SCMS SCHOL OF ENGINEERING & TECHNOLOGY, KARUKUTTY

Affiliated to A P J Abdul Kalam Technological University

2015 Scheme

Programme: B. Tech.

DEPARTMENT OF AUTOMOBILE ENGINEERING

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Within a few years of graduation, the candidate is expected to have achieved the following objectives:

PEO 1 – Knowledge Attainment: Graduates shall reap sound technical competency and expertise in numerous fields of Automobile Engineering leading to a successful career.

PEO 2 – Social Responsibility: Graduates shall use the obtained abilities and understanding to remedy complicated Automobile Engineering troubles for the betterment of society.

PEO 3 – Integrity and Ethics: Graduates shall conform to professional ethics and contribute to uphold the integrity of their profession.

PEO 4 – Communication Skills: Graduates shall develop strong technical communication skills and intra and inter personal skills which would help inculcate in them team spirit, management and leadership qualities.

PROGRAMME OUTCOMES (POs)

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

PO 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.

PO 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.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO 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.

PO 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.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 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.

PO 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.

PO 12: 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 OUTCOMES (PSOs)

PSO1 - Apply basic science and mathematical principles to design, develop or reengineer automobiles.

PSO2 - Design or develop subsystems required for building safe, efficient and green vehicles.

PSO3 - Applying knowledge of the function of various automobile components and systems for continuous and preventive service and maintenance.

COURSE OUTCOMES (COs)

SEMESTER I			

Course Code	Course Title		Course Outcomes
MA101	**CALCULUS**	CO1	Define Infinite series and use various convergence tests to determine convergence and divergence of series.
		CO2	Calculate higher order Partial derivatives, Apply chain rule to functions of several variables, Determining extrema and to interpret the physical meaning of Partial Derivatives.
		CO3	Calculate double and triple integrals using rectangular and polar co-ordinates and hence apply the same to find the area and volume.

		CO4	Use vector valued functions in various physical applications.
		CO5	Examine vector fields, define and calculate line integrals using the fundamental theorem of line integrals. Define and compute gradient, divergence and curl of vector fields and apply Green's Theorem, Stokes Theorem and Divergence Theorem to determine Line integral, Surface Integral and Flux Integral.
PH100	ENGINEERING PHYSICS	CO1	Know the various types of oscillators and waves, understand the theory related to them and solve engineering problems using the concepts of harmonic oscillations, wave motion.
		CO2	Recall, understand and apply the theory of thin film interference and diffraction to daily life experiences.
		CO3	Describe, explain and apply the theories of polarization and superconductivity to various engineering problems.
		CO4	Know and understand the role of quantum mechanics and statistical mechanics in engineering subjects so as to apply and analyze them in various situations.
		CO5	Know and understand the various aspects of Ultrasonic and acoustics.
		CO6	Know about the properties of laser, holography, fiber optics and photonics and understand their significance and in modern technology mainly communication and medical fields as well as apply the theory in solving related problems.
BE110	ENGINEERING GRAPHICS	CO1	Understand the theory of projection.
		CO2	Draw orthographic projections.
		CO3	Develop 3D models and convert 3-D models to free hand sketches.
		CO4	Students will become familiar with AutoCAD 2-D and 3-D drawings.
		CO5	Improve their visualization skills for developing new products.
		CO6	Draw real images of objects and curves of intersection of solids like cylinder, prism and cone.
BE101 02	INTRODUCTION TO MECHANICAL ENGINEERING	CO1	Describe about fundamentals and laws of thermodynamics and apply the concept to study the working of Carnot engine
		CO2	Explain about some of the energy conversion devices like engines, turbines and air compressor and discuss about basics of rocket propulsion
		CO3	Illustrate about basics of refrigeration and air conditioning and apply its use to various industries
		CO4	Explain the basics of automobile and aeronautical engineering to recognize the working of automobile and jet engines
		CO5	List the different engineering materials and discuss the various methods of material testing
		CO6	Explain the various manufacturing processes like casting, forging, rolling etc

BE103	**INTRODUCTION TO SUSTAINABLE ENGINEERING**	CO1	Understand the concepts, importance and challenges of sustainable engineering.
		CO2	Recognize various environmental issues, their sources, effects and suggest remedial measures.
		CO3	Apply different sustainable methods and techniques for product-service system development.
		CO4	Analyze the sustainability of different products and services using environmental management tools.
		CO5	Practice sustainable methods by utilizing the engineering knowledge and principles
		CO6	Compare the pollution potential of various services and products.
EC100	**BASICS OF ELECTRONICS ENGINEERING**	CO1	Illustrate construction and working of different active components, passive components, Transformer, Relays and discuss the relevance of electronics and communication in different areas.
		CO2	Describe the basic concepts of different semiconductor diodes and BJT.
		CO3	Study of DC power supply, amplifier and oscillator circuits
		CO4	Understand Analog IC's & Digital IC's and illustrate the working of commonly used laboratory equipment.
		CO5	Understanding the basics of communication and satellite communication systems.
		CO6	Discuss the basics of fiber optic communication, mobile communication, entertainment electronics & security.
PH110	**ENGINEERING PHYSICS LAB**	CO1	Operate CRO and function generator for the various procedures in electronics.
		CO2	Use a travelling microscope to record the data with precision.
		CO3	Employ a spectrometer to mark details with accuracy.
		CO4	Apply the diffraction concepts to find wavelength of laser and to develop various waves on a stretched string.
CE110	**BASIC CIVIL WORKSHOP**	CO1	Plan and set out a building.
		CO2	Measure and calculate the area and volume of different building components.
		CO3	Construct a wall in English bond and to find the compressive strength of different building materials.
EC110	**BASIC ELECTRONICS WORKSHOP**	CO1	Familiarize and identify different electronic components, measuring & testing instruments and commonly used tools.
		CO2	Practice interconnection methods and soldering and Implement basic electronic circuits on PCB.
		CO3	Familiarization of various modern electronic systems.

Course Code	Course Title		Course Outcomes
BE100	**ENGINEERING MECHANICS**	CO1	Understand the fundamental concepts and laws of mechanics and draw free body diagrams to determine the resultant of forces and/or moments.
		CO2	Use the knowledge about different types of beams, supports and loads to determine the support reactions developed in the beam and also to solve the force system in space using the vector approach.
		CO3	Determine the centroid and moment of inertia of surfaces and solids using parallel and perpendicular axis theorems and to calculate the area and volume of basic figures using the theorem of Pappus and Guldinus.
		CO4	Solve problems related to friction and apply the principle of virtual work to determine the support reactions in beam.
		CO5	Apply the laws of motion, kinematics of motion and their interrelationship to systems in general plane motion and practical engineering problems.
		CO6	Understand the concepts in simple harmonic motion and vibrations and to calculate the parameters of bodies executing such motion.
CE100	**BASICS OF CIVIL ENGINEERING**	CO1	Recognize the role of civil engineers in the development of the society and explain the relationship of civil engineering with other branches of engineering and technology.
		CO2	Illustrate different types of buildings and materials of construction.
		CO3	Differentiate the features and components of industrial and residential buildings.
		CO4	Explain the concepts of surveying and its advances in civil engineering like remote sensing techniques, GIS and GPS.
		CO5	Knowledge about various services in building and the need for intelligent buildings in the modern world.
		CO6	Develop a plan and set out a building.

SEMESTER II

Course Code	Course Title		Course Outcomes
MA102	**DIFFERENTIAL EQUATIONS**	CO1	Understand the methods used to solve homogeneous differential equations and apply them to solve the differential equations. Relate the methods to solve non homogeneous differential equations.
		CO2	Applies Fourier series to several problems.
		CO3	Understand the formation and solution of partial differential equations and further solve them.
		CO4	Analyse the equation governing small transverse vibrations of an elastic string and evaluate the temperature distribution in a uniform bar.

CY100	**ENGINEERING CHEMISTRY**	CO1	Understand the theory and principle of UV-Visible, IR and NMR spectroscopy and be able to predict the structure of unknown /new compounds with the help of spectroscopy.
		CO2	Demonstrates understanding of the essential aspects of electrochemical cells, EMF and applications of EMF measurement and solve related problems.
		CO3	Develop understanding of Chemical structure of polymers and its effects on their various properties when used as engineering material, also to understand the economical and new methods for the synthesis of nanomaterial.
		CO4	Explain thermal methods of analysis and also classify the various chromatographic techniques based on stationary and mobile phase.
		CO5	Explain the properties and separation techniques of petroleum and natural gases along with potential applications and role of biodiesel in the current situation.
		CO6	Differentiate hard and soft acid, solve the related numerical problems on water purification and its significance in the industry and daily life.
BE100	**ENGINEERING MECHANICS**	CO1	Understand the fundamental concepts and laws of mechanics and draw free body diagrams to determine the resultant of forces and/or moments.
		CO2	Use the knowledge about different types of beams, supports and loads to determine the support reactions developed in the beam as well as solve the force system in space using the vector approach.
		CO3	Determine the centroid and moment of inertia of surfaces and solids using parallel and perpendicular axis theorems and calculate the area and volume of basic figures using Pappus-Guldinus theorem.
		CO4	Solve problems related to friction and apply the principle of virtual work to determine the support reactions in beam.
		CO5	Apply the laws of motion, kinematics of motion and their interrelationship to systems in general plane motion and practical engineering problems.
		CO6	Understand the concepts of simple harmonic motion and vibrations and calculate the parameters of bodies executing such motion.
BE102	**DESIGN AND ENGINEERING**	CO1	Analyze the different elements involved in good design and apply them in practice when called for.
		CO2	Aware of the product oriented and user-oriented aspects of an optimal design.
		CO3	Produce an innovative design concept by incorporating the different segments of knowledge gained.
		CO4	Value the different perspective of design factors covering functions, cost, sustainability, environmental impact, safety and others.
EE100	**BASICS OF ELECTRICAL ENGINEERING**	CO1	Understand and analyse the concept and theory of electric circuits and laws so as to define and apply it for evaluating the parameters using various methods that will encourage students to take up innovative ideas.
		CO2	Understand magnetic circuits and electromagnetic induction and then to measure various quantities for assessing the magnetic performance of the circuits.

		CO3	Analyse line and phase quantities and to discuss its impact on the passive elements in order to evaluate the three-phase system and to measure power using various wattmeter methods.
		CO4	Acquire the concept of generation, transmission and distribution of power systems so that they can relate to the functioning of the present power system and substation equipment.
		CO5	Understand the construction, working and types of DC machines and transformers so as to get an idea of its applications and its possible outcome.
		CO6	Understand the construction, working and types of three phase and single-phase induction motors and its use in the present system.
CY110	**ENGINEERING CHEMISTRY LAB**	CO1	Standardize various solutions, estimate the amount of substance present in a given solution and determine the hardness of water.
		CO2	Provide an understanding in the methods of preparation of some industrially important polymers and to develop skills in the proper handling of apparatus and chemicals.
		CO3	For the interpretation and understanding of IR and NMR spectra and for the determination of structure of molecules using these techniques.
EE110	**ELECTRICAL ENGINEERING WORKSHOP**	CO1	Familiarized with supply arrangements and their limitations, knowledge of standard voltages and their tolerances, safety aspects of electrical systems and importance of protective measures in wiring systems.
		CO2	Knowledge about the types of wires, cables and other accessories used in wiring. Creating awareness of energy conservation in electrical systems.
		CO3	Wire simple lighting circuits for domestic buildings, distinguish between light and power circuits.
		CO4	Measure electrical circuit parameters and current, voltage and power in a circuit.
ME110	**MECHANICAL ENGINEERING WORKSHOP**	CO1	Identify and apply suitable tools and components in mechanical engineering workshop.
		CO2	Design and model different prototypes in the trade of joining processes such as carpentry, welding, fitting and sheet metal.
		CO3	Design and model different prototypes in the trade of shaping processes such as smithy and foundry.
		CO4	Demonstrate the working and applications of various machine tools.
		CO5	Interpret effective results based on the experiments conducted by individual and team work.
CE100	**BASICS OF CIVIL ENGINEERING**	CO1	Recognize the role of civil engineers in the development of the society and explain the relationship of Civil engineering with other branches of engineering and technology.
		CO2	Discuss different types of buildings and materials of construction.
		CO3	Differentiate the features and components of Industrial and Residential buildings.
		CO4	Explain the concepts of surveying and its advances in civil engineering like remote sensing techniques, GIS and GPS.

Course Code	Course Title		Course Outcomes
		CO5	Knowledge about various services in building and the need for intelligent buildings in the modern world.
		CO6	Develop a plan and set out a building.
CE110	**CIVIL ENGINEERING WORKSHOP**	CO1	Set out a building plan on the field.
		CO2	Measure and calculate the area and volume of different building components.
		CO3	Find the compressive strength of different building materials and construct a wall in English bond.

SEMESTER III

Course Code	Course Title		Course Outcomes
MA201	**LINEAR ALGEBRA AND COMPLEX ANALYSIS**	CO1	Relate the concepts of basic calculus in complex functions.
		CO2	Recognise the harmonic functions and construction of harmonic conjugate.
		CO3	Describe the geometry of analytic functions and identify their conformal mapping.
		CO4	Identify the singularities and formulate the residues to evaluate the real definite integrals.
		CO5	Apply gauss elimination method to solve the system of equations.
		CO6	Diagonalise a matrix by calculating eigen values and eigen vectors.
ME201	**MECHANICS OF SOLIDS**	CO1	Acquire knowledge on the concepts of stress and strain in elastic materials.
		CO2	Explain the concept of strain energy due to tension, compression and shear.
		CO3	Analyse structural members subjected to different types of loading and sketch SFD and BMD
		CO4	Analyse the behavior of beams under flexure by the application of simple bending theory.
		CO5	Analyse stresses in thick and thin cylinders and determine the torsional rigidity of springs.
		CO6	Determine deflections in determinate beams subjected to different loading conditions.
ME200	**FLUID MECHANICS & MACHINERY**	CO1	Familiarize with the properties of fluids, and analyze problems related to the calculation of forces on different surfaces
		CO2	Analyze flow problems associated with statics of fluids.
		CO3	Analyze the different types of fluid flow and calculate the various aspects related to kinematics of fluid flow

		CO4	Analyze flow problems associated with dynamics of fluids.
		CO5	Understand the constructional features, characteristics and working of Reaction Turbines. can apply the given data' s for the calculations involved in the design of turbine with reference to the given application/situation.
		CO6	Students will be able to understand the working and the constructional features of positive displacement & Roto dynamic pumps and can apply the given data' s for the calculations involved in design of pump with reference to given application/situation.
AU201	S I ENGINES & COMBUSTION	CO1	To introduce the basic thermodynamic cycles that govern I.C Engines and compare the theoretical cycles and actual thermodynamic cycles
		CO2	To understand the principle of combustion in SI engines along with fuel properties.
AU203	AUTO CHASSIS	CO1	Understand the types of chassis layouts and types of tires
		CO2	Acquires knowledge of the constructional details of front wheel drive
		CO3	Understand the constructional details of rear drive axle and components.
		CO4	Understand the constructional details of suspension systems
		CO5	Understand the constructional details of braking systems
		CO6	Understand the steering system and its components
HS210	LIFESKILLS	CO1	Know the nuances of technical communication to interpret the cues of non-verbal communication so as to develop communicative efficiency in oral and written format; and demonstrate competency to face interview and group discussion.
		CO2	Recall and understand the various theories related to creativity to illustrate critical thinking and problem solving abilities.
		CO3	Describe and differentiate the concepts involved in groups and teams and illustrate the ability to function effectively as an individual, and as a member or leader in diverse teams.
		CO4	Define the terms as well as grasp the distinction between different terms related to ethics and values; assess the different moral and ethical theories to Engineering ethics and Human value.
		CO5	Identify and discuss the different leadership styles and choose the suitable style to become an effective leader.
ME230	FLUID MECHANICS & MACHINES LAB	CO1	Sketch and illustrate the various components of buildings.
		CO2	Develop plan, section and elevation of buildings with site plan based on functional requirements and KMBR.
		CO3	Use AUTOCAD to draft 2D drawings.
CE230		CO1	Evaluate material properties.

Course Code	Course Title		Course Outcomes
	MATERIAL TESTING LAB	CO2	Interpret experimental data and reach a substantiated conclusion based on standards.
		CO3	Apply engineering fundamentals to identify the behavior of different materials in flexure, shear, torsion.

