions, concord, tenses etc.) in writing reports, technical articles, essays and in day- to-day conversations 4. Build creativity for career planning and entrepreneurship 5. Develop effective written communication skills in academic writing
Probability Theory and Numerical Methods (A3004)	1. Solve real world problems using the theory of probability. 2. Identify the types of random variables involved in a given problem and calculate relevant probabilities. 3. Develop appropriate Numerical methods to approximate a function. 4. Apply of Numerical differentiation and integration in solving problems of engineering. 5. Apply appropriate method to find numerical solution of a differential equation.
Basic Electronics (A3402)	1. Analyze the physical behavior of diodes and transistors. 2. Compare various rectifiers, filters, transistors, biasing circuits and transistor amplifier configurations. 3. Analyze single stage amplifier circuits using small signal low frequency transistor model. 4. Distinguish between the concepts of negative and positive feedback in amplifiers and analyze various feedback amplifiers and oscillator circuits. 5. Apply the knowledge of number systems and Boolean algebra in minimizing Boolean functions and realizing logic gates.
Engineering Mechanics-II (A3303)	1. Use the basic concepts of kinematics, laws to solve engineering problems. 2. Analyze rectilinear and curvilinear motion of particles and rigid bodies. 3. Solve the dynamics problems by using work-energy principle. 4. Apply the Impulse-momentum principles and solve the problems. 5. Determine the natural frequency of the system using simple harmonic motion principles.
English Language Communication Skills Lab (A3008)	1. Improve their pronunciation using the rules of Phonetics. 2. Take part in role-plays and interviews to perform effectively in real life situations. 3. Choose appropriate words and phrases to make the telephonic conversation conveying the meaning with etiquettes.

	4. Minimize the stage fear and make presentations with proper body language. 5. Adapt the art of debating and group discussion to present their view point convincingly.
Engineering Drawing-II (A3304)	1. Develop the lateral surface of regular solids. 2. Imagine the sectional views and curves of intersections of regular solids. 3. Analyze isometric projections of objects such as regular planes and solids using conventional drawing and CAD tools. 4. Convert isometric views to orthographic views & vice versa. 5. Visualize the perspective projections of regular planes and solids using conventional drawing and CAD tools.
Engineering Workshop (A3305)	1. Identify the tools and equipment utilized in workshop. 2. Choose the required trade for the suitable operations. 3. Make the Wooden joints, MS fittings, house wiring, sheet metal components and simple forgings. 4. Explain the working of Arc Welding and Plumbing operations, uses of power tools and installation of Software in the computer systems. 5. Prepare the documents, data sheets and power point slides by using the Microsoft office tools.
III – SEMESTER	
Mechanics of Solids (A3307)	1. Explain the basics of material properties, concepts of stress-strain relationships for homogenous, isotropic materials. 2. Design and analyze structural members and machine parts under axial load, shear load, bending moment and torsional moment. 3. Determine the deflections and deformations of loaded flexural members. 4. Calculate stresses and strains associated with thin-wall spherical and cylindrical pressure vessels. 5. Build the necessary theoretical background for further structural analysis and design courses.
Mechanics of Fluids (A3308)	1. Explain the fundamental aspects of fluid statics, kinematics and dynamics. 2. Compare types of fluids, fluid flows, pressure and flow measuring devices, losses in pipes, laminar and turbulent boundary layer concepts. 3. Solve problems by applying the principles of mass, momentum and energy conservation. 4. Analyze flow through pipes and pipe fittings, nozzles, drag and lift on submerged bodies, propagation of pressure waves. 5. Determine the specifications of pressure and flow measuring devices, piping, nozzles and submerged bodies
Thermodynamics (A3309)	1. Explain the properties and basic concepts of thermodynamics. 2. Develop the general energy equations for thermal systems by laws of thermodynamics. 3. Solve heat and work transfer for different thermodynamic processes. 4. Evaluate the performance of power cycles and refrigeration cycles. 5. Determine the properties of pure substance in various regions using steam tables.
Metallurgy & Material Science (A3310)	1. Explain the basic principles of materials. 2. Identify the phases and interrelationship between structure and properties. 3. Construct phase diagram of alloy systems. 4. Apply basic principles for selection of materials. 5. Characterize materials based on structure.

Electrical Technology (A3206)	1. Understand the basic principles of electrical circuit analysis. 2. Apply the basic knowledge of electrical circuit analysis to find the response in any branch of network using network theorems. 3. Apply the basic knowledge of DC Machines in finding their performance. 4. Apply the basic knowledge of AC Machines in finding their performance. 5. Develop the equivalent circuit and draw the phasor diagrams of AC machines for different types of loads.
Machine Drawing (A3311)	1. Identify the national and international standards pertaining to machine drawing. 2. Illustrate various machine components through drawings as per ISO standards. 3. Draw machine components by applying the principles of engineering drawing. 4. Compare part drawings and assembly drawings. 5. Prepare assembly drawings by applying drawing conventions.
Mechanics of Solids & Metallurgy Lab (A3312)	1. Apply methods to determine mechanical properties and elastic constants. 2. Estimate compressive strength of wood/concrete/brick materials. 3. Determine slope and deflection of beams. 4. Characterize the microstructures of different ferrous and non-ferrous metals. 5. Identify the effect of heat treatment and cooling rates on the properties of steels.
Electrical and Electronics Engineering Lab (A3209)	1. Analyze basic electrical Circuits in calculation of electrical parameters. 2. Analyze different circuits in application of mesh and Nodal analysis. 3. Able to conduct experiments on D.C. Generators and Dc Motors and plot the charecteristics. 4. Differentiate various speed control techniques that are used for dc shunt motors. 5. Analyze the tests of a single phase transformer and discuss about the operating conditions of a transformer.
Gender Sensitization (A3021)	1. Build the significance of the process of socialization and relationships between men and women on the basis of a just and equal world. 2. Examine the decline of female sex ratio and discrimination faced by people with different gender identities. 3. Take part in house work, in order to allow for equality and share equal family spaces. 4. Estimate women's contribution to the nation's economy. 5. Analyze the consequences of sexual violence and importance of consent in friendship and other relationships. 6. Perceive the invisibility of women in history and show how locating a women in history makes them
IV – SEMESTER	
Environmental Science (A3010)	1. Identify the important components of environment 2. Identify global environmental problems and come out with best possible solutions. 3. Apply environmental laws for the protection of forest and wildlife. 4. Apply the knowledge of Environmental ethics to maintain harmonious relation between nature and human being. 5. Illustrate the major environmental effects of exploiting natural resources.