SEMESTER IV

Course Code	Course Title		Course Outcomes
MA202	**PROBABILITY DISTRIBUTIONS TRANSFORMS AND NUMERICAL METHODS**	CO1	Identify different types of discrete probability distributions, their properties such as its mean and variance and solve problems on binomial and Poisson distributions. Explain continuous random variables and associate them with Normal, Uniform, Exponential distributions, their properties such as mean and variance and calculate corresponding probability density function and cumulative distribution function.
		CO2	Applies Fourier integrals and transforms to analyse linear systems and signal processing problems.
		CO3	Apprehend the knowledge of Laplace transforms and apply it in solving ordinary differential equations and compute convolutions.
		CO4	Analyse various numerical techniques and to obtain approximate solutions to otherwise intractable mathematical problems. Evaluate the solutions of equations using numerical techniques.
AU202	**ADVANCED THERMODYNAMICS**	CO1	The student will get an insight in to the concept of thermodynamics, gas laws and its relations.
		CO2	The student will get an insight in to the various temperature scales and will be able to apply the steady flow energy equation or the first law of thermodynamics to a system of thermodynamic components
		CO3	The student will be familiarized with the second law, concept of entropy, reversibility, and availability
		CO4	The student will be able to comprehend the applications of various thermodynamic relations to real world examples
		CO5	The student will be able to understand properties of various mixtures of gases and vapours
		CO6	The students will be able to solve different power cycle numerical problems
AU204	**C I ENGINES & COMBUSTION**	CO1	An understanding of the diesel fuels and its various properties and the parameters that affect the combustion process of diesel fuel.
		CO2	Describe various components of the fuel injection system and different types of fuel pumps.
		CO3	To impart knowledge on the modern fuel systems available for CI engines
		CO4	An understanding of the exhaust gas composition and various testing of I.C engines

		CO5	An understanding of sources and causes of pollution by diesel engines
		CO6	Summarize the knowledge about turbocharging and supercharging and an overview of the governors and cold starting devices.
AU206	**AUTO TRANSMISSION**	CO1	Acquires theoretical knowledge of operation of different types of clutches and understand the performance of vehicle under different conditions of resistance to motion
		CO2	Acquires the knowledge of determination of gear ratios for vehicles and working of gearboxes and gear shifting mechanisms in each.
		CO3	Acquires the knowledge of construction and operation of Ford – T-model gearbox, Wilson Gear box and electromagnetic transmission.
		CO4	Acquires the theoretical knowledge of Principle of operation, Constructional details of Fluid coupling and torque converters
		CO5	Acquires the knowledge of Principle of operation of automatic transmission and Continuously Variable Transmission (CVT)
		CO6	Acquires the knowledge of various types of hydrostatic drives and electric drives
AU208	**COMPUTER PROGRAMMING**	CO1	Familiarize the microcontroller modules and the importance of c in automobile industry
		CO2	Develop C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or Bitwise operators.
		CO3	Apply the concepts of Arrays, Strings and Structure in 'C' language for user defined problems.
		CO4	Divide a given computational problem into a number of modules and develop a readable multi-function C program by using recursion if required, to find the solution to the computational problem
		CO5	Write readable C programs which use pointers for array processing and parameter passing
		CO6	Develop readable C programs with files for reading input and storing output
HS200	**BUSINESS ECONOMICS**	CO1	Remember economics concepts and tools to make better decisions.
		CO2	Remember economics concepts and tools to make better decisions.
		CO3	Apply cost and benefits analysis for business projects.
		CO4	Apply and analyse the financial performance of business projects.
AU232	**COMPUTER PROGRAMMING LAB**	CO1	Provide experience in programming with C language
		CO2	Give exposure to computer software's like MATLAB

Course Code	Course Title		Course Outcomes
		CO3	Programming in C covering control structures functions, arrays, structures, pointers and files
AU234	VEHICLE SYSTEMS LAB	CO1	Study about hand tools, special purpose tools, and their uses.
		CO2	Familiarize yourself with various systems and components of an automobile.
		CO3	Writing technical specifications and description of all types of chassis and transmission components of automobiles, including body and interiors.

SEMESTER V

Course Code	Course Title		Course Outcomes
ME307	MACHINE DESIGN I	CO1	Develop the design and practical problem-solving skills in the area of mechanisms through velocity and acceleration analysis
		CO2	Develop the design and practical problem-solving skills in the area of mechanisms through static and dynamic force analysis
		CO3	Understand the working and application of different types of Governors.
		CO4	Interpret the precessional motion and gyroscopic couple and apply them for the stability analysis of automobiles, ships and aircrafts
		CO5	Apply energy principles to determine the energy fluctuations of a flywheel and demonstrate the concepts of static and dynamic balancing to rotating and reciprocating machine parts and analyse them for the amount of required balance.
		C06	Generate profile of cam to get required follower motion for any application. Analyze kinematic parameters of gears in mesh for typical power transmission application
ME309	METALLURGY & MATERIAL SCIENCE	CO1	Identify the crystal structures of metallic materials
		CO2	Analyze the binary phase diagrams of different alloys
		CO3	Correlate the microstructure with properties, processing and performance of metals
		CO4	Recognize the failure of metals with structural change
		CO5	Select materials for design and construction
		CO6	Apply core concepts in materials science to solve engineering problems

ME311	**MANUFACTURING PROCESS**	CO1	To give an exposure to different techniques of casting and molds required.
		CO2	To provide an exposure to different rolling processes and different rolled products
		CO3	To familiarize with different forging methods, cautions to be adopted in die design.
		CO4	To give an introduction to various work and tool holding devices used in manufacturing and apply the basic principles of clamping to clamp complex shaped objects
		CO5	To introduce to the bending, shearing and drawing processes of sheet metal working and allied machines
		CO6	To give an understanding of welding metallurgy and weldability and to introduce various metal joining techniques.
EE311	**ELECTRICAL DRIVES & CONTROL FOR AUTOMATION**	CO1	Students will be able to understand different types of dc generators, advantages and disadvantages
		CO2	Students will be able to remember the operating principles of dc motors in different applications
		CO3	Students will be able to understand the working principle of the transformer and evaluate the losses and efficiency.
		CO4	Students will be able to apply the three-phase induction motor in different applications.
		C05	Students will be able to analyze single phase induction motors and synchronous motors.
		C06	Students will be able to apply different machines in automation.
AU307	**VEHICLE BODY ENGINEERING**	CO1	To impart knowledge on the design of vehicle body to give maximum comfort for the passengers
		CO2	To discuss the methods of streamlining vehicle body to minimize drag
AU361	**ALTERNATIVE FUELS AND ENERGY SOURCES**	CO1	The students will understand the energy conversion, utilization and storage for renewable technologies.
		CO2	The students will be familiar with the potential of using renewable energy technologies as a complement to the extent possible, replacement for conventional technologies and the possibility of combining renewable and non-renewable energy technologies in hybrid systems.
		CO3	To understand the environmental aspects of energy usage and conversion
AU341	**DESIGN PROJECT**	CO1	Think innovatively on the development of components, products, processes or technologies in the engineering field
		CO2	Identify and analyze a current problem of interest

Course Code	Course Title		Course Outcomes
		CO3	Develop a methodology and work plan to solve the problem
ME333	HEAT ENGINES LAB	CO1	To give hands-on experience in testing different properties of fuels & lubricants.
		CO2	To perform characteristic tests on petrol and diesel engines.
ME335	PRODUCTION ENGINEERING LAB	CO1	To give an idea about different manufacturing processes and to perform different types of tests on various works.

SEMESTER VI

Course Code	Course Title		Course Outcomes
ME302	HEAT AND MASS TRANSFER	CO1	Solve problems involving steady state heat conduction with and without heat generation in simple geometries
		CO2	Evaluate heat transfer coefficients for Natural convection and Forced convection situations using empirical relations.
		CO3	Design Heat Exchangers and Fins and evaluate its performance.
		CO4	Solve problems involving transient heat conduction and understand the basics of Heat pipe, Boiling and Condensation
		CO5	Estimate radiation heat transfer between black body and gray body surfaces.
		C06	Solve problems involving mass transfer due to diffusion, chemical reaction and convection.
ME304	DYNAMICS OF MACHINERY	CO1	Develop the design and practical problem-solving skills in the area of mechanisms through static force analysis
		CO2	Develop the design and practical problem-solving skills in the area of mechanisms through dynamic force analysis
		CO3	Apply energy principles to determine the energy fluctuations of a flywheel and demonstrate the concepts of static and dynamic balancing to rotating and reciprocating machine parts and analyse them for the amount of required balance.
		CO4	Interpret the precessional motion and gyroscopic couple and apply them for the stability analysis of automobiles, ships and aircrafts

		CO5	Understand the basics of single degree of freedom vibrations, their measurements, transmission and control
		CO6	Apply the concepts of multiple degrees of freedom vibrations in the design problem of mechanisms
ME314	MACHINE DESIGN II	CO1	The students will describe the design process, purpose of material selection, solve stresses and stress concentrations under variable loading.
		CO2	The students will demonstrate the ability by correctly performing the design and analysis of different types of shafts and welded joints
		CO3	The students will demonstrate the ability by correctly performing the design and analysis of clutches and brakes
		CO4	The students will demonstrate the ability by correctly performing the design and analysis of sliding and rolling contact bearings
		CO5	The students will apply the multidimensional static failure and analyze forces and design of gears.
		CO6	The students will demonstrate the ability by performing correctly, material selection and design of engine parts.
AU302	AUTOMOTIVE ELECTRICAL AND ELECTRONICS	CO1	To understand the construction and working of different batteries and energy storage devices.
		CO2	To understand the construction and working of the charging system and the starting system of automobiles.
		CO3	To understand the construction and working of various types ignition systems
		CO4	To understand the construction and working of various lighting systems and also the working of various instrumentation devices.
		CO5	To understand the working principle and application of various sensors in automobiles.
		CO6	To understand how various electronic fuel injection systems work.
HS300	PRINCIPLES OF MANAGEMENT	CO1	Identify and discuss the relevance and different perspectives of management concepts.
		CO2	Describe and utilize management techniques for meeting current and future management challenges faced by the organization.

Course Code	Course Title		Course Outcomes
		CO3	Compare the management theories and models critically and demonstrate its validity in the real world.
		CO4	Understand the different decision-making situations and outline the steps involved in solving problems faced by management.
		CO5	Identify the skills required by a manager with varying working situations
AU362	HYBRID AND FUEL CELL VEHICLES	CO1	Understand the construction and working of various hybrid electric topologies.
		CO2	Discuss the construction and working of various electric motors
		CO3	Explain the various energy storage systems available.
		CO4	Explain the procedure to match electric motor and ic engine.
		CO5	Understand the construction and working of various types of fuel cells.
ME332	COMPUTER AIDED DESIGN AND ANALYSIS LAB	CO1	To provide working knowledge on Computer Aided Design methods and procedures
		CO2	To impart training on solid modelling software
		CO3	To impart training on finite element analysis software
AU332	AUTO ELECTRICAL & ELECTRONICS LAB	CO1	To familiarize the design and construction of various automotive electrical systems
		CO2	Identify the charging and discharging capacity of a battery through suitable tests
		CO3	Students will understand how to design and construct various electrical system circuits
AU352	COMPREHENSIVE EXAM	CO1	Recall the comprehensive knowledge gained in courses relevant to civil engineering.
		CO2	Comprehend the questions (Oral and written) and answer them with confidence.

SEMESTER VII

Course Code	Course Title		Course Outcomes
AU401	AUTOMOTIVE SYSTEM DESIGN	CO1	To impart basic definition and terminologies related to vehicle motion
		CO2	To impart the aspects of design parameters of multi-cylinder engines.

		CO3	To impart the design aspects of valve gears in an engine.
		CO4	To impart the design aspects of engine structure and lubricating systems.
		CO5	To impart the design aspects of cooling system components.
		CO6	To impart the design aspects of the gear box and its components.
AU403	VEHICLE DYNAMICS	CO1	Acquires theoretical knowledge of vibrations and its effect and performance of automobiles.
		CO2	Acquires the knowledge of tire dynamics tire vibrations and understeer and oversteer conditions.
		CO3	Acquires the knowledge of types of suspension systems and dampers.
		CO4	Acquires the knowledge of stability of a vehicle on slope, banked track and curved track
		CO5	Acquires the knowledge of Principle of operation of brake, efficiency of braking and stopping distance.
		CO6	Acquires the knowledge of various aerodynamic effect on a moving vehicle and aerodynamic aids
AU405	AUTOMOTIVE REFRIGERATION AND AIR CONDITIONING	CO1	Explain the thermodynamic cycle of refrigeration Compute C.O.P and classify refrigerants
		CO2	Understand various types of refrigerants and their properties, components of refrigeration system
		CO3	Analyse the load needed for air conditions on various conditions
		CO4	Understand the duct system in automotive air conditioning systems.
		CO5	Understand working of Automotive heater system and its components
		CO6	Understand maintenance and service procedure of Air conditioner
AU407	ADVANCED IC ENGINES	CO1	An understanding of the special types of engines

		CO2	To understand about Dual Fuel Engine, Multi fuel engine
		CO3	To understand about the lean burn engines
		CO4	To understand about the gas turbines
		CO5	To understand the difference between gas turbine and I C Engines"
		CO6	To understand about stratified charge engine
AU409	SIMULATION AND ANALYSIS OF IC ENGINE PROCESSES	CO1	Analyze and calculate the adiabatic flame temperature for an IC engine process.
		CO2	Analyze and calculate the adiabatic flame temperature for an SI engine under part throttle and full throttle conditions.
		CO3	Analyze and calculate the adiabatic flame temperature for an CI engine under naturally aspirated and supercharged conditions.
		CO4	Describe the factors that affect the breathing ability (intake/exhaust) of an Internal combustion engine.
		CO5	Explain the working of scavenging process in two stroke engine
		CO6	Describe how friction and heat transfer affects the performance of an internal combustion engine.
AU463	OPERATION MANAGEMENT IN AUTO INDUSTRY	CO1	To identify and discuss the relevance and different perspectives of operation management concepts
		CO2	To describe and utilize operation management techniques for meeting current and future management challenges faced by the organization
		CO3	To compare the operation management theories and models critically and to inspect and question its validity in the real world
		CO4	To assess different decision making situations and develop methods to solve problems faced by operation management
		CO5	To make use of operation management in order to execute the role of a manager in auto industry
AU431	AUTOTRONICS LAB	CO1	Understand the construction and working of various sensors.
		CO2	Understand the function of various electronic components like transistor, capacitor, Darlington pair, microcontrollers, diodes etc.

		CO3	Perform vehicle diagnostics and identify errors in vehicle operations.
		CO4	Understand the relationship between temperature and resistance of a thermistor.
		CO5	Understand the relationship between temperature and voltage of a thermistor.
		CO6	Understand the relationship between temperature and current characteristics of an AD – 590 sensor.
AU451	**SEMINAR AND PROJECT PRELIMINARY**	CO1	Analyse a current topic of research / professional interest and present the matter effectively as a technical report and orally before an audience.
		CO2	Identify problems relevant to the present civil engineering scenario and prepare a work plan based on knowledge gained from different courses and detailed literature review.

SEMESTER VIII

Course Code	Course Title		Course Outcomes
AU402	**TWO & THREE WHEELERS**	CO1	To introduce the subject. Understanding of Power Plants
		CO2	To understand the Fuel Supply System & Ignition systems.
		CO3	To have a thorough understanding of Transmission System
		CO4	To introduce the Chassis & Sub system.
		CO5	To have a detailed look at Brakes & Wheels.
		CO6	To impart knowledge on the Maintenance & Specifications of Two & Three Wheeler.
AU404	**ENGINE & VEHICLE MANAGEMENT SYSTEMS**	CO1	To understand the difference between open loop and closed control systems and the basic operating principle of engine ECU.
		CO2	Analyze the input and output variables for electronic engine control and engine mapping
		CO3	To understand the working of electronic fuel control systems and their response to various operating conditions
		CO4	To understand how various system parameters affect combustion, noise and emissions in CI engines.
		CO5	To understand how electronic control of automatic transmission takes place.
		CO6	To understand how various advance driver assist systems work

AU464	**SPECIAL TYPE OF VEHICLES**	CO1	Acquires theoretical knowledge of construction and operation of tyre and tracked vehicles.
		CO2	Acquires the knowledge of construction of hydraulic systems and final drives of earth moving and construction equipments
		CO3	Acquires the knowledge of construction and operation of Excavators and graders.
		CO4	Acquires the knowledge of construction and operation of Haulage vehicle and Lift Truck.
		CO5	Acquires the knowledge of construction and operation of Cranes and Compaction vehicles.
		CO6	Acquires the knowledge of construction and operation of Scrapers, Dozers and Loaders
AU462	**VEHICLE MAINTENANCE**	CO1	Understand the importance of vehicle inspection and maintenance
		CO2	Understand the owner maintenance schedule of various automobiles
		CO3	Diagnose the causes of common vehicle problems and provide remedial action
		CO4	Understand the maintenance of electric vehicle
		CO5	Possess the knowledge about the inspection and maintenance of modern vehicle systems
AU492	**FINAL PROJECT**	CO1	Apply the technical knowledge gained in solving real life engineering problems and elaborate it through a detailed design.
		CO2	Develop prototypes / methodologies to solve the key issues related to Civil Engineering systems and conduct appropriate tests to measure and evaluate the performance of prototype/methodology.
		CO3	Communicate the team's logistical and technical approaches to the final project using appropriate graphical/modelling tools through project report and presentation.