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Managerial Economics and Financial Analysis (A3011)	1. Explain and infer the concepts of Managerial Economics and Financial Accounting 2. Analyze the demand, production, cost and break even to know interrelationship of among variables and their impact 3. Classify the market structure to decide the fixation of suitable price. 4. Apply capital budgeting techniques to select best investment opportunity. 5. Prepare financial statements and analyze them to assess financial health of business
Thermal Engineering – I (A3314)	1. Compare air standard cycles with actual and fuel air cycles. 2. Analyze combustion phenomenon in SI and CI engines. 3. Explain the performance parameters of internal combustion engines and compressors. 4. Solve the problems related to IC engines and compressors. 5. Evaluate the performance parameters of internal combustion engines and compressors.
Production Technology – I (A3315)	1. Understand various manufacturing operations, including their capabilities, limitations, and applications. 2. Analyze products and be able to improve their manufacturability and to reduce their costs. 3. Analyze the thermal, metallurgical aspects during solidification in casting and welding and their role on quality of cast or weld objects. 4. Design the gating and riser system needed for defect free casting. 5. Apply knowledge on selection of suitable manufacturing process for the typical component.
Hydraulic Machines (A3316)	1. Explain the basic concepts and working of hydraulic turbines, pumps and systems. 2. Classify the hydraulic turbines and pumps. 3. Solve problems of impact of jet on vanes using impulse momentum equation. 4. Analyze the performance of vanes, turbines and pumps. 5. Evaluate the design parameters of hydraulic turbines and pumps.
Kinematics of Machinery (A3317)	1. Explain the principles of kinematic pairs, chains and their classification, degrees of freedom, inversions and planar mechanisms. 2. Analyze the planar mechanisms for position, velocity and acceleration. 3. Synthesize planar four bar and slider crank mechanisms for specified kinematic conditions. 4. Evaluate gear tooth geometry and select appropriate gears for the required applications. 5. Design cams and followers for specified motion profiles.
Fluid Mechanics and Hydraulic Machinery Lab (A3318)	1. Demonstrate the working of flow meters and hydraulic machines. 2. Evaluate the discharge and co-efficient of discharge of flow meters. 3. Identify the type of flow through a pipe. 4. Estimate the major and minor loss of flow through pipes. 5. Determine the performance parameters of vanes, hydraulic turbines and pumps.

Production Technology Lab (A3326)	1. Determine mould sand properties. 2. Prepare pattern for casting processes. 3. Apply various casting and welding techniques. 4. Perform different sheet metal operations. 5. Prepare plastic moulding technique.
V – SEMESTER	
Dynamics of Machinery (A3319)	1. Determine the value of gyroscopic couple and explain the effect of gyroscopic couple on all rotating bodies. 2. Apply the laws of friction and laws of motion to determine the power lost in brakes, clutches, pivots and calculate the forces developed in governors and torque developed in machine bodies. 3. Minimize the vibrations developed in engines due to unbalanced masses by balancing the rotating and reciprocating masses. 4. Determine the frequency of vibrations in different types of beams by using the concept of Simple harmonic Motion. 5. Discuss effectively on dynamics of machinery and work as a team for solving problems on reducing the effect of unwanted effect of forces developed in engines.
Production Technology – II (A3320)	1. Apply the knowledge of cutting tool geometry, mechanism of chip formation and mechanics of orthogonal cutting. 2. Evaluate the tool life and cutting forces by using Taylor's tool life equation and Merchant circle diagram. 3. Explain the features, working principles and applications of lathe, shaper, planer, slotter, milling, drilling, grinding and broaching machines. 4. Analyze the various surface finishing operations like lapping honing and grinding. 5. Classify the various jigs, fixtures and clamping devices used in machining.
Thermal Engineering – II (A3321)	1. Explain the working principles of components of steam, gas turbine power plants and different jet propulsion systems. 2. Sketch various property diagrams and plot the cycle diagrams for steam, gas turbines and jet propulsion systems. 3. Derive the efficiency, property relations for Steam, Gas turbines and jet propulsion systems. 4. Solve problems of steam, gas turbines and jet propulsion systems. 5. Analyze the thermodynamic aspects of steam, gas turbines and jet propulsion systems.
Design of Machine Members – I (A3322)	1. Explain the fundamental concepts of design for various design elements such as shafts, couplings, rivets, welded and bolted joints. 2. Apply theories of failure and fatigue failure criteria for the design of mechanical components. 3. Design of riveted, welded and bolted joints for various loading conditions. 4. Determine the dimensions of shaft with different geometrical features under various loading conditions. 5. Design shaft couplings for various operating conditions.

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Operations Research (A3333)	1. Explain the Operations Research features, models, applications and methods such as linear programming, transportation, sequencing, assignment, replacement, games theory and dynamic programming. 2. Build mathematical models for finding optimum solutions for various real world problems and case studies. 3. Evaluate various alternatives available to aid in effective decision making. 4. Choose the best strategies to maximize the profit in the presence of a competitor. 5. Devise operating policies for the efficient and effective management of men, materials and machines in inventory, production, distribution and service systems.
Instrumentation and Control Systems (A3323)	1. Identify the basic functional elements of a generalized measuring system, errors occurring in instrumentation and its remedial measures. 2. Categorize the mechanical, electrical and optical measuring instruments. 3. Apply skills in instrumentation, measurement and signal processing through vibration testing for several physical and mechanical systems. 4. Measure displacement, pressure, temperature, speed, flow, liquid level, stress, strain, humidity etc. 5. Apply of control systems for various applications.
Thermal Engineering & Fuels Lab (A3324)	1. Compare the performance of SI and CI engines. 2. Determine the performance parameters of internal combustion engines and compressor. 3. Analyze an engine under different loading conditions to calculate brake power, indicated power, friction power and efficiencies. 4. Find the properties of different fuels and lubricants. 5. Draw the valve and port timing diagrams of two stroke and four stroke engines.
Theory of Machines Lab (A3325)	1. Examine the active and reactive couple based on the principle of angular momentum using gyroscope. 2. Apply the force couple polygon method for balancing the reciprocating and rotating mass systems. 3. Calculate the moment of inertia of various suspension and rotor systems. 4. Analyze the centrifugal forces in governors. 5. Determine the critical speed of shafts.
Professional Ethics and Human Values (A3012)	1. Adapt engineering ethics to overcome various moral dilemmas after choosing engineering as profession. 2. Develop awareness on different human values, such as love, empathy, honesty, etc. to lead a successful life. 3. Know the responsibilities of the engineer towards the society. 4. List out and practice the safety procedures to avert the risks at work place. 5. Determine various roles of engineer and help them to make the world a better place.

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VI – SEMESTER	
Design of Machine Members – II (A3327)	1. Classify different types of bearings, IC engine parts, and power transmission elements and springs related terminology. 2. Deduct the equations for stress in bearings, IC engine parts and power transmission elements for different operating conditions. 3. Estimate load carrying capacity of bearings, IC engine parts, power transmissions parts and springs. 4. Select the suitable bearing, power transmission elements and springs for different application. 5. Design bearings , IC engine parts, power transmission elements and springs
Heat Transfer (A3328)	1. Apply the principles of conduction, convection and radiation heat transfer to analyze natural phenomena. 2. Determine thermal resistance for conduction, convection and radiation heat transfer using fundamental relationships and correlations. 3. Analyze and apply empirical correlations in connection with convection, boiling and condensation. 4. Design and analyze the performance of heat exchangers and evaporators. 5. Examine blackbody and gray surface radiation, and evaluate radiation exchange between surfaces.
Metrology and Surface Engineering (A3330)	1. Apply the knowledge of limits, fits and tolerance for interchangeability and selective assembly. 2. Measure the length, angles and other physical geometrical characteristics using various instruments, tools and techniques. 3. Use various measuring instruments such as Talysurf, comparators, toolmakers microscope, profile thread gauges, slip gauges, sine bars etc. 4. Determine the flatness and roughness of surface using various methods and tools. 5. Conduct alignment tests on machine tools such as lathe, milling and drilling machine.
Professional Elective – I	
Automobile Engineering (A3351)	1. Explain the working components of four wheeler automobile 2. Classify the different ignition systems used in automobiles. 3. Differentiate various types of automobile Transmission. 4. Elaborate the requirements of fuel injection systems used in automobiles. 5. Discuss the steering control mechanism used in automobiles.
Advanced Strength of Materials (A3352)	1. Remember the concepts of mechanics of solids and analyze the responses of structures (shear centre, curved beam, unsymmetrical bending) at different loading conditions. 2. Analyze the theory of elasticity and its application to plane stress and strain problems. 3. Examine the torsion problems with linear elastic solution of non-circular cross section with different analogies. 4. Explain the responses of structures on elastic foundation at various end conditions with different loading scenarios. 5. Analyze the influences of contact stress induced in structures.

Welding Technology (A3353)	1. Explain different types of welding processes and the principles guiding the operations. 2. Analyze the causes of welding defects and their prevention. 3. Select welding parameters to obtain desired mechanical properties of welded joints. 4. Describe arc welding and resistance welding processes. 5. Identify the welding equipment needed for different applications.
Manufacturing of Composite Materials (A3354)	1. Explain various types of composite materials. 2. Compare the characteristics of composite materials. 3. Select the production processes for various composite materials. 4. Evaluate the strength of composite materials. 5. Recommend materials for advanced applications.
Professional Elective – II	
Power Plant Engineering (A3355)	1. Classify conventional and non-conventional power plants. 2. Explain the classification, working principle, components and auxiliaries, merits and limitations of various power plants. 3. Illustrate the layouts of conventional power plants with schematics. 4. Solve problems by considering economic and environmental aspects. 5. Analyze the performance of Diesel and Gas turbine power plants.
Unconventional Manufacturing Processes (A3356)	1. Significance of the modern machining processes 2. Understand the latest machining technologies. 3. Knowledge of metal removal mechanism for various machining techniques. 4. Selection of machining process for various work materials 5. Apply suitable machining process for the typical component.
Nano Technology (A3301)	1. Explain the features of nanomaterials and nanotechnology. 2. Identify the techniques for nanoparticle fabrication. 3. Categorize the operations for making the nanocomponents. 4. Evaluate the parameters applicable to complex problems in manufacturing process. 5. Compare the various tools and techniques to optimize the systems.
Production Planning and Control (A3358)	1. Explain various elements of production, planning and control (PPC) and the role of computers in PPC. 2. Estimate the demand for products using forecasting techniques. 3. Determine operating policies for inventory control systems to manage inventories efficiently and effectively using the techniques such as ABC analysis, VED analysis, MRP, ERP, JIT etc. 4. Devise procedures and strategies for various functions of PPC such as aggregate planning, routing, scheduling, dispatching, and follow-up. 5. Apply line balancing techniques for the efficient management of assembly lines.
Heat Transfer Lab (A3331)	1. Determine the thermal conductivity of a given material. 2. Estimate the performance of heat exchangers and fins. 3. Determine the heat transfer coefficient in convection process. 4. Compare heat pipe performance with other pipes. 5. Determine the emissivity of a given material.