DEPARTMENT OF CIVIL ENGINEERING.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Within a few years of graduation, the candidate is expected to have achieved the following objectives:

PEO 1 – Knowledge Attainment: Graduates shall attain sound technical competency and knowledge in various fields of Civil Engineering leading to a successful career.

PEO 2 – Social Responsibility: Graduates shall use the acquired skills and knowledge to solve complex Civil Engineering problems for the betterment of the society.

PEO 3 – **Integrity and Ethics:** Graduates shall conform to professional ethics and contribute to uphold the integrity of their profession

PEO 4 –Communication Skills: Graduates shall develop strong technical communication skills and intra and inter personal skills which would help inculcate in them team spirit, management and leadership qualities.

PROGRAMME OUTCOMES (POS)

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

PO 2: Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 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.

PO 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.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO 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.

PO 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.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 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.

PO 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.

PO 12: 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.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1 – Graduates shall demonstrate good understanding of engineering fundamentals and demonstrate sound knowledge in analysis, design and laboratory investigations in various domains of Civil Engineering.

PSO2 – Graduates will exhibit a passion for continuous self-learning and/ or pursue higher studies and engineering research.

PSO3 – Graduates will possess ability to interact and function within multidisciplinary teams with competence in modern tool usage.

COURSE OUTCOMES (COs)

	SEMESTER I	

Course Code	Course Title	Course Outcomes	
MA101	**CALCULUS**	CO1	Define Infinite series and use various convergence tests to determine convergence and divergence of series.
		CO2	Calculate higher order Partial derivatives, Apply chain rule to functions of several variables, Determining extrema and to interpret the physical meaning of Partial Derivatives.
		CO3	Calculate double and triple integrals using rectangular and polar co-ordinates and hence apply the same to find the area and volume.
		CO4	Use vector valued functions in various physical applications.
		CO5	Examine vector fields, define and calculate line integrals using the fundamental theorem of line integrals. Define and compute gradient, divergence and curl of vector fields and apply Greens Theorem, Stokes Theorem and Divergence Theorem to determine Line integral, Surface Integral and Flux Integral.
PH100	**ENGINEERING PHYSICS**	CO1	Know the various types of oscillators and waves, understand the theory related to them and solve engineering problems using the concepts of harmonic oscillations, wave motion.
		CO2	Recall, understand and apply the theory of thin film interference and diffraction to daily life experiences.
		CO3	Describe, explain and apply the theories of polarization and superconductivity to various engineering problems.
		CO4	Know and understand the role of quantum mechanics and statistical mechanics in engineering subjects so as to apply and analyze them in various situations.
		CO5	Know and understand the various aspects of Ultrasonic and acoustics.
		CO6	Know about the properties of laser, holography, fiber optics and photonics and understand their significance and in modern technology mainly communication and medical fields as well as apply the theory in solving related problems.
BE110	**ENGINEERING GRAPHICS**	CO1	Understand the theory of projection.
		CO2	Draw orthographic projections.
		CO3	Develop 3D model and convert 3-D models to free hand sketches.
		CO4	Student will become familiar with AutoCAD 2-D and 3-D drawings.
		CO5	Improve their visualization skills for developing new products.

		CO6	Draw real images of objects and curves of intersection of solids like cylinder, prism and cone.
BE101 01	**INTRODUCTION TO CIVIL ENGINEERING**	CO1	Recognize the role of Civil Engineer in the society and develop interest into the branch of Civil Engineering.
		CO2	Identify different types of civil engineering structures and understand the various building aspects of a residential building.
		CO3	Interpret the types, properties, tests and uses of common building blocks used in civil engineering construction.
		CO4	Describe the properties, types, uses and manufacturing methods of different building materials.
		CO5	Distinguish various types of bonds from their facing arrangements and select suitable masonry for different structural situations.
		CO6	Discuss on the types of roofs and floors and select suitable flooring and roofing materials.
BE103	**INTRODUCTION TO SUSTAINABLE ENGINEERING**	CO1	Understand the concepts, importance and challenges of sustainable engineering.
		CO2	Recognize various environmental issues, their sources, effects and suggest remedial measures.
		CO3	Apply different sustainable methods and techniques for product-service system development.
		CO4	Analyze the sustainability of different products and services using environmental management tools.
		CO5	Practice sustainable methods by utilizing the engineering knowledge and principles
		CO6	Compare the pollution potential of various services and products.
EC100	**BASICS OF ELECTRONICS ENGINEERING**	CO1	Illustrate construction and working of different active components, passive components, Transformer , Relays and discuss about relevance of electronics and communication in different areas.
		CO2	Describe the basic concepts of different semiconductor diodes and BJT.
		CO3	Study of DC power supply, amplifier and oscillator circuits
		CO4	Understand Analog IC's & Digital IC's and illustrate the working of commonly used laboratory equipment's.
		CO5	Understanding the basics of communication and satellite communication system.
		CO6	Discuss the basics of fiber optic communication, mobile communication, entertainment electronics & security.
PH110	**ENGINEERING PHYSICS LAB**	CO1	Operate CRO and function generator for the various procedures in electronics.
		CO2	Use travelling microscope to record the data with precision.
		CO3	Employ spectrometer to mark details with accuracy.

Code	Course	CO	Description
		CO4	Apply the diffraction concepts to find wavelength of laser and to develop various waves on a stretched string.
CE110	**BASIC CIVIL WORKSHOP**	CO1	Plan and set out a building.
		CO2	Measure and calculate the area and volume of different building components.
		CO3	Construct a wall in English bond and to find the compressive strength of different building materials.
EC110	**BASIC ELECTRONICS WORKSHOP**	CO1	Familiarize and identify different electronic components, measuring & testing instruments and commonly used tools.
		CO2	Practice interconnection methods and soldering and Implement basic electronic circuits on PCB.
		CO3	Familiarization of various modern electronic systems.
BE100	**ENGINEERING MECHANICS**	CO1	Understand the fundamental concepts and laws of mechanics and draw free body diagrams to determine the resultant of forces and/or moments.
		CO2	Use the knowledge about different types of beams, supports and loads to determine the support reactions developed in the beam and also to solve the force system in space using vector approach.
		CO3	Determine the centroid and moment of inertia of surfaces and solids using parallel and perpendicular axis theorems and to calculate the area and volume of basic figures using theorem of Pappus and Guldinus.
		CO4	Solve problems related to friction and apply principle of virtual work to determine the support reactions in beam.
		CO5	Apply the laws of motion, kinematics of motion and their interrelationship to systems in general plane motion and practical engineering problems.
		CO6	Understand the concepts in simple harmonic motion and vibrations and to calculate the parameters of bodies executing such motion.
CE100	**BASICS OF CIVIL ENGINEERING**	CO1	Recognize the role of civil engineer in the development of the society and explain relationship of civil engineering with other branches of engineering and technology.
		CO2	Illustrate different types of buildings and materials of construction.
		CO3	Differentiate the features and components of industrial and residential buildings.
		CO4	Explain the concepts of surveying and its advances in civil engineering like remote sensing techniques, GIS and GPS.
		CO5	Knowledge about various services in building and need of intelligent buildings in modern world.
		CO6	Develop plan and set out a building.

SEMESTER II

Course Code	Course Title	Course Outcomes	
MA102	**DIFFERENTIAL EQUATIONS**	CO1	Understand the methods used to solve homogeneous differential equations and apply them to solve the differential equations. Relate the methods to solve non homogeneous differential equations.
		CO2	Applies Fourier series to several problems.
		CO3	Understand the formation and solution of partial differential equations and further solve them.
		CO4	Analyse the equation governing small transverse vibrations of an elastic string and evaluate the temperature distribution in a uniform bar.
CY100	**ENGINEERING CHEMISTRY**	CO1	Understand the theory and principle of UV-Visible, IR and NMR spectroscopy and able to predict the structure of unknown /new compounds with the help of spectroscopy.
		CO2	Demonstrates understanding of the essential aspects of electrochemical cells, EMF and applications of EMF measurement and solve related problems.
		CO3	Develop understanding of Chemical structure of polymers and its effects on their various properties when used as engineering material, also to understand the economical and new methods for the synthesis of nanomaterial.
		CO4	Explain thermal methods of analysis and also classify the various chromatographic techniques based on stationary and mobile phase.
		CO5	Explain the properties and separation techniques of petroleum and natural gases along with potential applications and role of biodiesel in the current situation.
		CO6	Differentiate hard and soft acid, solve the related numerical problems on water purification and its significance in the industry and daily life.
BE100	**ENGINEERING MECHANICS**	CO1	Understand the fundamental concepts and laws of mechanics and draw free body diagrams to determine the resultant of forces and/or moments.
		CO2	Use the knowledge about different types of beams, supports and loads to determine the support reactions developed in the beam as well as solve the force system in space using vector approach.
		CO3	Determine the centroid and moment of inertia of surfaces and solids using parallel and perpendicular axis theorems and calculate the area and volume of basic figures using Pappus-Guldinus theorem.
		CO4	Solve problems related to friction and apply principle of virtual work to determine the support reactions in beam.
		CO5	Apply the laws of motion, kinematics of motion and their interrelationship to systems in general plane motion and practical engineering problems.
		CO6	Understand the concepts of simple harmonic motion and vibrations and calculate the parameters of bodies executing such motion.
BE102	**DESIGN AND ENGINEERING**	CO1	Analyze the different elements involved in good design and apply them in practice when called for.

Course Code	Course Name	CO	Course Outcome
		CO2	Aware of the product oriented and user oriented aspects of an optimal design.
		CO3	Produce an innovative design concept by incorporating the different segments of knowledge gained.
		CO4	Value the different perspective of design factors covering functions, cost, sustainability, environmental impact, safety and others.
EE100	**BASICS OF ELECTRICAL ENGINEERING**	CO1	Understand and analyse the concept and theory of electric circuits and laws so as to define and apply it for evaluating the parameters using various methods that will encourage students to take up innovative ideas.
		CO2	Understand magnetic circuits and electromagnetic induction and then to measure various quantities for assessing the magnetic performance of the circuits.
		CO3	Analyse line and phase quantities and to discuss its impact on the passive elements in order to evaluate the three phase system and to measure power using various wattmeter methods.
		CO4	Acquire the concept of generation, transmission and distribution of power system so that they can relate to the functioning of the present power system and substation equipment.
		CO5	Understand the construction, working and types of DC machines and transformers so as to get an idea of its applications and its possible outcome.
		CO6	Understand the construction, working and types of three phase and single phase induction motors and its use in the present system.
ME100	**BASICS OF MECHANICAL ENGINEERING**	CO1	Explain the basics of thermodynamics, laws and application of thermodynamics and apply it to solve the air standard efficiency of various cycles.
		CO2	Discuss the concept of energy conversion and working of energy conversion devices such as IC engines, boiler, turbines, pumps.
		CO3	Explain the concepts of refrigeration and air-conditioning.
		CO4	Discuss the various components of automobile and the various power transmission devices.
		CO5	List the different engineering materials and discuss the various manufacturing processes like casting, forging, rolling, welding.
		CO6	Explain the various machine tools used in manufacturing industry.
CY110	**ENGINEERING CHEMISTRY LAB**	CO1	Standardize various solutions, estimate the amount of substance present in a given solution and determine the hardness of water.
		CO2	Provide an understanding in the methods of preparation of some industrially important polymers and to develop skills in the proper handling of apparatus and chemicals.
		CO3	For the interpretation and understanding of IR and NMR spectra and for the determination of structure of molecules using these techniques.
EE110	**BASIC ELECTRICAL WORKSHOP**	CO1	Familiarized with supply arrangements and their limitations, knowledge of standard voltages and their tolerances, safety aspects of electrical systems and importance of protective measures in wiring systems**.**

Course Code	Course Title		Course Outcomes
		CO2	Knowledge about the types of wires, cables and other accessories used in wiring. Creating awareness of energy conservation in electrical systems.
		CO3	Wire simple lighting circuits for domestic buildings, distinguish between light and power circuits.
		CO4	Measure electrical circuit parameters and current, voltage and power in a circuit.
ME110	BASIC MECHANICAL WORKSHOP	CO1	Identify and apply suitable tools and components in mechanical engineering workshop.
		CO2	Design and model different prototypes in the trade of joining processes such as carpentry, welding, fitting and sheet metal.
		CO3	Design and model different prototypes in the trade of shaping processes such as smithy and foundry.
		CO4	Demonstrate the working and applications of various machine tools.
		CO5	Interpret effective results based on the experiments conducted by individual and team work.
CE100	BASICS OF CIVIL ENGINEERING	CO1	Recognize the role of civil engineer in the development of the society and explain relationship of Civil engineering with other branches of engineering and technology.
		CO2	Discuss different types of buildings and materials of construction.
		CO3	Differentiate the features and components of Industrial and Residential buildings.
		CO4	Explain the concepts of surveying and its advances in civil engineering like remote sensing techniques, GIS and GPS.
		CO5	Knowledge about various services in building and need of intelligent buildings in modern world.
		CO6	Develop plan and set out a building.
CE110	CIVIL ENGINEERING WORKSHOP	CO1	Set out a building plan on field.
		CO2	Measure and calculate the area and volume of different building components.
		CO3	Find the compressive strength of different building materials and construct a wall in English bond.

SEMESTER III

Course Code	Course Title		Course Outcomes
MA201	LINEAR ALGEBRA AND	CO1	Relate the concepts of basic calculus in complex functions.
		CO2	Recognise the harmonic functions and construction of harmonic conjugate.

	COMPLEX ANALYSIS	CO3	Describe the geometry of analytic functions and identify their conformal mapping.
		CO4	Identify the singularities and formulate the residues to evaluate the real definite integrals.
		CO5	Apply gauss elimination method to solve the system of equations.
		CO6	Diagonalise a matrix by calculating eigen values and eigen vectors.
CE201	**MECHANICS OF SOLIDS**	CO1	Acquire knowledge on the concepts of stress and strain in elastic materials.
		CO2	Explain the concept of strain energy due to tension, compression and shear.
		CO3	Analyse structural members subjected to different types of loading and sketch SFD and BMD
		CO4	Analyse the behavior of beams under flexure by the application of simple bending theory.
		CO5	Analyse stresses in thick and thin cylinders and determine the torsional rigidity of springs.
		CO6	Determine deflections in determinate beams subjected to different loading conditions.
CE203	**FLUID MECHANICS-I**	CO1	Understand the basics of fluids; calculate the pressure in fluids and to analyze the condition of stability of floating and submerged bodies.
		CO2	Compare different types of fluid flows and apply continuity equation to one dimensional fluid flow problems.
		CO3	Apply Bernoulli's equation to fluid flow problems involving venturimeter, orifice meter, pitot tube and compute forces acting on a pipe bend.
		CO4	Classify different types of orifices, notches and weirs and calculate flow through these devices using Bernoulli's equation.
		CO5	Analyze the flow through pipes and compute the major and minor energy losses occurring in pipe.
		CO6	Understand the concept of development of boundary layer over a flat plate and apply this concept to calculate drag and lift forces.
CE205	**ENGINEERING GEOLOGY**	CO1	Acquire knowledge about the factors that determine the stability of earth's surface.
		CO2	Describe effects of subsurface water in soils with relevance to construction.
		CO3	Demonstrate a basic knowledge of investigation techniques and mitigation strategies for difficult scenarios.
		CO4	Use the knowledge about minerals to interpret basic properties of various strata and describe their significance to various projects.
		CO5	Identify and distinguish between various geological deformations and compare their shortcomings.

Course Code	Course Title		Course Outcomes
		CO6	Understand engineering and construction problems associated with natural phenomenon and of the procedures used to counteract such problems.
CE207	**SURVEYING**	CO1	Understand the basics of surveying and different methods of surveying.
		CO2	Acquire knowledge on levelling and plane table survey procedures.
		CO3	Identify the various errors in surveying and apply their corrections.
		CO4	Compare conventional to advanced surveying equipments and apply their knowledge to practical scenario.
		CO5	Compute the area of tract surveyed and determine the quantity of earthwork.
		CO6	Judge the suitable method of surveying based on the precision required and extent of work.
HS210	**LIFESKILLS**	CO1	Know the nuances of technical communication to interpret the cues of non-verbal communication so as to develop communicative efficiency in oral and written format; and demonstrate competency to face interview and group discussion.
		CO2	Recall and understand the various theories related to creativity to illustrate critical thinking and problem solving abilities.
		CO3	Describe and differentiate the concepts involved in groups and teams and illustrate the ability to function effectively as an individual, and as a member or leader in diverse teams.
		CO4	Define the terms as well as grasp the distinction between different terms related to ethics and values; assess the different moral and ethical theories to Engineering ethics and Human value.
		CO5	Identify and discuss the different leadership styles and choose the suitable style to become an effective leader.
CE231	**CIVIL ENGINEERING DRAFTING LAB**	CO1	Sketch and illustrate the various components of buildings.
		CO2	Develop plan, section and elevation of buildings with site plan based on functional requirements and KMBR.
		CO3	Use AUTOCAD to draft 2D drawings.
CE233	**SURVEYING LAB**	CO1	Employ conventional tools such as chain/tape, compass and dumpy level in surveying.
		CO2	Use theodolite and tacheometric surveying for linear and angular measurements.
		CO3	Demonstrate and operate modern surveying tools such as total station, auto level.

SEMESTER IV

Course Code	Course Title	Course Outcomes

MA202	**PROBABILITY DISTRIBUTIONS TRANSFORMS AND NUMERICAL METHODS**	CO1	Identify different types of discrete probability distributions, their properties such as its mean and variance and solve problems on binomial and Poisson distributions. Explain continuous random variables and associate them with Normal, Uniform, Exponential distributions, their properties such as mean and variance and calculate corresponding probability density function and cumulative distribution function.
		CO2	Applies Fourier integrals and transforms to analyse linear systems and signal processing problems.
		CO3	Apprehend the knowledge of Laplace transforms and applies it in solving ordinary differential equations and compute convolutions.
		CO4	Analyse various numerical techniques and to obtain approximate solutions to otherwise intractable mathematical problems. Evaluate the solutions of equations using numerical techniques.
CE202	**STRUCTURAL ANALYSIS I**	CO1	Analyse determinate trusses and discuss the concepts of elastic theorems and energy principles.
		CO2	Apply unit load method and strain energy method for analysis of statically determinate beams, frames - pin jointed trusses.
		CO3	Analyse structures by method of consistent deformation and employ strain energy methods on building components.
		CO4	Apply the concepts of influence line on moving loads and discuss its effect on structures.
		CO5	Interpret forces acting on cables and suspension bridges.
		CO6	Describe the theory of arches and determine reactions, normal thrust and radial shear developed on the arches.
CE204	**CONSTRUCTION TECHNOLOGY**	CO1	Understand the properties and testing of various materials used in building construction.
		CO2	Discuss in detail the properties of concrete and its manufacture.
		CO3	Describe about foundation, constructional features of different masonry and cost effective methods of construction.
		CO4	Explain the functional requirements of building and other finishing works carried out in a building.
		CO5	Understand about construction of tall buildings, different vertical transportation systems and other types of massive construction techniques.
		CO6	Understand different types of building failures and suggest retrofitting methods.
CE206	**FLUID MECHANICS–II**	CO1	Apply basic knowledge of impulse-momentum principle to analyse velocity triangles for designing hydraulic machines like turbines and pumps.
		CO2	Understand different components of hydroelectric power plants and suggest different types of turbines and pumps.

		CO3	Understand characteristics of uniform flow through open channels and design most economic and efficient channel sections.
		CO4	Apply concepts of specific energy, critical flow, sequent depths and energy losses to compute hydraulic jump characteristics for various applications.
		CO5	Understand gradually varied flow in open channels and apply analytical methods for computation of surface profiles.
		CO6	Apply dimensional analysis and model laws in hydraulic similitude studies.
CE208	**GEOTECHNICAL ENGINEERING–I**	CO1	Define the basic terms used in geotechnical engineering and solve the problems using the relationships between them.
		CO2	Utilise the index properties for classifying the soil.
		CO3	Determine the permeability of various types of soils and compute the effective stress under various field conditions.
		CO4	Determine the shear strength of soil and explain different shear tests to find the shear parameters used in various civil engineering applications.
		CO5	Explain the consolidation characteristics of the soil, define the coefficients related to consolidation and apply this information to find the consolidation settlement
		CO6	Explain the compaction characteristics of soil, various field compaction methods and analyse the stability of slopes.
HS200	**BUSINESS ECONOMICS**	CO1	Remember economics concepts and tools to make better decisions.
		CO2	Remember economics concepts and tools to make better decisions.
		CO3	Apply cost and benefits analysis for business projects.
		CO4	Apply and analyse the financial performance of business projects.
CE232	**MATERIALS TESTING LAB I**	CO1	Evaluate material properties.
		CO2	Interpret experimental data and reach a substantiated conclusion based on standards.
		CO3	Apply engineering fundamentals to identify the behavior of different materials in flexure, shear, torsion.
CE234	**FLUID MECHANICS LAB**	CO1	Understand the working principle of different flow measurement equipments and determine its coefficient of discharge
		CO2	Analyze the performance characteristics of different pumps and turbines
		CO3	Understand the stability conditions of floating bodies to determine its metacentric height
		CO4	Interpret effective results and inferences based on the experiments conducted

		CO5	Develop skill of experimentation techniques by individual and team work

SEMESTER V

Course Code	Course Title		Course Outcomes
CE301	**DESIGN OF CONCRETE STRUCTURES I**	CO1	Understand the design philosophies of reinforced concrete.
		CO2	Acquire awareness about the behaviour and resistance mechanism of reinforced concrete elements under flexure, shear, compression and torsion.
		CO3	Analyse and design various reinforced concrete components such as beam, slab, column, stair etc. and there by to arrive safety and economy.
		CO4	Prepare construction site-specific reinforcement detailing for various structural components.
		CO5	Familiarize the use of IS codes / standards in the design of concrete structures.
CE303	**STRUCTURAL ANALYSIS II**	CO1	Acquire knowledge on statically indeterminate structures and different methods of analysis.
		CO2	Identify the appropriate method of analysis for solving various types of statically indeterminate structures.
		CO3	Use equilibrium conditions and additional equations to solve given redundant structures.
		CO4	Analyse the given structure and calculate the shear force, bending moment and deflection.
		CO5	Analyse beams curved in plan.
		CO6	Analyse structures using plastic theory.
CE305	**GEOTECHNICAL ENGINEERING II**	CO1	Calculate the stress on soil under various loading conditions.
		CO2	Analyse the earth pressure on retaining structures for different soil/load conditions.
		CO3	Determine the bearing pressure and the load carrying capacities of foundations.
		CO4	Design different types of foundations for various site conditions.
		CO5	Compute the settlement of foundations.
		CO6	Prepare execution plan for site investigation and analyse bore log data.
CE307	**GEOMATICS**	CO1	Explain various traversing methods and traverse balancing methods.
		CO2	Identify the elements of different curves and set out simple and compound curves.

		CO3	Explain the components, principles, and applications of GPS.
		CO4	Describe the phases and methods of GPS survey.
		CO5	Explain the types of sensors, resolution in remote sensing and energy interactions with various features.
		CO6	Describe the components, coordinate systems and data types used in GIS.
CE309	**WATER RESOURCE ENGINEERING**	CO1	Describe the various components of hydrologic cycle.
		CO2	Analyse and estimate the rainfall data.
		CO3	Interpret the basic requirements of irrigation, various irrigation techniques and requirements of the crops.
		CO4	Comprehend the objectives and features of various river training works.
		CO5	Calculate the storage capacity of reservoirs, their useful life for reservoir planning and management.
		CO6	Discuss the occurrence, distribution and movement of ground water and compute the yield of ground water sources.
CE361	**ADVANCED CONCRETE TECHNOLOGY**	CO1	Identify the functional role of ingredients of concrete and apply this knowledge to mix design philosophy.
		CO2	Acquire and apply fundamental knowledge in the fresh properties of concrete.
		CO3	Develop an awareness of the utilization of waste materials as novel innovative materials for use in concrete and to design a concrete mix which fulfils the required properties for fresh and hardened concrete.
		CO4	Acquire and apply fundamental knowledge in the fresh properties of hardened concrete.
		CO5	Evaluate the effect of the environment on service life performance, properties and failure modes of structural concrete and demonstrate techniques of measuring the Non Destructive Testing of concrete.
		CO6	Develop awareness on special concretes and special processes of concreting.
CE371	**ENVIRONMENT & POLLUTION**	CO1	Acquire basic knowledge about environment, its structure and function.
		CO2	Interpret the technical aspects of pollution in terms of air, water, soil and noise.
		CO3	Recognize the various types of pollutants present in the environment and suggest suitable control methods.
		CO4	Interpret the ill effects of pollution on environment.
		CO5	Understand global environmental problems caused by human activities.

Course Code	Course Title		Course Outcomes
		CO6	Inspect the quality standards with respect to air, water and noise pollution.
CE331	MATERIALS TESTING LAB II	CO1	Conduct various tests on cement and assess its conformance to Indian standards.
		CO2	Determine the properties of fresh and hardened concrete using standard test procedures.
		CO3	Conduct tests to obtain the properties of fine and coarse aggregates and analyse it for various applications.
		CO4	Determine the strength of bricks and tiles used for construction.
CE333	GEOTECHNICAL ENGINEERING LAB	CO1	Evaluate the results obtained to classify soils and interpret its behaviour.
		CO2	Identify and conduct the tests required to obtain the soil properties pertaining to a specific field problem.
		CO3	Conduct laboratory tests to determine the physical and engineering properties of soils.

SEMESTER VI

Course Code	Course Title		Course Outcomes
CE302	DESIGN OF HYDRAULIC STRUCTURES	CO1	Understand various diversion head works, their layout and functions.
		CO2	Design the canal systems based on various silt theories and understand minor irrigation structures such as regulators, cross drainage works and canal falls.
		CO3	Design the hydraulic aspects and sketch various hydraulic structures for the given field conditions.
		CO4	Explain the various aspects of gravity dam and perform its stability analysis.
		CO5	Discuss the features of arch dam, earth dam, spillways and other hydraulic structures.
CE304	DESIGN OF CONCRETE STRUCTURES-II	CO1	Acquire in-depth knowledge and understand the design principles of RCC elements.
		CO2	Perceive, analyse and design RCC structures like columns, foundations, retaining walls, domes, circular slabs and water tanks.
		CO3	Identify and apply the Indian standard design codes relevant to the design of reinforced concrete members.
		CO4	Prepare structural drawings of different RCC elements.
		CO5	Perform a term project on design and detailing of any structure of real- world application.
		CO6	Understand the principles of prestressing techniques and determine the resultant stress distribution across the cross section incorporating loss of prestress at various stages.

CE306	**COMPUTER PROGRAMMING AND COMPUTATIONAL TECHNIQUES**	CO1	Attain knowledge about object-oriented concepts, flowchart and design algorithm for a given problem and to develop simple C++ programs.
		CO2	Analyse problems, identify subtasks and implement them as functions/procedures.
		CO3	Write C++ programs to solve simple engineering programs using array, functions and structures.
		CO4	Use object-oriented concepts like classes and objects for a given specification.
		CO5	Solve linear system of equations and partial differential equation both numerically and using C++ programs.
CE308	**TRANSPORTATION ENGINEERING-I**	CO1	Understand types of roads, requirements and factors controlling the alignment of a road.
		CO2	Design various geometric elements of highway.
		CO3	Describe the properties of materials used for pavement construction.
		CO4	Identify different types of pavements and modes of failure.
		CO5	Conduct traffic engineering studies and analyse data for efficient management of roadway facilities.
		CO6	Design traffic signals for road intersections.
		CO7	Understand the requirements and features of an airport and design basic airport facilities.
HS300	**PRINCIPLES OF MANAGEMENT**	CO1	Identify and discuss the relevance and different perspectives of management concepts.
		CO2	Describe and utilize management techniques for meeting current and future management challenges faced by the organization.
		CO3	Compare the management theories and models critically and demonstrate its validity in the real world.
		CO4	Understand the different decision making situations and outline the steps involved in solving problems faced by management.
		CO5	Identify the skills required by a manager with varying working situations
CE362	**GROUND IMPROVEMENT TECHNIQUES**	CO1	Knowledge about problematic soils and different ground improvement methods to improve its behavior.
		CO2	Identify suitable grouting method for a range of problematic soil with the knowledge of various types and its applications.
		CO3	Recognise appropriate stabilization method based on field soil conditions.
		CO4	Identify suitable rock bolting techniques with the knowledge of its mechanisms and applications.

Course Code	Course Title		Course Outcomes
		CO5	Interpret proper compaction methods than can be adopted based on field soil conditions.
		CO6	Interpret appropriate dewatering system with the knowledge of various methods and its design aspects.
CE366	TRAFFIC ENGINEERING AND MANAGEMENT	CO1	Describe the role of various traffic management measures including intelligent transportation system.
		CO2	Explain various traffic regulations concerning driver and vehicle.
		CO3	Identify level of service of highway and compute theoretical maximum capacity of a highway.
		CO4	Compute rotary intersection capacity and design fixed time traffic signals.
		CO5	Explain various causes of road accidents and preventive measures.
		CO6	Describe fundamental traffic flow theories and sketch basic diagrams of traffic flow.
CE374	AIR QUALITY MANAGEMENT	CO1	Identify different sources and types of air pollutants.
		CO2	Analyse the effects of air pollution on human health, plant, animal and the environment.
		CO3	Interpret meteorological data for atmospheric stability and air pollutant dispersion.
		CO4	Perform Gaussian Plume modeling based on different dispersion conditions.
CE332	TRANSPORTATION ENGINEERING LAB	CO1	Determine the properties of bitumen and assess its suitability in highway construction
		CO2	Evaluate the quality of aggregates, subgrade soil and their suitability in highway construction.
		CO3	Evaluate the functional condition of flexible pavements.
CE334	COMPUTER AIDED CIVIL ENGINEERING LAB	CO1	Use AutoCAD and Staad Pro to model, analyse and design structures as well as effectively interpret the results.
		CO2	Perform project planning and scheduling using project management software.
		CO3	Conduct land survey using total station.
CE352	COMPREHENSIVE EXAM	CO1	Recall the comprehensive knowledge gained in courses relevant to civil engineering.
		CO2	Comprehend the questions (Oral and written) and answer them with confidence.

SEMESTER VII

Course Code	Course Title	Course Outcomes

CE401	**DESIGN OF STEEL STRUCTURES**	CO1	Understand the design philosophy of steel structures based on limit state design.
		CO2	Illustrate the behaviour of steel structures, in particular the various forms of failure for members and connections under tension, compression, bending and combined actions.
		CO3	Apply the principles and relevant IS code requirements for the analysis and design of steel tension members, beams, columns, plate girders and connections.
		CO4	Estimate the loads acting on roof truss and design it's structural components.
		CO5	Distinguish the behaviour of timber structures under flexure, shear and bearing and Design structural components of flitched beam sections.
CE403	**STRUCTURAL ANALYSIS III**	CO1	Analyse multi-storied buildings/structures using approximate methods.
		CO2	Identify the static and kinematic indeterminacy of structures.
		CO3	Analyse trusses, continuous beams and rigid frames by flexibility method.
		CO4	Analyse trusses, continuous beams and rigid frames by stiffness method.
		CO5	Describe and analyse frames and trusses by direct stiffness method.
		CO6	Recall the basics of structural dynamics and identify the dynamic response of SDOF systems.
CE405	**ENVIRONMENTAL ENGINEERING I**	CO1	Acquire knowledge of elementary principles of water supply engineering.
		CO2	Explain the various phases of water quality analysis and the operation of water treatment plant.
		CO3	Apply diverse methodologies for assessing quality of water from different sources.
		CO4	Estimate the fluctuations in quantity of water for the design of different components of a water supply system.
		CO5	Design the outline and structural components of water supply scheme for urban as well as rural areas.
		CO6	Appraise most suitable options for treatment and networking from different accessible options based on inflow and outflow characteristics.
CE407	**TRANSPORTATION ENGINEERING – II**	CO1	List the role of railways in national development, modern techniques adopted and recognise the factors affecting alignment and requirements of a track structure.
		CO2	Design the horizontal and vertical elements of a railway track.
		CO3	Discuss the various aspects of points and crossings, interlocking of signals .
		CO4	Identify failures in railway track & suggest maintenance measures.
		CO5	Understand the various aspects of tunnel surveying and compare different tunnel driving procedures in complex geographical profiles.