Metrology & Machine Tools Lab (A3332)	1. Demonstrate the working principle and parts of different machine tools used in machine shop. 2. Apply the procedures to measure length, width, depth, bore diameters, internal and external tapers, tool angles, and surface roughness by using different instruments. 3. Inspect machine tools whether properly aligned or not. 4. Measure effective diameter of thread profile using different methods. 5. Create stepped surface using shaper and keyways using milling machine, perform different turning operations.
Intellectual Property Rights (A3013)	1. Enumerate the basics of the four primary forms of intellectual property rights. 2. Infer the basic principles and sources of intellectual property rights as well as examine how these have changed and are changing as a result of globalization. 3. Explain the different forms of intellectual property protection in terms of their key differences and similarities. 4. Sketch the process to acquire different intellectual property rights i.e., trademarks, copy rights, patents, and trade secrets. 5. Examine the new developments in IPR.
VII – SEMESTER	
Finite Element Methods (A3329)	1. Choose the type of analysis to solve the given problem. 2. Develop shape functions for 1D, 2D and 3D elements. 3. Model the given physical problem to mathematical form. 4. Analyze deformation of elements as per boundary and loading conditions. 5. Determine the stresses, strains and reaction forces in the element applying finite element methods.
Computer Aided Design and Manufacturing (A3334)	1. Explain various elements of computers, computer graphics, product cycle in manufacturing industry, drafting and modeling systems. 2. Model various synthetic curves and surfaces. 3. Develop NC part programming, group technology and computer aided process planning. 4. Perceive quality using computer aided quality control techniques. 5. Apply computer integrated manufacturing systems in industries.
Management Science (A3014)	1. Apply the concepts & principles of management in industry. 2. Design & develop organization structure for an enterprise. 3. Apply Quality Control techniques and Work-study principles in industry. 4. Handle purchase process and can determine Economic Order Quantity. 5. Apply the concepts of HRM in Recruitment, Selection and Training & Development. 6. Develop PERT/CPM Charts for projects of an enterprise and estimate time & cost of project.
Professional Elective – III	
Renewable Energy Systems (A3359)	1. Illustrate various renewable energy technologies and systems. 2. Identify various forms of renewable energy sources by imparting the knowledge of storage technologies. 3. Apply the knowledge and understanding of various possible mechanisms to develop renewable energy projects.

	4. Explain the performance characteristics of renewable energy sources and policies associated with energy sources. 5. Evaluate the techno economic analysis of renewable energy systems and conduct life cycle analysis of renewable sources.
Design of Production Tooling (A3360)	1. Interpret the geometrical and dimensional details of a production drawing. 2. Classify the various jigs, fixtures and clamping devices used during machining. 3. Identify various tools for the different machining processes. 4. Design single point and multipoint cutting tools. 5. Understand theory of deformation, stages of cutting operation.
NDT Techniques (A3361)	1. Explain the operation of various NDT equipment used for inspection of metals and non metals. 2. Apply scientific and technical knowledge to the field of non destructive testing. 3. Adapt the relevant non destructive testing method for various engineering practice. 4. Conduct the experiments and validate the report. 5. Test the product quality and manufacturing defects using emerging technologies.
Materials for High Temperature Applications (A3362)	1. Explain the property requirements of high temperature materials. 2. Interpret the condition of use in order to select the correct material for specific application. 3. Choose the appropriate manufacturing process of high temperature materials. 4. Correlate high temperature material properties with application. 5. Evaluate and recommend material for advanced applications.
Gas Dynamics and Jet Propulsion (A3363)	1. Explain the basic concepts and property variations of a flow through ducts. 2. Determine the performance of different jet propulsion systems. 3. Develop governing equations of normal and oblique shocks that encounter in jet propulsion systems. 4. Solve problems of different jet propulsion systems. 5. Assess functioning, merits and demerits of different jet propulsion systems.
Professional Elective – IV	
Computer Aided Design and Manufacturing Lab (A3335)	1. Model machine components using Computer Aided Design software. 2. Identify parametric modeling techniques to reflect engineering requirements. 3. Simulate the static, dynamic and thermal analysis of the components as per the boundary conditions. 4. Operate CNC machine to produce machine components. 5. Build the NC part program as per the geometry of component.
Robotics (A3365)	1. Explain the basic concepts and components of a robotic system. 2. Compute the forward and inverse kinematics of robots. 3. Utilize the key concepts of programming and program the robot path with obstacle avoidance. 4. Identify the use of actuators and sensors for robot mobility system. 5. Interpret the various applications of robots in Modern Manufacturing Systems.