		CO6	Understand the features, classifications and design principles of harbours, breakwaters and docks.
CE409	**QUANTITY SURVEYING AND VALUATION**	CO1	Understand the specifications for various building works.
		CO2	Estimate the quantity of materials for building works.
		CO3	Evaluate rates of various building construction works.
		CO4	Prepare the Bar bending schedule of different RCC components/ structures.
		CO5	Prepare detailed and abstract estimates.
		CO6	Determine the value of land and building.
CE467	**HIGHWAY PAVEMENT DESIGN**	CO1	Understand the component parts of pavements and their desirable properties.
		CO2	Analyse the stresses and deflections in flexible pavements.
		CO3	Design flexible pavement layers using various approaches.
		CO4	Analyse the stresses in rigid pavements.
		CO5	Design longitudinal and transverse joints in cement concrete pavements.
		CO6	Evaluate structural condition of pavements and design pavement overlays.
CE469	**ENVIRONMENTAL IMPACT ASSESSMENT**	CO1	Describe various types of environmental pollution that affects air, water, soil and noise.
		CO2	Understand the concepts of impact assessment methodologies and environmental management plans.
		CO3	Apply the relevant quality standards of air, water and noise for assessing environmental pollution.
		CO4	Assess Environmental Impact Statement for different projects.
		CO5	Develop opinion or decisions regarding the commencement of new projects in an ecosystem based on the impacts of that project on environment.
		CO6	Explain the impacts due to deforestation, ozone layer depletion, land degradation, urbanization, pesticide pollution and the improper disposal of solid waste.
CE431	**ENVIRONMENTAL ENGINEERING LAB**	CO1	Identify the appropriate tests for the given environmental problems and conduct experiments to estimate water and wastewater quality parameters.
		CO2	Interpret laboratorial results.
		CO3	Apply the knowledge for problem identification, quantification, and basic environmental design for sustainable development.

Course Code	Course Title		Course Outcomes
CE451	**SEMINAR AND PROJECT PRELIMINARY**	CO1	Analyse a current topic of research / professional interest and present the matter effectively as a technical report and orally before an audience.
		CO2	Identify problems relevant to the present civil engineering scenario and prepare a work plan based on knowledge gained from different courses and detailed literature review.

SEMESTER VIII

Course Code	Course Title		Course Outcomes
CE402	**ENVIRONMENTAL ENGINEERING II**	CO1	Acquire knowledge of elementary principles of sanitary engineering.
		CO2	Explain the various wastewater characteristics and the operation of effluent treatment plant.
		CO3	Apply diverse methodologies for assessing quality & quantity of sewage from different sources.
		CO4	Familiarize materials, design and construction of sewerage.
		CO5	Design the outline and structural components of sewage treatment systems for domestic as well as industries.
		CO6	Appraise most appropriate option of treatment based on source characteristics and valid disposal facility.
CE404	**CIVIL ENGINEERING PROJECT MANAGEMENT**	CO1	Understand the concepts of planning and scheduling and network analysis techniques.
		CO2	Understand the approaches for resource allocation and codification of planning system.
		CO3	Explain the various aspects of disputes, settlement and construction budget.
		CO4	Apply the principles of ethics in decision making and to use information system in project management.
		CO5	Demonstrate the concepts of material management and application of safety measures in construction works.
		CO6	Discuss various construction procedures and understand the basics of Total Quality Management.
CE462	**TOWN AND COUNTRY PLANNING**	CO1	Explain the fundamentals of town and country planning and list various push and pull factors of urbanization.
		CO2	Explain concepts of regional planning and identify major regional problems and their solution.
		CO3	Describe and interpret various theories of urbanization and urban forms.
		CO4	Explain urban structure and its characteristics, illustrate special standards of various entities of a town and provisions of Town Planning Act.

		CO5	Describe the concept of new town and urban renewal.
		CO6	Understand the concepts of town development plan and its key components.
CE492	**FINAL PROJECT**	CO1	Apply the technical knowledge gained in solving real life engineering problems and elaborate it through a detailed design.
		CO2	Develop prototypes / methodologies to solve the key issues related to Civil Engineering systems and conduct appropriate tests to measure and evaluate the performance of prototype/methodology.
		CO3	Communicate the team's logistical and technical approaches to the final project using appropriate graphical/modelling tools through project report and presentation.
ME482	**ENERGY CONSERVATION AND MANAGEMENT**	CO1	Know the importance of Energy Auditing by reviewing the present global energy scenario and its implications on the environment.
		CO2	Explain the components of electricity billing and analyze and calculate the lighting requirements for a facility.
		CO3	Relate and analyze the theories of energy management and consumption for Boilers, Furnaces and Thermic Fluid Heaters. They also understand the utilization of Steam traps, condensate recovery systems etc. to enhance the efficiency of the system.
		CO4	Discuss the working of basic mechanical systems and evaluate its efficiency.
		CO5	Explain the process of energy auditing and are able to identify and compare the energy consumption by a process and to reduce the losses.
		CO6	Define and discuss the energy economics and ESCO concepts

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Program Educational Objectives (PEO)

PEO 1. Apply computer science theory blended with mathematics and engineering to model computing systems.

PEO 2. Nurture strong understanding in logical, computing and analytical reasoning among students coupled with problem solving attitude that prepares them to productively engage in research and higher learning.

PEO 3. Communicate effectively with team members, engage in applying technologies and lead teams in industry.

PEO 4. Engage in lifelong learning, career enhancement and adapt to changing professional and societal needs.

Program Outcomes (PO)

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, 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 modelling 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 Outcomes

Computer Science and Engineering graduates will be able to:

PSO 1: Apply knowledge of mathematics, science, engineering and computer science fundamentals to solve complex computational problems.

PSO 2: Use modern tools to analyze,design and develop software solutions in the areas pertaining to system software, database, networking, web and mobile applications, information security, data analytics and machine learning.

PSO 3: Employ modern computer languages, environments, and platforms to create innovative career paths, pursue higher studies and entrepreneurship.

COURSE OUTCOMES (COs)

B.Tech Semester 1
COURSE NAME:BE101-05 Introduction to Computing and Problem Solving
Year of study:2015

Sl. No.	Course Outcomes
C201.1	Understanding about the basic functional units of a computer
C201.2	Develops the ability to analyze a problem, develop an algorithm to solve it.
C201.3	Develops the use of the Python programming language to implement various algorithms, and develops the basic concepts and terminology of programming in general.
C201.4	Thorough understanding of functions and its implementation in Python
C201.5	Introduces the more advanced features of the the Python programming language.

B.Tech I Semester
COURSE NAME: BE 100 ENGINEERING MECHANICS

Sl. No.	Course Outcomes
BE100.1	Understand the fundamental concepts and laws of mechanics and draw free body diagrams to determine the resultant of forces and/or moments.
BE100.2	Use the knowledge about different types of beams, supports and loads to determine the support reactions developed in the beam and also to solve the force system in space using vector approach
BE100.3	Determine the centroid and moment of inertia of surfaces and solids using parallel and perpendicular axis theorems and to calculate the area and volume of basic figures using theorem of Pappus and Guldinus

BE100.4	Solve problems related to friction and apply principle of virtual work to determine the support reactions in beam.
BE100.5	Apply the laws of motion, kinematics of motion and their interrelationship to systems in general plane motion and practical engineering problems
BE100.6	Understand the concepts in simple harmonic motion and vibrations and to calculate the parameters of bodies executing such motion

B.Tech II Semester
COURSE NAME:

B.Tech III Semester
COURSE NAME: CS 203 SWITCHING THEORY AND LOGIC DESIGN
Year of Study: 2017

C203.1	To impart an understanding of the basic concepts of Boolean algebra and digital systems. Introduction to different number systems and its arithmetic.
C203.2	Apply the basic concepts of Boolean algebra for the simplification and implementation of logic functions using suitable gates namely NAND, NOR etc.
C203.3	Design simple Combinational Circuits such as Adders, Subtractors, Code Convertors, Decoders, Multiplexers, and Magnitude Comparators etc.
C203.4	Analyze and Design simple and commonly used Sequential Circuits viz. different types of Counters, Shift Registers, Serial Adders and Sequence Generators.
C203.5	Explain and illustrate algorithms for addition/subtraction operations on Binary, BCD and Floating Point Numbers. Basic knowledge of memory and processor.

B.Tech Semester III

COURSE NAME:CS205 DATA STRUCTURES
Year of study:2016

Sl. No.	Course Outcomes
C205.1	Can analyse the perfomance of different algorithms using asymptotic notations and will be able to compare different programming methodologies
C205.2	Students will be able to recognize the appropriate memory management techniques, linear data structures like arrays and linked list to solve real world problems efficiently.

C205.3	Students will be able to represent and manipulate data using stacks and queues and apply suitably and use nonlinear data structures like trees and graphs to design algorithms for various applications.
C205.4	Students will be able to illustrate, compare various techniques for searching and sorting
C205.5	Students will be able to illustrate strings handling functions and various hashing techniques

B.Tech IV Semester
CS 206 Object Oriented Design and Programming

C206.1	Apply object-oriented principles in software design process
C206.2	Develop Java programs for real applications using Java constructs and libraries
C206.3	Understand and apply various object-oriented features like inheritance, data abstraction, encapsulation and polymorphism to solve various computing problems using Java language
C206.4	Implement Exception Handling in Java
C206.5	Use graphical user interface and Event Handling in Java
C206.6	Develop and deploy Applet in Java

COURSE NAME: Principles of Database Design

Sl. No.	Course Outcomes
C208.1	The students will be able to define, explain and illustrate the fundamental concepts of databases.
C208.2	The students will be able to construct an Entity-Relationship (E-R) model from specifications and to perform the transformation of the conceptual model into corresponding logical data structures.
C208.3	The students will be able to model and design a relational database following the design principles
C208.4	The students will be able to develop queries for relational database in the context of practical applications

C208.5	The students will be able to define normalization techniques, explain and illustrate fundamental principles of data organization, query optimization and concurrent transaction processing.
C208.6	The students will be able to appreciate the latest trends in databases.

COURSE NAME: CS 202: Computer Organization and Architecture
Year of Study: 2017

Sl. No.	Course Outcomes
C202.1	Identify the basic structure and functional units of a digital computer.
C202.2	Analyze the effect of addressing modes on the execution time of a program.
C202.3	Design processing unit using the concepts of ALU and control logic design.
C202.4	Identify the pros and cons of different types of control logic design in processors.
C202.5	Select appropriate interfacing standards for I/O devices.
C202.6	Identify the roles of various functional units of a computer in instruction execution

COURSE NAME: CS 204 OPERATING SYSTEMS
Year of Study: 2017

Sl. No.	Course Outcomes
C204.1	Identify the significance of operating system in different environments
C204.2	Exemplify the communication between application programs and hardware devices through system calls.
C204.3	Compare and illustrate various process scheduling algorithms.
C204.4	Apply appropriate memory and file management schemes.
C204.5	Illustrate various disk scheduling algorithms.
C204.6	Examine the need of access control and protection in an operating system.

B.Tech V Semester
COURSE NAME: Theory of Computation
Year of Study: 2018

Sl. No.	Course Outcomes

C301.1	Students will be able to define the mathematical principles behind theoretical computer science
C301.2	Students will be able to differentiate and give examples for the different types of automata like finite automata, pushdown automata, linear bounded automata and Turing machine.
C301.3	Students will be able to correlate the different types of automata to real world applications.
C301.4	Students will be able to choose and design appropriate automata for the different requirements outlined by theoretical computer science.
C301.5	Students will be able to differentiate and give grammars for different types of languages associated with the automata.

B.Tech V Semester
COURSE NAME: CS307 Data Communication
Year of Study: 2017

Sl. No.	Course Outcomes
C307.1	The students will be able to identify and list the various issues present in the design of a data communication system
C307.2	The students will be able to apply the time domain and frequency domain concepts of signals in data communication
C307.3	The students will be able to compare and select transmission media based on transmission impairments and channel capacity.
C307.4	The students will be able to select and use appropriate signal encoding techniques and multiplexing techniques for a given scenario
C307.5	The students will be able to design suitable error detection and error correction algorithms to achieve error free data communication and explain different switching techniques.

B.Tech V Semester
COURSE NAME: CS361 Soft Computing
Year of Study: 2017

Sl. No.	Course Outcomes
C361.1	Students will be able to relate various soft computing techniques and their applications and also able to differentiate ANN and biological Neuron
C361.2	Students will be able to Analyze and relate various neural network architectures.

Sl. No.	
C361.3	Students will be able to explain and develop fuzzy systems.
C361.4	Identify and select a suitable Soft Computing technology to solve the problem.
C361.5	Understand genetic algorithm concepts and their applications and solve the genetic algorithm problem

B.Tech VI Semester
COURSE NAME: CS302 DESIGN AND ANALYSIS OF ALGORITHMS
Year of Study: 2018-2019

Sl. No.	Course Outcomes
C302.1	Understand a given algorithm and express its time and space complexities in asymptotic notations
C302.2	Solve recurrence equations using Iteration method, Recursion tree method and Master's Theorem
C302.3	Understand and design algorithms using Divide and Conquer Strategy
C302.4	Perform comparison of dynamic Programming and Divide and Conquer Strategies of various algorithms
C302.5	Understand greedy strategy and Solve optimization problems using Greedy strategy
C302.6	Designing efficient algorithms using Backtracking and Branch and Bound Techniques for solving problems. Classify computational problems into P, NP, NP-Hard and NP-Complete.

B.Tech VI Semester
COURSE NAME: CS368 WEB TECHNOLOGIES
Year of Study: 2018-2019

Sl. No.	Course Outcomes
C368.1	Explain and discuss the fundamentals of Web Technology.
C368.2	Explain and summarize the basic tags and properties in HTML, XHTML.
C368.3	Designing web pages using XHTML tags and CSS properties.
C368.4	Develop web applications using Javascript
C368.5	Students will be able to prepare XML documents to store and transport data.

C368.6	Developing web applications using PHP.

B.Tech VI Semester
COURSE NAME: CS306 Computer Networks
Year of Study:2019

Sl. No	Course Outcomes
C306.1	Enables the students to visualize the different aspects of networks, protocols and network design models
C306.2	Enables the students to examine various Data Link layer design issues and Data Link protocols
C306.3	Enables the students to analyze and compare different LAN protocols
C306.4	Enables the students to compare and select appropriate routing algorithms for a network
C306.5	Enables the students to examine the important aspects and functions of different Internet Control and Routing Protocols
C306.6	Enables the students to examine the important aspects and functions of transport layer and application layer in internetworking

B.Tech Semester VI
COURSE NAME:CS 304 COMPILER DESIGN
Year of study:2018

Sl. No.	Course Outcomes
C304.1	Students will be able to explain the concepts and different phases of compilation with compile time error handling.
C304.2	Students will be able to represent language tokens using regular expressions and finite automata and design lexical analyzer for a language.
C304.3	Students will be able to understand the concepts of parsing , develop basic top down and bottom up parsers for a CFG and to generate the parse trees by analysing the features of the given grammar.
C304.4	Students will be able to generate intermediate representations for statements as assignment statements, control statements, array operations and boolean statements
C304.5	Students will be able to design syntax directed translation schemes for a given context free grammar

Sl. No.	
C304.6	Students will be able to apply optimization techniques to intermediate code and generate machine code for high level language program.
C304.7	Students will be able to apply concepts of Runtime Environment related to Code Generation

B.Tech VI Semester
COURSE NAME: CS308 Software Engineering and Project Management
Year of Study: 2018

Sl. No.	Course Outcomes
C308.1	Understand the fundamental concepts of Software Engineering and able to identify suitable life cycle models to be used.
C308.2	Understand the various phases in Software development and analyze a problem and identify and define the computing requirements to the problem.
C308.3	Using the knowledge of requirement specification, able to translate to a design using appropriate software engineering methodologies. Determine the effective modular design based on the requirement specification
C308.4	Use the knowledge of design determine the coding practice and complexity analysis. Apply appropriate testing strategy for a given software system.
C308.5	Develop software projects based on current technology, by managing resources economically and by keeping ethical values.
C308.6	Analyze the project and be able to schedule and track. Also able to perform software configuration management.

COURSE NAME: CS 364 Mobile Computing
Year of Study: 2018

Sl. No.	Course Outcomes
C364.1	The students will be able to learn about the history and employ the basic of mobile communication

C364.2	The students will be able to define various Mobile Computing application, services and architecture
C364.3	The students will be able to describe protocol architecture of WLAN technology
C364.4	The students will be able to recognize the structure and functions of mobile network layer
C364.5	The students will be able to distinguish various technology trends for next generation cellular wireless networks
C364.6	The students will be able to identify Security Issues in mobile computing and get familiarized with the latest technologies currently used

B.Tech V Semester
COURSE NAME: CS 309 Graph Theory & Combinatorics
Year of Study: 2018

Sl. No.	Course Outcomes
C309.1	Understand the fundamental concepts in graph theory including properties and characterization of graphs/ trees and Graphs theoretic algorithms
C309.2	Define basic concepts in combinatorial graph theory
C309.3	Discuss how graphs serve as models for many standard problems
C309.4	Analyze the concept of Euler graph, cut set and connectivity.
C309.5	Differentiate computer representations of graphs
C309.6	Various applications of graphs in science, business and industry with the help of algorithms

B.Tech VII Semester
COURSE NAME: CS403 Programming Paradigms
Year of Study: 2018

Sl. No.	Course Outcomes

C403.1	Understand the basic constructs of all programming languages and compare scope and binding of names in different programming languages
C403.2	Application of correct programming language when asked to solve a real time problem.
C403.3	Appraise constructs in functional and logic languages
C403.4	Ability to understand and implement the features of OOP and scripting languages.
C403.5	Comparison of various concurrency concepts
C403.6	Interpret the concepts of run- time program management

B.Tech VII Semester
COURSE NAME: CS405 Computer System Architecture
Year of Study:2018

Sl. No.	Course Outcomes
C405.1	Summarize different parallel computer models and Analyze performance of a machine using fixed workload
C405.2	Analyze and interpret the advanced processor technologies and Memory Hierarchy
C405.3	Differentiate between different multiprocessor system interconnecting mechanisms
C405.4	Analyze different message passing mechanisms and different pipe lining techniques and also analyze the design of instruction and arithmetic pipeline
C405.5	Summarize concepts of multithreaded and dataflow architectures

B.Tech VII Semester
COURSE NAME: CS407 DISTRIBUTED COMPUTING
Year of Study:2018

Sl. No.	Course Outcomes
C407.1	The students will be able to distinguish distributed computing paradigm from other computing paradigms
C407.2	The students will be able to identify the core concepts of distributed systems
C407.3	The students will be able to illustrate the mechanisms of inter process communication in distributed system

C407.4	The students will be able to apply appropriate distributed system principles in ensuring transparency, consistency and fault-tolerance in distributed file system
C407.5	The students will be able to compare the concurrency control mechanisms in distributed transactional environment
C407.6	The students will be able to interpret the need for mutual exclusion and election algorithms in distributed systems

B.Tech VIII Semester
COURSE NAME: CS 404 EMBEDDED SYSTEMS
Year of Study: 2019

Sl. No.	Course Outcomes
C404.1	The students will be able to distinguish the technologies behind embedded computing systems
C404.2	The students will be able to model the operations of a given embedded system using computational models and UML
C404.3	The students will be able to analyze the characteristics of different computing elements and select the most appropriate one for an embedded system
C404.4	The students will be familiarized with different Embedded System Development Environments
C404.5	The students will be able to develop simple tasks to run on an RTOS
C404.6	The students will be able to examine the latest trends prevalent in embedded system design

COURSE NAME: CS 464 ARTIFICIAL INTELLIGENCE
Year of Study: 2019-2020

Sl. No.	Course Outcomes
C464.1	Appreciate the scope and limits of the artificial intelligence (AI) field.
C464.2	Explain various search algorithms (uninformed, informed, and heuristic) for problem solving
C464.3	Understand the fundamentals of knowledge representation (logic-based, frame-based, semantic nets)

| C464.4 | Ability to apply machine learning techniques to real-world problems |
| C464.5 | Comprehend the fundamentals of Natural Language Processing and expert systems |

COURSE NAME: CS 466 DATA SCIENCE
Year of Study: 2019-2020

S.NO	Course Outcome
C466.1	Explain and discuss the significance of data science and its key functionalities
C466.2	Discuss and demonstrate various models suitable for data science
C466.3	Perform preliminary statistical analysis using R language on simple data sets
C466.4	Perform python-based prediction and filtering on simple data sets
C466.5	Explain Hadoop Ecosystem and perform Map-Reduce for data analysis documents
C466.6	Perform data visualization techniques and explain methods for deploying

Course Name: CS402 DATA MINING AND WAREHOUSING
Year of Study: 2018-1019

C402.1	To introduce the concepts of data mining and its applications.
C402.2	To understand data pre-processing methods
C402.3	To understand data classification models.
C402.4	To understand classification accuracy measures and methods to improve performance of models.
C402.5	To understand data clustering algorithms.
C402.6	To understand different methods to mine frequent itemsets.
C402.7	To introduce advanced Data Mining techniques.

B.Tech Semester VII
COURSE NAME: CS 401 COMPUTER GRAPHICS
Year of Study: 2018

Sl. No.	Course Outcomes

C401.1	Students will be able to explain the working of various output and input devices for graphics.
C401.2	Students will be able to understand and apply various algorithms for generating and displaying output primitives
C401.3	Students will be able explain about graphics primitives and work with coordinate spaces, coordinate conversion, and transformations of graphics objects.
C401.4	Students will be able to understand and apply the concepts of 2D and 3D geometrical transformations using modern tools.
C401.5	Enable students to understand and explain various 3D projections and current models for surfaces.
C401.6	Enable the students to analyze the application of computer graphics in digital image processing

B.Tech Semester V

COURSE NAME:CS303 system software
Year of Study: 2017

Sl. No.	Course Outcomes
C303.1	Students will be able to distinguish different software into different categories
C303.2	Students will be able to compare and assess the SIC and SIC\XE Architectures
C303.3	Students will be able to design, analyze and implement one pass, two pass or multi pass assembler
C303.4	Students will be able to design, analyze and implement loader and linker.
C303.5	Students will be able to design, analyze and implement macro processors
C303.6	Students will be able to distinguish the features of modern editing debugging tools

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

<u>**PROGRAM EDUCATIONAL OBJECTIVES**</u>

PEO 1. Be able to apply the fundamental concepts of mathematics, science and computing to Electronics and Communication Engineering so as to design and develop interdisciplinary and innovative systems.

PEO 2. Be able to communicate effectively and inculcate team work, ethics and leadership for a successful career in industry and R&D organizations.

PEO 3. Be competent to use new technologies and attain professional excellence from lifelong learning through advanced research, publications and other professional activities.

PROGRAM OUTCOMES

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, 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 modelling 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 OUTCOMES

PSO 1. To prepare students with good scientific and engineering breadth so as to recognize and assess problems and apply fundamental knowledge to design and create novel systems in the field of Electronics and Communication to solve these problems.

PSO 2. To provide graduates with a skill in using hardware and software tools for advanced Electronics and Communication engineering applications for furtherance of research activities.

PSO 3. To impart quality and value based education so that graduates are competent in analysing the working of electronic systems and interpreting results to arrive at valid conclusions.

COURSE OUTCOMES (COs)

Course Code	Course Title	Course Outcomes	DEFINITION OF COURSE OUTCOMES

			SEMESTER 1
MA 101	**Calculus**	**CO1**	Define Infinite series and use various convergence tests to determine convergence and divergence of series.
		CO2	Calculate higher order Partial derivatives, Apply chain rule to functions of several variables , Determining extrema and to interpret the physical meaning of Partial Derivatives.
		CO3	Calculate double and triple integrals using rectangular and polar co-ordinates and hence apply the same to find the area and volume.
		CO4	Use vector valued functions in various physical applications.
		C05	Examine vector fields , define and calculate line integrals using the fundamental theorem of line integrals. Define and compute gradient, divergence and curl of vector fields and apply Greens Theorem, Stokes Theorem and Divergence Theorem
CY100	**Engineering Chemistry**	**CO1**	The theory and principle of UV-Visible, IR and NMR spectroscopy and able to predict the structure of unknown /new compounds with the help of spectroscopy.
		CO2	Demonstrates understanding of the essential aspects of electrochemical cells, emf , applications of emf measurement and solve related problems
		CO3	Develop understanding of Chemical structure of polymers and its effects on their various properties when used as engineering material, also to understand the economical and new methods for the synthesis of nanomaterial.
		CO4	Will be able to explain thermal methods of analysis and also classify the various chromatographic techniques based on stationary and mobile phase.
		C05	Will be able to explain the properties and separation techniques of petroleum and natural gases along with potential applications and role of biodiesel in the current situation.
		CO6	Will be able to differentiate hard and soft water , solve the related numerical problems on water purification and its significance in the industry and daily life.
BE100	**Engineering Mechanics**	**CO1**	Understand the fundamental concepts and laws of mechanics and draw free body diagrams to determine the resultant of forces and/or moments.

		CO2	Use the knowledge about different types of beams, supports and loads to determine the support reactions developed in the beam and also to solve the force system in space using vector approach
		CO3	Determine the centroid and moment of inertia of surfaces and solids using parallel and perpendicular axis theorems and to calculate the area and volume of basic figures using theorem of Pappus and Guldinus
		CO4	Solve problems related to friction and apply principle of virtual work to determine the support reactions in beam.
		CO5	Apply the laws of motion, kinematics of motion and their interrelationship to systems in general plane motion and practical engineering problems
		CO6	Understand the concepts in simple harmonic motion and vibrations and to calculate the parameters of bodies executing such motion
BE10104	**Introduction to Electronics Engineering**	CO1	Apply knowledge about different passive components used in electronic industry for common application
		CO2	Familarize with the working of different active components for designing basic electronic circuits
		CO3	Design circuits using passive and active components for strengthening fundamental idea about basic electronics
		CO4	Identify the basic construction of measuring instruments used in electronic measurements
		C05	Familarize the devices used in entertainment electronics
		CO6	Familarize the devices used in basic communication systems
BE103	**Sustainable Engineering**	CO1	Define the concepts, importance and challenges of sustainable engineering
		CO2	Recognize various environmental issues, their sources, effects and remedies
		CO3	Apply different sustainable methods and techniques for product-service system development
		CO4	Analyze the sustainability of different products and services using environmental management tools
		C05	Practice sustainable methods by utilizing the engineering knowledge and principles gained from this course

Course Code	Course Title	Course Outcomes	DEFINITION OF COURSE OUTCOMES
		CO6	Compare the pollution potential of various services and products
CE100	Basics of Civil Engineering	CO1	Recognize the role of civil engineer in the development of the society and explain relationship of civil engineering with other branches of engineering and technology
		CO2	Illustrate different types of buildings and materials of construction.
		CO3	Differentiate the features and components of Industrial and Residential buildings by conducting field visits
		CO4	Explain the concepts of surveying and its advances in civil engineering like remote sensing techniques, GIS and GPS.
		C05	Knowledge about various services in building and need of intelligent buildings in modern world
		CO6	Plan and set out a building

Course Code	Course Title	List of Course Outcomes	
		Course Outcomes	DEFINITION OF COURSE OUTCOMES
SEMESTER 2			
MA102	Differential Equations	CO1	Understand the methods used to solve homogeneous differential equations and apply them to solve the differential equations. Relate the methods to solve non homogeneous differential equations.

		CO2	Applies Fourier series to several problems.
		CO3	Understand the formation and solution of partial differential equations and further solve them.
		CO4	Analyze the equation governing small transverse vibrations of an elastic string and evaluate the temperature distribution in a uniform bar.
PH100	Engineering Physics	CO1	Know the various types of oscillators and waves, understand the theory related to them and solve engineering problems using the concepts of harmonic oscillations, wave motion.
		CO2	Recall, understand and apply the theory of thin film interference and diffraction to daily life experiences.
		CO3	Describe, explain and apply the theories of polarization and superconductivity to various engineering problems.
		CO4	Know and understand the role of quantum mechanics and statistical mechanics in engineering subjects so as to apply and analyze them in various situations.
		C05	Know and understand the various aspects of Ultrasonic and acoustics.
		CO6	Know about the properties of laser, holography, fiber optics and photonics and understand their significance and in moderntechnology mainly communication and medical fields as well asapply the theory in solving related problems.
BE102	Design & Engineering	CO1	Analyze the different elements involved in good design and apply them in practice when called for
		CO2	Aware of the product oriented and user oriented aspects of an optimal design
		CO3	Produce an innovative design concept by incorporating the different segments of knowledge gained
		CO4	Value the different perspective of design factors covering functions, cost,

			sustainability, environmental impact, safety and others
ME100	Basics of Mechanical Engineering	CO1	Explain the basics of thermodynamics, laws and application of thermodynamics and apply it to solve the air standard efficiency of various cycles
		CO2	Discuss the concept of energy conversion and working of energy conversion devices such as IC engines, boiler, turbines, pumps
		CO3	Explain the concepts of refrigeration and air-conditioning
		CO4	Discuss the various components of automobile and the various power transmission devices
		C05	List the different engineering materials and discuss the various manufacturing processes like casting, forging, rolling, welding
		CO6	Explain the various machine tools used in manufacturing industry
BE110	Engineering Graphics	CO1	Understand the fundamental concepts of theory of projection and determine the projections of the line positioned in different conditions.
		CO2	Solve problems related to the projection of solids placed in different conditions
		CO3	Understand the fundamental concept of Isometric projections to sketch the isometric view of solids
		CO4	Recognize the features of CAD software to sketch the orthographic views of the given isometric view
		C05	Use the knowledge of projection of solids to section and develop the given solids
		CO6	Understand the concepts of Perspective Projection and Intersection of surfaces to sketch the real view of objects
EE100	Basics of Electrical Engineering	CO1	Understand and analyse the concept and theory of electric circuits and laws so as to define and apply it for evaluating the parameters using various methods that will encourage students to take up innovative ideas.

		CO2	Understand magnetic circuits and electromagnetic induction and then to measure various quantities for assessing the magnetic performance of the circuits.
		CO3	Analyse line and phase quantities and to discuss its impact on the passive elements in order to evaluate the three phase system and to measure power using various wattmeter methods.
		CO4	Acquire the concept of generation, transmission and distribution of power system so that they can relate to the functioning of the present power system and substation equipment.
		C05	Understand the construction, working and types of DC machines and transformers so as to get an idea of its applications and its possible outcome.
		CO6	Understand the construction, working and types of three phase and single phase induction motors and its use in the present system.

List of Course Outcomes			
Course Code	Course Title	Course Outcomes	DEFINITION OF COURSE OUTCOMES
SEMESTER 3			
MA201	Linear Algebra & Complex Analysis	CO1	Relate the concepts of basic calculus in complex functions. Recognise the harmonic functions and construction of harmonic conjugate.
		CO2	Describe the geometry of analytic functions and identify their conformal mapping
		CO3	Evaluate line integrals using Cauchy's integral theorem and Cauchy's integral formula and the singularities in finding the residues to evaluate the real definite integrals.
		CO4	Apply gauss elimination method to solve the system of equations. Diagonalise a matrix by calculating eigen values and eigen vectors.