Production Drawing Practice and Instrumentation lab (A3336)	1. Choose suitable fits and associated tolerance for machine elements. 2. Develop detailed part drawings from assembly drawings of machine components. 3. Calibrate pressure, temperature, strain, speed, and angle by measuring instruments. 4. Justify the appropriate device for the measurement of parameters like temperature, pressure, speed, strain etc. 5. Represent materials, screw joints, welded joints, and gears conventionally.
Mini Project (A3338)	1. Demonstrate presentation and communication skills. 2. Compare the theoretical approach with the practical approach in the industry. 3. Identify the gaps, issues and directions for future applications. 4. Develop problem solving skills and industrial expertise in specific domain. 5. Conclude the idea of expertise in the industry in the form of presentation and documentation.
VIII – SEMESTER	
Refrigeration and Air Conditioning (A3337)	1. Explain the basic concepts and working of various refrigeration and air-conditioning systems. 2. Compare the performance of different refrigeration and air conditioning systems. 3. Solve problems of different refrigeration and air conditioning systems. 4. Assess merits and demerits of different refrigeration and air conditioning systems. 5. Classify the refrigerants based on environmental considerations.
Professional Elective – V	
Computational Fluid Dynamics (A3367)	1. Identify the governing differential equations and apply the boundary conditions for fluid dynamics problems. 2. Explain discretization techniques and error analysis for stability. 3. Apply general transformation equations for grid generations. 4. Develop algorithms for flow field analysis. 5. Analyze turbulence models for different Reynolds numbers.
Vibrations and Structural Dynamics (A3368)	1. Formulate the mathematical models and develop the equation of motion of vibrating systems by different principles. 2. Advance the essential information, skills and competencies to evaluate and resolve vibration problems across a wide range of applications. 3. Articulate the basic concepts of mechanical vibrations and justify their application in a variety of engineering design contexts. 4. Discuss the influences of factors on the dynamic behavior of structures. 5. Analyze the structures and machines by considering the economic, industry, human and environment.
Micro Electro Mechanical Systems (A3369)	1. Identify the governing differential equations and apply the boundary conditions for fluid dynamics problems. 2. Explain discretization techniques and error analysis for stability. 3. Apply general transformation equations for grid generations. 4. Develop algorithms for flow field analysis. 5. Analyze turbulence models for different Reynolds numbers.

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Mechatronics (A3370)	1. Describe the precision actuation systems, signal conditioning, electro mechanical drives and electronic interface systems. 2. Analyze the precision actuation systems, signal conditioning, electro mechanical drives and electronic interface systems. 3. Analyze the performance of devices using microcontrollers. 4. Develop the mechanical systems using the micro controllers and programmable logic controllers 5. Design a system, component, or process to meet desired needs within realistic constraints
Technical Seminar (A3339)	1. Demonstrate presentation and communication skills. 2. Compare old technology with emerging technology. 3. Identify the gaps, issues and direction for future Research. 4. Develop problem solving skills 5. Conclude the presentation of ideas/procedures for validity.
Project Work (A3340)	1. Demonstrate a sound technical knowledge of their selected project topic. 2. Apply critical and creative thinking in the design of engineering projects. 3. Identify the key elements of professional codes of ethics as well as the ethical and societal issues related to the disciplines and their impact on society and the world. 4. Develop creative solutions to problems and conceive innovative approaches in developing and designing of mechanical systems. 5. Conclude the project outlining the approach and expected results using good oral and written presentation skills.

HOD, Mechanical Engineering

HEAD
MECHANICAL ENGINEERING DEPT.
Vardhaman College of Engineering
Shamshabad (Md), R.R. Dist - 501 218

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

Autonomous institute affiliated to JNTUH

DEPARTMENT OF MANAGEMENT STUDIES

COURSE COUTCOMES FOR 2015 – 2017 BATCH

Course Title with Code	Course Outcomes	
Management Fundamentals C3001	CO1	Explain the concepts of management and organisational behaviour.
	CO2	Analyze the evolution of management and contributions of Management thinkers.
	CO3	Apply the relevance of planning and control to take decisions in the organisation.
	CO4	Examine the relevance of organizing and different structure of the organisation.
	CO5	Identify the theories of leadership and motivation to lead people to attain the organisation goals.
Research Methodology & Statistical Analysis C3002	CO1	Explain and evaluate various measures of central tendency and measures of dispersion.
	CO2	Evaluate and interpret the nature of skewness and kurtosis.
	CO3	Inspect scientific hypothesis and theories.
	CO4	Calculate correlation, regression and rank correlation coefficients.
	CO5	Construct and evaluate time series models as well as interpret indexes to identify trends in a data set.
Managerial Economics C3003	CO1	Explain the concepts of Managerial Economics.
	CO2	Analyze managerial economics concepts and demand and supply related issues.
	CO3	Analyze interrelationship among production and cost variables and their impact.
	CO4	Examine the market structure and break even to decide the fixation of suitable price.
	CO5	Analyze the impact of macroeconomic variables on business.
Financial Accounting and Analysis C3004	CO1	Explain the concepts of financial accounting.
	CO2	Apply accounting principles & process for preparation of financial accounting.
	CO3	Apply valuation methods for inventory & fixed assets to calculate closing value.
	CO4	Examine the procedure followed to issue of shares and debentures.
	CO5	Analyze financial statements and accounting standards to assess financial health of business.
Business Law & Regulations C3005	CO1	Understand and identify the documents required for incorporation of the company.
	CO2	Demonstrate the rules regarding negotiable instruments for exchange of goods and services.
	CO3	Analyze and evaluate the management of company affairs.
	CO4	Analyze and interpret the legal course of action through case laws in the interest of business.
	CO5	Analyze and apply law for unfair trade practices to avoid legal actions.
	CO6	Analyze and compute the tax liability of assessee