HS200	Business Economics	CO1	To remember economics concepts and tools to make better decisions
		CO2	To understand and analyze market conditions for decisions
		CO3	To apply cost and benefits analysis for business projects
		CO4	To apply and analyse the financial performance of business projects
		C05	To apply capital budgeting methods for investment proposals
EC201	Network Theory	CO1	Recall about basic theorems like Kirchoff's laws and Ohm's Law
		CO2	Illustrate the behaviour and current and voltage relations of ac and dc circuits .
		CO3	Apply the network theorems on various electrical networks
		CO4	Apply laplace transform techniques on dc and ac transients
		C05	Study and illustrate problems on two port networks
		CO6	Study coupled and resonant circuits
EC203	Solid State Devices	CO1	To understand the behaviour and electrical properties of semiconductors
		CO2	To create knowledge on quantitave analysis of semiconductor devices
		CO3	To categorize and analyze working principles of various solid state devices
		CO4	To understand the basic concepts of BJT and FET.
		C05	To apply and acquire knowledge on microelectronic devices and MOS Capacitors
		CO6	To create knowledge on the behaviour and electrical properties of semiconductors
EC205	Electronic Circuits	CO1	Understand the concepts of RC circuit for different input waveforms

		CO2	Analyze the small signal equivalents circuits for low frequency analysis of BJT
		CO3	Analyze the small signal equivalents circuits high frequency analysis of BJT
		CO4	Analyze and design of negative feedback amplifiers and oscillators
		C05	To understand and analyze power amplifiers & switching circuits
		CO6	To provide insight into the working , analysis and design of different types of voltage regulator and MOSFET
EC 207	Logic Circuit Design	CO1	Understand various number systems, logic gates, Boolean laws and its application in digital design.
		CO2	Optimize the Boolean equations using K-map and design different combinational circuits
		CO3	To design and implement combinational circuits using basic programmable blocks
		CO4	Design and implement different sequential circuits with flip flops, registers and counters.
		C05	To analyze sequential circuits and sequential systems in terms of state machines

List of Course Outcomes

Course Code	Course Title	Course Outcomes	DEFINITION OF COURSE OUTCOMES
			SEMESTER 4
MA 204	Proba bility, Rando m Proces s & Numer ical Metho ds	CO1	Explain discrete and continuous random variables, identify their probability and cumulative distribution functions. Discuss their properties such as mean and variance and solve real life problems.
		CO2	Applies Random processes to analyse linear systems and signal processing problems.
		CO3	Apprehend the knowledge of Markov chains and applies it in solving stochastic processes
		CO4	Analyse various numerical techniques and to obtain approximate solutions to otherwise interectable mathematical problems. Evaluate the solutions of equations using Numerical technique.
EC 202	Signal s & Syste m	CO1	Define, represent, classify and characterize basic properties of continuous and discrete time signals and systems.
		CO2	Characterize CT and DT LTI systems in time domain using convolution
		CO3	Understand and Interpret frequency domain representation of CT signals
		CO4	Represent CT LTI system using Fourier and Laplace Transform
		C05	Understand the frequency domain representation of DT signals and sampling theorem
		CO6	Represent DT systems using Fourier transform and Z transform
EC 204	Analo g Interg rated Circui ts	CO1	Understand the basic concepts of differential amplifiers
		CO2	The students will have a thorough understanding of operational amplifiers
		CO3	Students will be able to design circuits using operational amplifiers for various applications
		CO4	Understand the concepts of data converters using op-amp and various specialized ICs.
EC 206	Comp uter Organ isation	CO1	Describe the generic principles that underline the design of digital computer, including the structure and functioning of a arithmetic circuits and its data representation.
		CO2	Discuss about the different types of machine and assembly language
		CO3	Summarize and describe the different types of addressing modes, Steps for executing a program.

		CO4	Discuss and illustrate the design of microarchitecture of the Single cycle processor and multicycle processor. Discuss and illustrate the design of microarchitecture of the Single cycle processor and multicycle processor.
		C05	Describe the organization of the Memory unit and the I/O unit
		CO6	Discuss and demonstrate Cache memory, its mapping, Evolution of processors, their present technology and inter-process communication
EC 208	**Analo g Comm unicati on Engine ering**	**CO1**	Understand the elements of communication system and the various types noises which may affect communication
		CO2	Understand amplitude modulation and the circuits used for AM generation
		CO3	Understand single sideband modulation techniques
		CO4	Understand the receiver circuits used for AM and basics of Angle modulation
		C05	Compare phase and frequency modulation and understand about FM Transmitters
		CO6	Understand detector circuits for Angle modulation and basics of Telephone systems
HS 210	**Life Skills**	**CO1**	Know the nuances of technical communication to interpret the cues of non-verbal communication so as to develop communicative efficiency in oral and written format; and demonstrate competency to face interview and group discussion.
		CO2	Recall and understand the various theories related to creativity to illustrate critical thinking and problem solving abilities
		CO3	Describe and differentiate the concepts involved in groups and teams and illustrate the ability to function effectively as an individual, and as a member or leader in diverse teams
		CO4	Define the terms as well as grasp the distinction between different terms related to Ethics and Values; assess the different moral and ethical theories of Engineering ethics and Human values.
		C05	Identify and discuss the different leadership styles and choose the suitable style to become an effective leader

			List of Course Outcomes
Course Code	**Course Title**	**Course Outcomes**	**DEFINITION OF COURSE OUTCOMES**
			SEMESTER 5
EC30L	**Digital Signal Processing**	CO1	The student will be able to apply DFT in linear filtering and can examine the frequency analysis of signals using DFT
		CO2	The student will be able to compute DFT and IDFT computation by using FFT algorithms
		CO3	The student will be able to solve discrete time LTI systems into FIR and IIR filters and compare and build digital FIR filters using various methods
		CO4	The student will be able to compute and design digital IIR filters using various transformations
		C05	The student will be able to explain the TMS320C67XX digital signal processor and build digital FIR and IIR filters using various structures
		CO6	The student will be able to illustrate decimation and interpolation in multirate signal processing and examine finite word length effects in DSP systems
EC303	**Applied Electromagnet ic Theory**	CO1	Locate vectors in various coordinate systems and relate the laws and equations governing electrostatic and magneto static fields.
		CO2	Compute Maxwell's equations from fundamental laws
		CO3	Explain the propagation of electromagnetic waves in different media and study the propagation of EM waves at boundaries
		CO4	Discuss the characteristics of transmission lines
		C05	Sketch the different transmission line problems using Smith chart
		CO6	Solve various modes of propagation in various types of waveguides
EC305	**Microcontroll ers and**	CO1	To analyze 8085 microprocessor architecture and Microprocessor based system

	Microprocessors	CO2	To apply addressing modes and instruction sets of 8085 Microprocessor and understand the peripheral IC interfacing .
		CO3	To analyze 8051 microcontroller architecture
		CO4	To apply addressing modes and instruction sets in assembly language programming of 8051 Microcontroller .
		CO5	To analyze interrupts ,timer programming and serial communication of 8051 microcontroller .
		CO6	To apply 8051 microcontroller programming to interface DIP Switch , Stepper Motor,ADC,DAC,LED and LCD display
EC307	**Power Electronics**	C01	Able to identify various power electronic devices and its various applications. Also they are able to reproduce the switching characteristics of power electronic devices.
		CO2	Able to distinguish and explain the various power electronics converters and regulators
		CO3	Able to distinguish various types of inverters and uninterruptable power supplies.
		CO4	Able to describe and memorize the block diagram and characteristics of a measuring instrument and apply it to different types of bridges
		C05	Able to summarize and compare various types of Instrument transducers.
		CO6	Able to recognize ,explain and summarize about various measuring equipment's.
EC361	**DSD**	CO1	The student should able to analyze and design clocked synchronous sequential circuits 23 4
		CO2	The student should able to analyze and design asynchronous sequential circuits
		CO3	The student should able to apply their knowledge in diagnosing faults in digital circuits, PLA
		CO4	The student should able to interpret architecture of CPLDs and FPGA
HS300	**POM**	CO1	Identify and discuss the relevance and different perspectives of management concepts

Course Code	Course Title	Course Outcomes	DEFINITION OF COURSE OUTCOMES
		CO2	Describe and utilize management techniques for meeting current and future management challenges faced by the organization
		CO3	Compare the management theories and models critically and demonstrate its validity in the real world
		CO4	Understand the different decision making situations and outline the steps involved in solving problems faced by management
		C05	Identify the skills required by a manager with varying working situations

List of Course Outcomes			
Course Code	Course Title	Course Outcomes	DEFINITION OF COURSE OUTCOMES
SEMESTER 6			
EC302	Digital Communication	CO1	Understand random process and probability in digital communication. Explaining the various analog to digital
		CO2	Design of matched filter to reduce the effect of ISI in baseband channel
		CO3	Understand signal space analysis. Implement likelihood function at receiver output
		CO4	Comprehend various digital modulation schemes used in digital communication
		C05	Understand spread spectrum communication by designing PN sequence generators
		CO6	Classify and analyze multipath challenges and diversity techniques and OFDM principle
EC304	VLSI	CO1	To describe the VLSI fabrication processes
		CO2	To explain the fabrication sequences for various electronic devices
		CO3	The student will be able to summarize the characteristics and power dissipation of CMOS inverters and develop ~~layout and stick diagram for CMOS combinational circuits~~
		CO4	The student will be able to build logic functions using the various types of MOSFET logic like pass transistor, CPL ~~and transmission gate~~

Course Code	Course Name	CO	Course Outcome
		C05	The student will be able to explain the architecture and working of memories, PLDs and FPGAs and build logic circuits using PLAs
		CO6	The student will be able to summarize and choose various adder circuits and array multiplier logic.
EC306	AWP	CO1	Describe how antenna converts electrical energy to electromagnetic energy and vice versa and also about basic
		CO2	Analyze radiation pattern of various antennas
		CO3	Describe various antenna measurement techniques
		CO4	Comprehend and design various types of antennas and antenna arrays
		CO5	Compare different modes of propagation of electromagnetic waves.
EC308	Embedded Systems	C01	Ability to understand basics of embedded system and to design an embedded system product
		CO2	Understand the different standards and protocols used for
		CO3	Interpret different ways of communication with I/O devices
		CO4	Develop basic programming concepts of Embedded
		C05	Understand about inter-process communication.
		CO6	Design real time embedded systems using the concepts of RTOS.
EC312	OOPS	C01	Understand the features of Object Oriented Programming paradigm in C++ and Java languages
		CO2	Develop basic programming concepts of C++ like class construction, polymorphism and inheritance.
		CO3	Be able to understand and implement the advanced features of C++ such as templates, abstract classes and virtual functions.
		CO4	Understand the advanced features of Java such as multithreading, packages and error management
		C05	Be able to develop skills in designing android applications
		CO6	The student will be able to analyze and develop skills in debugging, deploying and testing mobile applications.
EC370	DIP	CO1	Outline fundamentals of digital image processing. Be able to identify the applications of image processing
		CO2	Be able to summarize the 2D image transforms
		CO3	Sketch the divisions of image enhancement techniques

		CO4	Be able to choose image restoration techniques based on the degradation process.
		C05	Classify the different image segmentation algorithms
		CO6	Compare the various image compression schemes and standards
EC366	**RTOS**	CO1	Understanding the evolution and architecture of OS.
		CO2	Students will understand the scheduling algorithms used in RTOS
		CO3	Understanding the classic problems of synchronization and the concept of deadlock
		CO4	Understanding the concept of memory partitioning and memory allocation strategies
		C05	Understanding I/O management and disk scheduling
		CO6	Compare and contrast Vxworks and µCOS

Course Code	Course Title	Course Outcomes	DEFINITION OF COURSE OUTCOMES
			List of Course Outcomes
			SEMESTER 7
EC401	Information Theory and Coding	CO1	Basic knowledge about information theory
		CO2	Apply the knowledge of Shannon's source coding theorem and Channel coding theorem for designing an efficient and error free communication link.
		CO3	Analyze various coding schemes and capacity of Gaussian channels
		CO4	Understand Galois field concepts, and encoding and decoding of Linear block codes and cyclic codes
		C05	Understand the encoding and decoding of Convolution codes
EC403	Microwave and Radar Engineering	CO1	Understand the principles of microwaves and be able to analyze the operation of microwave devices like Klystron amplifier
		CO2	Analyze the working of microwave oscillators such as Reflex Klystron and Magnetron
		CO3	Analyze the working of travelling wave tube amplifier and understand the measurement of various micorwave parameters
		CO4	Analyze working of microwave hybrid circuits in terms of Scattering matrix
		C05	Understand the operation of microwave solid state devices
		CO6	Understand the basic concepts of radar and operating principles of radar transmitters and receivers
EC405	Optical Communication	CO1	Know the working of optical communication system, optical source and detectors.
		CO2	Compare the performance of various optical modulation schemes
		CO3	Analyse the performance of optical amplifiers and apply the knowledge of optical amplifiers in the design of optical link
		CO4	To know the concept of WDM, LiFi, OTDR Technique.
EC407	Computer Communication	CO1	To have a good understanding of different types of network topologies and protocols
		CO2	To discuss the layers of the OSI model and TCP/IP with their functions.

Course Code	Course Title	Course Outcomes	DEFINITION OF COURSE OUTCOMES
		CO3	Illustrate the concept of subnetting and routing mechanisms
		CO4	To review the basic protocols of computer networks, and how they can be used to assist in network design and implementation
		C05	Use of security aspects in designing a trusted computer communication system
		CO6	
EC409	Control Systems	CO1	Obtain the transfer function of mechanical and electrical system. Reduce the block diagram and verify using the signal flow graph.
		CO2	Analyse first and second order system of step and ramp input Static and Dynamic errors. Aware of time domain specification.
		CO3	Analyse the stability using1. classical techniques(root locus), 2. Routh Hurwitz. To explain the relation between time and frequency domain
		CO4	Analysis of bode plot, Nyquist plot, Design and analysis of controllers
		C05	Understand about the state variable, its transfer function, state equation and solution.
		CO6	Get an idea about Discrete control system and Z transform
EC465	MEMS	CO1	Understanding the basic principles of micro sensors and actuators used in MEMS
		CO2	Analysing various types of beams and the basic mechanical concepts used in MEMS
		CO3	Understanding the various scaling laws that aim at minimizing the device dimensions
		CO4	Understanding the various materials used for fabrication of MEMS devices
		C05	Understanding the micro manufacturing and micro machining techniques
		CO6	Understanding the various bonding techniques used in MEMS and the various application areas of MEMS

List of Course Outcomes			
Course Code	Course Title	Course Outcomes	DEFINITION OF COURSE OUTCOMES
SEMESTER 8			

EC402	**Nanoelectronics**	**CO1**	Understanding the trends in microelectronics
		CO2	Review of the basic fabrication methods used in nanotechnology
		CO3	Understanding the principles of operation of nanotechnology tools techniques.
		CO4	Identifying the two dimensional behavior of various Nanoelectronic structures.
		C05	Recognizing transport of charges under electric and magnetic fields.
		CO6	Understanding the working of various Nanoelectronic devices.
EC404	**Advanced Communication Systems**	**CO1**	The students will understand the basics of microwave radio communication
		CO2	Understand about digitized video &Digital Video Broadcasting
		CO3	To understand & analyze the concepts of satellite communication system
		CO4	Understand the evolution modern wireless communication techniques& different generations of wireless technologies
		C05	Understand the cellular concept & analyze various propagation mechanisms
		CO6	Understand the multiple access techniques & new data services
EC468	**Secure Communication**	**CO1**	Students will be aware of the different security attacks and techniques to prevent and tackle such attacks.
		CO2	Students will study the fundamentals of abstract algebra
		CO3	Students will be able to know how to apply in the field of secure communication using ciphers.
		CO4	Students will be able to know how to generate and protect robust system using different Encryption standards
		C05	Students will be capable of developing new algorithms in the field of secure communication using Public key cryptosystem.
		CO6	Students can demonstrate ability to identify, formulate a robust password in the field of secure communication.
CE482	**Environmental Impact Assessment**	**CO1**	Describe, explain and interpret basic aspects of the various forms of pollution in environmental systems.
		CO2	Recognize and predict causes and effects of the various forms of pollution.

		CO3	Explain the impacts due to deforestation, ozone layer depletion, climate change and land degradation.
		CO4	Explain essential elements and methodologies used in the EIA process.
		C05	Analyse and review project level EIAs.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS AND ENGINEERING

PROGRAMME EDUCATIONAL OBJECTIVES

PEO 1. To design and develop innovative products and services in the field of electrical and electronics engineering.

PEO 2. To keep pace with the rapid changes in the technology.

PEO 3. To assist the learners in pursuing higher and professional studies.

PEO 4. To nurture self-confidence, self-sufficiency, social commitment and employability amongst students.

PROGRAMME OUTCOMES

PO 1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 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.

PO 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.

PO 5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO 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.

PO 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.

PO 8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 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.

PO 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.

PO 12. 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 OUTCOMES

Electrical and Electronics Engineering Graduates will be able:

PSO 1. To analyze and apply the knowledge of electrical fundamentals, circuit design, control engineering, field theory, power system and allied topics.

PSO 2. To understand technologies and gain the practical skills to design, simulate and analyse electrical system to engage in lifelong learning and successfully adapt in multi disciplinary environment.

PSO 3. To design, develop and implement Electrical and inter disciplinary projects to meet industry demand and to provide solution to real time problems in current scenario.