Course Title with Code	Course Outcomes	
Business Environment C3006	CO1	Enhance their cognitive knowledge about Indian business environment.s
	CO2	Explain the effects of government policy on the economic environment and Indian industry.
	CO3	Elucidate SEBI and its role in investor protection
	CO4	Describe global trade agreements and economic organizations that regulate and promote global trade
	CO5	Knowledge of union budget, fiscal and monetary policies of the government.
Financial Management C3009	CO1	Explain the concepts of financial management.
	CO2	Examine the overall role and importance of the finance function.
	CO3	Apply cost of capital and capital budgeting techniques to select best investment opportunity.
	CO4	Analyze the capital structures and divided decisions for better performance of organisation.
	CO5	Analyze the working capital and current assets management for maintaining good liquidity position of the business.
Marketing Management C3010	CO1	Understand fundamental marketing concepts, theories and principles in areas of marketing policy; of market and consumer behaviour.
	CO2	Formulate a marketing plan including marketing objectives, marketing mix, strategies, budgetary considerations and evaluation criteria.
	CO3	Determine strategies for developing new products and services that are consistent with evolving market needs.
	CO4	Gathering marketing information persuasively and accurately.
	CO5	Apply the knowledge, concepts, tools necessary to understand challenges and issues of marketing in a growing international and global context.
Human Resource Management C3011	CO1	Explain the concepts and objectives of HRM.
	CO2	Summarise the process for recruitment, selection and human resource planning.
	CO3	Analyse the performance appraisals and identifying the needs of training and development.
	CO4	Apply the compensation factors in job evaluations.
	CO5	Examine the organisational climate, workers participation and quality embedded with the workers and work.
Organizational Behavior C3012	CO1	Explain the concepts of organisation behavior.
	CO2	Analyze individual and group behaviour to motivate employees for better performance.
	CO3	Identify the processes used in developing communication and resolving conflicts.
	CO4	Identify the various leadership styles and the role of leaders in a decision making process.
	CO5	Examine organizational culture and its dimensions.
Quantitative Analysis For Business Decisions C3013	CO1	Construct linear programming models and discuss the solution techniques.
	CO2	Recognize and formulate transportation, assignment problems and drive their optimal solution.
	CO3	Analyze the best strategy using decision making methods under uncertainty and game theory.
	CO4	Make use of CPM and PERT techniques, to plan, schedule, and control project activities.
	CO5	Analyze basic Markov queuing models and situations to which they may be applied.

Course Title with Code	Course Outcomes	
Management Information System C3014	CO1	Explain the concepts of management information system and enterprise resource planning.
	CO2	Analysis the concept of business application of information system in the organisation.
	CO3	Examine the strategic and project planning for management information system.
	CO4	Analysis the different concepts of enterprise resource planning overview, MRP, ERP modules and benefits of ERP.
	CO5	Make use of ERP implementation and maintenance and building information system.
International Business C3017	CO1	Enhance their cognitive knowledge of international business.
	CO2	Describes the benefits of international business and the factors affect companies.
	CO3	Conduct environmental scan to evaluate the impact of world issues of an organizations &international business opportunities
	CO4	Design an international marketing plan, and evaluate strategies that support an organization.
	CO5	Develop and implement strategies to negotiate effectively within various countries cultural environments
Production and Operations Management C3018	CO1	Explain the concepts of production and operations management.
	CO2	Analyze the different plant layouts, work study tools for enhancement of productivity in an organization.
	CO3	Apply the project management techniquesto decide the optimum time and cost for completion of a project.
	CO4	Use materials management, scheduling and aggregate planning techniques for better controlling of costs.
	CO5	Apply statistical quality control techniques to know quality of product with in control limits
Strategic Management C3019	CO1	Explain the concepts of Strategic Management
	CO2	Infer the statements of vision, mission, objectives ,policies and different strategies for smooth functioning
	CO3	Analyse the different turnaround , diversification strategies for enhancement of competitive advantage
	CO4	Make use of tools and techniques of strategic analysis
	CO5	Classify various Industry and competitive analysis for better strategic implementation, evaluation and control
Cost and Management Accountancy C3020	CO1	Explain the concepts, methods and techniques of cost and management accounting
	CO2	Analyze the usefulness of different accounting systems, apportionment and absorption of overheads
	CO3	Apply unit costing and process costing methods to find out cost of production.
	CO4	Apply marginal costing technique and budgetary control to make decision making on several issues of organisation.
	CO5	Analyze standard costing technique to control cost as well as inter-firm comparison, cost and management audit.
Security Analysis and portfolio	CO1	Explain the concepts of investment and security market.
	CO2	Select the best investment alternatives available for investment.
	CO3	Analyze interrelationship among risk and return for selecting best securities and portfolios.

Course Title with Code	Course Outcomes	
Management C3026	CO4	Apply fundamental and technical analysis factors for calculating intrinsic value of equity share.
	CO5	Analyze mutual funds and derivatives to assess performance of different funds.
Training and Development C3027	CO1	Understand and Analyze the models and training methods in an organization.
	CO2	Demonstrate the need analysis of training and development.
	CO3	Analyze and evaluate the areas of organizational training.
	CO4	Analyze the significance of career and career management of individuals.
	CO5	Analyze the implementation of training and its function in the organization.
	CO6	Analyze the trends and learning culture of training in the organization.
Financial Institutions and Markets C3030	CO1	Explain the concepts of financial institutions, markets, instruments and services.
	CO2	Analysis the role and function of financial institutions and banking and non – banking financial institutions.
	CO3	Compare the performance and risk of financial market and securities markets.
	CO4	Identify the fund based financial services & they functions of lease, housing finance, and venture capital financing.
	CO5	Develop the strategies to promote financial advisory and services in the present markets
Compensation and Reward Management C3031	CO1	Explain the concepts of compensation and reward management.
	CO2	Assess contemporary compensation system in modernorganizations.
	CO3	Analyse the content and base pay structure of jobs.
	CO4	Describe the different options and rationale for designing compensation system.
	CO5	Build the relationships amongst the components of total rewards.
Retail Management C3033	CO1	Analyze the evolution of the retail industry
	CO2	Demonstrate the skills needed to develop ideas and make decisions based on ethics, proper research, analysis, and critical thinking.
	CO3	Describe the actions taken to acquire and retain customers; produce goods and services; and measure/track financial performance.
	CO4	Explain the design, implementation, and assessment of retailing strategies based on consumer needs and market changes.
	CO5	Describe the process of conceiving, producing, and selling fashion products for in-store and on-line retailing.
Entrepreneurs hip Development C3037	CO1	Understand the role, characteristics, qualities and functions and legal issues of entrepreneur.
	CO2	Interpret various Institutional supports for setting up a business enterprise and apply this knowledge while approaching these institutions for financial support.
	CO3	Infer the concept of Project Management and steps in Project development and analyse while taking future project assignments.
	CO4	Importance of corporate governance and corporate social responsibilities..
	CO5	Equip the students with basic concepts of strategy and business ethics.
Banking and	CO1	Explain the concept of basics of banking and the Indian picture and various legal aspects of banking system.
	CO2	Analyse the various charge and Act of banking system.
	CO3	Examine the role, principle and classification of insurance.

Course Title with Code	Course Outcomes	
Insurance C3039	CO4	Apply the function, act of IRDA in insurance business.
	CO5	Analyse different functional areas of insurance companies.
Industrial Relations C3040	CO1	Analyze the objective, structural and legal framework of actors in Industrial relations.
	CO2	Analyze and resolve the employees and workers grievance at different levels to manage industrial relations.
	CO3	Understand pre and post-independent industrial relations in India.
	CO4	Analyze the nature of an organization and suggests the applicability of labour laws to attain organization goals.
	CO5	Evaluate the role of Government of India in maintaining industrial relations.
	CO6	Analyze the objective, structural and legal framework of actors in Industrial relations.
International Finance C3043	CO1	Explain the concepts of International finance.
	CO2	Examine the additional complexities financial mangers face as they move from a domestic to an international arena.
	CO3	Evaluate international monetary system & international flow of funds in Indian context.
	CO4	Identify risk relating to exchange rate fluctuations and develop strategies to deal with them
	CO5	Evaluate foreign direct investment and international acquisition opportunities.
Strategic Human Resource Management C3044	CO1	Explain the concepts of SHRM and the key aspects of forecasting the HR needs of the organisation.
	CO2	Describe the feasibility and nature of the link between business strategy and HR strategy.
	CO3	Analyse the alternative HR and compensation systems required for strategic HRM.
	CO4	Outline HR evaluation and the contemporary approaches for HR evaluation.
	CO5	Evaluate the motivational techniques, feedback strategies and other basic principles to manage and motivate employees using strategic HRM practices.
Advertising & Brand Management C3046	CO1	Examine advertising and its functions in relation to brand success
	CO2	Critically evaluate how creative concepts and executions will contribute to brand success
	CO3	Analyze promotional techniques and apply them to a variety of different issues
	CO4	Understanding consumer behaviour
	CO5	Work effectively in teams to analyze and prepare presentations on advertising.

Head, MBA

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Dept. of Management Studies
Vardhaman College of Engg
V); Kacharam, (M); Shamshabad, R.R. Dt

Department of Mechanical Engineering

PG Programme

Engineering Design (VCE)

Programme Educational Objectives (PEO's)

PEO1: Build essential knowledge in the latest technological domains of Engineering Design and motivate the students for future research in the areas.

PEO2: Create congenial environment that promotes learning, growth and imparts ability to work in inter-disciplinary groups thereby making them industry oriented.

PEO3: Enhance/Sharpen student's capabilities in analytical/ experimental methods and analysis of data enabling them for scholarly writing and presentation.

PEO4: Developing students as Professionals, academicians and Researchers with ethics and social responsibility.

Programme Outcomes (PO's)

Upon completion of the M.Tech Engineering Design, the student will be able to

PO1: Apply advanced knowledge, techniques, skills and modern tools in the field of Design to critically assess the emerging technological issues.

PO2: Design machine elements with complex geometry and composite materials using Software tools for various loading conditions.

PO3: Conduct experimental / analytical study and analyze results with modern mathematical / scientific methods and use of software tools.

PO4: Write and present a detailed / thorough technical report / document.

PO5: Independently carry out research / investigation and development work to solve realistic problems

PO6: Design and validate technological solutions to problems faced and recognize the need to engage in lifelong learning through continuing education.

Course outcomes (R18)

S.NO	Code	Subject		Course Outcomes
1	B4701	Advanced Mechanics of Solids	CO1	Remember and understand the concepts of mechanics of solids and its application to the behavior of structures (shear centre, curved beam, unsymmetrical bending) at different loading conditions.
			CO2	Investigate the response of beam structure on elastic foundation
			CO3	Examine the torsion problems with linear elastic solution of non-circular cross section and explain with different analogies.
			CO4	Explain the responses of structures on elastic foundation various end conditions and evaluate at different loading scenarios.
			CO5	Analyze the influences of contact stress induced in structures.
2	B4702	Analysis and synthesis of Mechanisms	CO1	Understand the kinematic theories to real-world problems of mechanical design.
			CO2	Apply the graphical and analytical techniques commonly used in the synthesis of mechanisms.
			CO3	Formulate and solve numerical problems of analysis and synthesis of mechanisms.
			CO4	Explain the theory and methodologies employed for design of mechanisms.
			CO5	Synthesize mechanisms with 3 and 4 accuracy points.
3	B4753	Mechanics of Composite Materials	CO1	Explain the significance and objectives of Composite Materials
			CO2	Apply the basic concepts and characteristics of Composite Materials
			CO3	Analyze the elastic behavior of unidirectional lamina
			CO4	Solve the mechanical strength parameters of unidirectional lamina
			CO5	Estimate the elastic behavior, stress and failure analysis of laminate
4	B4755	Tribology	CO1	Understand the nature of engineering surfaces, concepts of friction, wear and lubrication
			CO2	Explain the different bearing Materials with their properties
			CO3	Apply the basic theories of friction, wear and lubrication to predictions about the frictional behavior of commonly encountered sliding interfaces.
			CO4	Identify, Analyze and solve the Tribo-logical problems by using laws of friction, wear and lubrication
5	B4703	Advanced Computer Aided Modeling Lab	CO1	Illustrate the solid modeling in modern solid packages like CATIA
			CO2	Build the MATLAB codes for the CAD applications
			CO3	Develop the Analytical and Syntheic curves using Matlab
			CO4	Utilize the advanced modeling tools for product development
			CO5	Judge the detailed drawings and bill of materials
6	B4704	Kinematics and Dynamics Lab	CO1	Analyze the characteristics curves of different types of Governors.
			CO2	Examine the balancing conditions of rotating and reciprocating systems.
			CO3	Determine the active and reactive Gyroscope couples.

			CO4	Evaluate the natural frequency of single rotor system with viscous damping and amplitude of a vibrating system.
			CO5	Analyze the direct and inverse mechanism of robot.
7	**B4705**	Finite Element Analysis	CO1	Outline the basic concepts of finite element analysis
			CO2	Choose the finite element formuation
			CO3	Develop shape function of different element under different bounary conditions
			CO4	Analyze the axisymmetric problems
			CO5	Estimate the eigen values and eigen vector for bar and beam elements
8	**B4706**	Computer Aided Design	CO1	Define the CAD Hardware and computer communications
			CO2	Expalin the concepts of Computer Graphics
			CO3	Apply the principals of Geometric Modeling
			CO4	Analyze the fundamentals of Solid Modeling and its applications
			CO5	Distinguish the need of simulation and finite element anlysis applications
9	**B4757**	Advanced Machine Design	CO1	Understand the concept generation, evaluation and testing.
			CO2	Identify important processes in product development in an organization.
			CO3	Apply various techniques of Rapid Prototyping in order to shorter product development time.
			CO4	Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, ethical, health and safety, manufacturability, and sustainability.
			CO5	Creatively explore strategies to conceptualize and generate original and relevant solutions to design problems.
10	**B4760**	Mechanical Vibrations	CO1	Understand the causes and effects of vibration in mechanical systems and its effects on various systems.
			CO2	Develop the mathematical modeling of structure with schematic models.
			CO3	Determine the dynamic response of system using different computational approaches.
			CO4	Implement the approximate and iterative techniques to form the continuous vibratory systems.
			CO5	Analyze the mechanism of rotating components and measure the responses of different vibrating structures.
11	**B4707**	Numerical Methods and Analysis Lab	CO1	Demonstrate the applications of Numerical Methods
			CO2	Solve the two dimensional problems
			CO3	Analyze the mode shape and frequencies of a beam under different boundary conditions
			CO4	Estimate the temperature distribution of heat transfer problems
			CO5	Identify the harmonic response of a 2D component

12	**B4708**	Advanced Design Lab	CO1	Determine the deflection, shear centre, whirling speed and stress of different structures.
			CO2	Analyze the transverse vibration of different beam set up.
			CO3	Evaluate the compressive, tensile and buckling strength of 3-D printed structures.
			CO4	Estimate the natural frequency of dynamic system using FFT analyzer and its application to fault detection.
			CO5	Explore the natural frequencies and mode shapes of mechanical components using spectrum analysis concepts.
13	**B4756**	Fracture, Fatigue and Creep	CO1	Understand the concepts of fracture, fatigue and creep behavior of structure and emphasize the significance of material properties.
			CO2	Explore the behavior of cracks using liner elastic fracture mechanics concepts.
			CO3	Investigate the influence of fracture parameters on failure prediction.
			CO4	Examine the micro mechanisms of brittle and ductile fracture
			CO5	Apply the acquaintance for failure analysis with case studies
14	**B4765**	Design for Manufacturing	CO1	Select the suitable material for manufacturing of different machine parts
			CO2	Apply the concept of design and generate numerical solutions for different manufacturing process
			CO3	Examine different case studies and write conclusions regarding the observations
			CO4	Design different elements considering the properties of materials
			CO5	Improve the properties of materials by adopting best methods for designing of machine members

HOD, MECH

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