COURSE OUTCOMES (COs)

Course Code	Course Title	Course Outcomes	DEFINITION OF COURSE OUTCOMES
List of Course Outcomes			
SEMESTER I			
MA101	CALCULUS	CO1	Definite infinite series and use various convergence tests to determine convergence and divergence of series
		CO2	Calculate higher order Partial derivatives, Apply chain rule to functions of several variables Determining extrema and to interpret the physical meaning of Partial Derivatives.
		CO3	Calculate double and triple integrals using rectangular and polar co-ordinates and hence apply the same to find the area and volume
		CO4	Use vector valued functions in various physical applications.
		CO5	Examine vector fields , define and calculate line integrals using the fundamental theorem of line integrals. Define and compute gradient, divergence and curl of vector fields and apply Greens Theorem, Stokes Theorem and Divergence Theorem to determine Line integral ,Surface Integral and Flux Integral
PH 100	ENGINEERING PHYSICS	CO1	Know the various types of oscillators and waves, understand the theory related to them and solve engineering problems using the concepts of harmonic oscillations, wave motion.
		CO2	Recall, understand and apply the theory of thin film interference and diffraction to daily life experiences.
		CO3	Describe, explain and apply the theories of polarization and superconductivity to various engineering problems.
		CO4	Know and understand the role of quantum mechanics and statistical mechanics in engineering subjects so as to apply and analyse them in various situations
		CO5	Know and understand the various aspects of Ultrasonic and acoustics
		CO6	Know about the properties of laser, holography, fibre optics and photonics and understand their significance and in modern technology mainly communication and medical fields as well as apply the theory in solving related problems
			Know about the properties of laser, holography, fibre optics and photonics and understand their significance and in modern technology mainly communication and medical fields as well as apply the theory in solving related problems

BE101 03	INTRODUCTION TO ELECTRICAL ENGINEERING	CO1	Students will be able to acquire fundamental knowledge of Electrical circuits and can solve circuit related problems
		CO2	.Students will be able to recall and state ideas about magnetic circuits.
		CO3	Students will be able to explain the fundamentals of AC circuits
		CO4	Students will be able to analyse three phase systems.
		CO5	Students will be able to compare and contrast various types of resonance circuits
		CO6	Students will be able to identify and differentiate between various methods of Power measurement
CE100	BASICS OF CIVIL ENGINEERING	CO1	Recognize the role of civil engineer in the development of the society and explain relationship of civil engineering with other branches of engineering and technology
		CO2	Illustrate different types of buildings and materials of construction.
		CO3	Differentiate the features and components of Industrial and Residential buildings by conducting field visits
		CO4	Explain the concepts of surveying and its advances in civil engineering like remote sensing techniques, GIS and GPS.
		CO5	Knowledge about various services in building and need of intelligent buildings in modern world
		CO6	Plan and set out a building
BE110	ENGINEERING GRAPHICS	CO1	Understand the fundamental concepts of theory of projection and determine the projections of the line positioned in different conditions
		CO2	Solve problems related to the projection of solids placed in different conditions
		CO3	Understand the fundamental concept of Isometric projections to sketch the isometric view of solids
		CO4	Recognize the features of CAD software to sketch the orthographic views of the given isometric view
		CO5	Use the knowledge of projection of solids to section and develop the given solids
		CO6	Understand the concepts of Perspective Projection and Intersection of surfaces to sketch the real view of objects
BE103	INTRODUCTION TO SUSTAINABNLE ENGINEERING	CO1	Understand the concepts, importance and challenges of sustainable engineering.
		CO2	Recognize various environmental issues, their sources, effects and suggest remedial measures.
		CO3	Apply different sustainable methods and techniques for product-service system development.
		CO4	Analyse the sustainability of different products and services using environmental management tools.
		CO5	Practice sustainable methods by utilizing the engineering knowledge and principles
		CO6	Compare the pollution potential of various services and products.

Course Code	Course Title	Course Outcomes	Definition
PY110	ENGINEERING PHYSICS LAB	CO1	Operate CRO and function generators for various procedures in electronics
		CO2	Use travelling microscope to record the data with precision.
		CO3	Employ spectrometer to mark measurements with accuracy.
		CO4	Apply the diffraction concepts to find wavelength of laser and to develop various waves on a stretched string.
CE110	CIVIL ENGINEERING WORKSHOP	CO1	Plan and set out a building
		CO2	Measure and calculate the area and volume of different building components.
		CO3	Construct a wall in English bond and to find the compressive strength of different building materials
BE110	ELECTRICAL ENGINEERING WORKSHOP	CO1	Students will be able to recognize, remember and understand commonly used components, accessories and equipment in Electrical Installation
		CO2	Students will be able to remember, understand and analyse use of energy, voltage, current etc.
		CO3	Students will be able to predict, analyse and create design of wiring circuit
		CO4	Students will be able to do, analyse wiring and test the circuit

List of Course Outcomes			
Course Code	Course Title	Course Outcomes	DEFINITION OF COURSE OUTCOMES
SEMESTER II			
		CO1	Understand the methods used to solve homogeneous differential equations and apply them to solve the differential equations. Relate the methods to solve non homogeneous differential equations.

		CO2	Applies Fourier series to several problems
MA102	DIFFERENTIAL EQUATIONS	CO3	Understand the formation and solution of partial differential equat and further solve them
		CO4	Analyse the equation governing small transverse vibrations of an el string and evaluate the temperature distribution in a uniform bar.
CY100	ENGINEERING CHEMISTRY	CO1	The theory and principle of UV-Visible, IR and NMR spectroscopy and able to predict the structure of unknown /new compounds with the help of spectroscopy.
		CO2	Demonstrates understanding of the essential aspects of electrochemical cells, emf , applications of emf measurement and solve related problems
		CO3	Develop understanding of Chemical structure of polymers and its effects on their various properties when used as engineering material, also to understand the economical and new methods for the synthesis of nanomaterial.
		CO4	Will be able to explain thermal methods of analysis and also classify the various chromatographic techniques based on stationary and mobile phase.
		CO5	Will be able to explain the properties and separation techniques of petroleum and natural gases along with potential applications and role of biodiesel in the current situation.
		CO6	Will be able to differentiate hard and soft water solve the related numerical problems on water purification and its significance in the industry and daily life.
BE 100	ENGINEERING MECHANICS	CO1	Understand the fundamental concepts and laws of mechanics and draw free body diagrams to determine the resultant of forces and/or moments.
		CO2	. Use the knowledge about different types of beams, supports and loads to determine the support reactions developed in the beam and also to solve the force system in space using vector approach
		CO3	Determine the centroid and moment of inertia of surfaces and solids using parallel and perpendicular axis theorems and to calculate the area and volume of basic figures using theorem of Pappus and Guldinus

		CO4	Solve problems related to friction and apply principle of virtual work to determine the support reactions in beam.
		CO5	Apply the laws of motion, kinematics of motion and their interrelationship to systems in general plane motion and practical engineering problems
		CO6	Understand the concepts in simple harmonic motion and vibrations and to calculate the parameters of bodies executing such motion
BE 102	DESIGN AND ENGINEERING	CO1	Analyse the different elements involved in good design and apply them in practice when called for
		CO2	Aware of the product oriented and user oriented aspects of an optimal design"
		CO3	Produce an innovative design concept by incorporating the different segments of knowledge gained
		CO4	Value the different perspective of design factors covering functions, cost, sustainability, environmental impact, safety and others"
ME 100	BASICS OF MECHANICAL ENGINEERING	CO1	Explain the basics of thermodynamics, laws and application of thermodynamics and apply it to solve the air standard efficiency of various cycles
		CO2	Discuss the concept of energy conversion and working of energy conversion devices such as IC engines, boiler, turbines, pumps
		CO3	Explain the concepts of refrigeration and air-conditioning
		CO4	Discuss the various components of automobile and the various power transmission devices
		CO5	List the different engineering materials and discuss the various manufacturing processes like casting, forging, rolling, welding
		CO6	Explain the various machine tools used in manufacturing industry
EC100	BASICS OF ELECTRONICS ENGINEERING	CO1	Illustrate construction and working of different, passive components, Transformer , Relays and discuss about relevance of electronics and communication in different areas.
		CO2	Describe the basic concepts of different semiconductor diodes and BJT.
		CO3	Study of DC power supply, amplifier and oscillator circuits
		CO4	Understand Analog IC's & Digital IC's and illustrate the working of commonly used laboratory equipment's.
		CO5	Understanding the basics of communication and satellite communication system.
		CO6	Discuss the basics of fibre optic communication, mobile communication , entertainment electronics & security.
CY 110	ENGINEERING CHEMISTRY LAB	CO1	Students will be able to standardise various solutions, estimate the amount of substance present in a given solution and determine hardness of water .
		CO2	To provide an understanding in the methods of preparation of some industrially important polymers and to develop skills in the proper handling of apparatus and chemicals.

Course Code	Course Title	Course Outcomes	DEFINITION OF COURSE OUTCOMES
		CO3	For the interpretation and understanding of IR and NMR spectra and for the determination of structure of molecules using these techniques.
ME 110	MECHANICAL ENGINEERING WORKSHOP	CO1	Identify and apply suitable tools and components in mechanical engineering workshop
		CO2	Design and model different prototypes in the trade of joining processes such as carpentry, welding, fitting and sheet metal
		CO3	Design and model different prototypes in the trade of shaping processes such as smithy and foundry
		CO4	Demonstrate the working and applications of various machine tools
		CO5	Interpret effective results based on the experiments conducted by individual and team work
EC110	ELECTRONICS ENGINEERING WORK SHOP	CO1	Familiarize and identify different electronic components, measuring & Testing instruments and commonly used tools
		CO2	Practice interconnection methods and soldering and Implement basic electronic circuits on PCB
		CO3	Familiarisation of various modern electronic system

List of Course Outcomes			
Course Code	Course Title	Course Outcomes	DEFINITION OF COURSE OUTCOMES
SEMESTER III			
MA201	LINEAR ALGEBRA AND COMPLEX ANALYSIS	CO1	Relate the concepts of basic calculus in complex functions. Recognise the harmonic functions and construction of harmonic conjugates.
		CO2	Describe the geometry of analytic functions and identify their conformal mapping
		CO3	Evaluate the line integrals using cauchy's intergral theorem and cauchy's integral formula and the singularities in finding the residues to evaluate real definite integrals.
		CO4	Apply gauss elimination method to solve the system of equati Diagonalise a matrix by calculating eigen values and eigen vectors.

EE201	CIRCUITS AND NETWORKS	CO1	Students will be able to understand and analyse different types of electrical networks using network theorems
		CO2	Students will be able to analyse different methods to find voltage and current in an electrical network using graph theory
		CO3	Students will be able to acquire knowledge about steady state and transient response of RL, RC and RLC networks
		CO4	Students will be able to apply Laplace transform technique on electrical network and transformed network and coupled circuits
		CO5	Students will be able to differentiate parameter representation on two port networks and analyse circuits
		CO6	Students will be able to understand the network synthesis using Foster and Cauer form
EE203	ANALOG ELECTRONIC CIRCUITS	CO1	To give the concept of using semiconductor devices like diodes and BJT to change the signal shapes and levels/ magnitude respectively.
		CO2	. To design amplifiers using current controlled/voltage controlled (BJT/FET) semiconductor devices and its frequency response analysis
		CO3	To develop the concept of designing power amplifiers using BJT.
		CO4	To study the concept of positive and negative feedback for the to design amplifiers and oscillators.
		CO5	To provide thorough understanding of operational amplifier and circuits to generate wave forms
		CO6	Design of waveform generating and oscillator circuits using operational amplifier and 555 IC.
EE205	DC MACHINES AND TRANSFORMERS	CO1	Students will be able to understand different types of dc machines and electro dynamical energy conversion
		CO2	Students will be able to explain the working of DC Generators
		CO3	Students will be able to analyse, justify and compare the functioning of DC machines and transformers in different working conditions
		CO4	Students will be able to understand the principle of operation of single phase transformers
		CO5	Students will be able to analyse the performance of single phase transformers
		CO6	Students will be able to familiarize with the principle of operation and performance of three phase transformers
EE207	COMPUTER PROGRAMMING	CO1	Identify appropriate C language constructs to solve problems
		CO2	Analyse problems, identify subtasks and implement them as functions/procedures
		CO3	Implement algorithms using efficient C programming techniques

		CO4	Explain the concept of file system for handling data storage and apply it for solving problems
		CO5	Apply sorting and searching techniques to solve application programs
HS210	LIFE SKILLS	CO1	Know the nuances of technical communication to interpret the cues of non-verbal communication so as to develop communicative efficiency in oral and written format; and demonstrate competency to face interview and group discussion
		CO2	Recall and understand the various theories related to creativity to illustrate critical thinking and problem solving abilities
		CO3	Describe and differentiate the concepts involved in groups and teams and illustrate the ability to function effectively as an individual, and as a member or leader in diverse teams
		CO4	Define the terms as well as grasp the distinction between different terms related to Ethics and Values; assess the different moral and ethical theories of Engineering ethics and Human values.
		CO5	identify and discuss the different leadership styles and choose the suitable style to become an effective leader
EE233	PROGRAMMING LAB	CO1	Identify and select appropriate C language constructs to solve problems.
		CO2	Analyse problems, identify subtasks and implement them as functions/procedures.
		CO3	Explain the concept of file system for handling data storage and apply it for solving problems
		CO4	Apply sorting & searching techniques to solve application programs
EE231	ELECTRONIC CIRCUITS LAB	CO1	To design and develop electronic circuits using discrete components
		CO2	To design and develop electronic circuits using op -amp and 555 Ics
		CO3	To simulate electronic circuits using PSpice simulator tool

List of Course Outcomes			
Course Code	**Course Title**	**Course Outcomes**	**DEFINITION OF COURSE OUTCOMES**
SEMESTER IV			
MA202	PROBABILITY,DISTRIBUTION, TRANSFORMS AND NUMERICAL METHODS	CO1	Identify different types of discrete probability distributions ,their properties such as its mean and variance and solve problems on binomial and Poisson distributions. Explain continuous random variables and associate them with Normal, Uniform ,Exponential distributions, their properties such as mean and variance and calculate corresponding probability density function and cumulative distribution function
		CO2	Applies Fourier integrals and transforms to analyse linear systems and signal processing problems
		CO3	Apprehend the knowledge of Laplace transforms and applies it in solving ordinary differential equations and compute convolutions.
		CO4	Analyse various numerical techniques and to obtain approximate solutions to otherwise interactable mathematical problems and Evaluate the solutions of equations using Numerical techniques
EE202	SYNCHRONOUS AND INDUCTION MACHINES	CO1	Students will be able to differentiate the different types of Synchronous machines and types of AC armature windings.
		CO2	Students will be able to demonstrate knowledge on importance of Voltage regulation of Alternators and how to pre-determine the voltage regulation of Synchronous machines in laboratory.
		CO3	Students will be able to acquire knowledge on how Alternators can be paralleled to Infinite bus and how loads can be shared.
		CO4	Students will be able to understand all about Synchronous Motors and applications of various starting methods. Students will be able to differentiate the different types of Induction machines
		CO5	Ability to analyse the performance of induction machines in order to implement in household and industrial applications.
		CO6	Will acquire knowledge on performance characteristics of synchronous induction motors relating the features of synchronous machines and induction machines. Ability to differentiate different types of single phase Induction motors
EE204	DIGITAL ELECTRONICS AND LOGIC DESIGN	CO1	To understand the concept of digital electronics and to familiarize with various number system
		CO2	To design and analysis any digital logic gate circuits and flip flop based systems
		CO3	To Familiar with combinational circuits

		CO4	Students will gain the capability of implementing various types of synchronous and asynchronous counters.
		CO5	To describe the operation of ADC and DAC circuits
		CO6	Students will acquire basic knowledge on VHDL
EE206	MATERIAL SCIENCE	CO1	To understand characteristics of conducting and semiconducting
		CO2	To classify magnetic materials and describe different laws related to them
		CO3	To classify and describe different insulators and to explain the behaviour of dielectrics in static and alternating fields
		CO4	To describe the mechanisms of breakdown in solids, liquids and gases
		CO5	To Classify and describe Solar energy materials and superconducting
		CO6	To gain knowledge in the modern techniques for material studies
EE208	MEASUREMENTS AND INSTRUMENTATION	CO1	Students will be able to compare different types of instruments, their working principles advantages and disadvantages
		CO2	Students will be able to explain the operating principles of various ammeters, voltmeters and ohm meters
		CO3	Students will be able to describe watt meters and energy meters.
		CO4	Students will be able to describe different flux and permeability measurements methods
		CO5	Students will be able to identify different AC potentiometers and bridges, also understand the application of cathode ray oscilloscope
		CO6	Students will be able to identify the transducers for physical variables and to describe the operating principles
HS200	BUSINESS ECONOMICS	CO1	To remember economics concepts and tools to make better decisions
		CO2	To understand and analyse market conditions for decisions
		CO3	To apply cost and benefits analysis for business projects
		CO4	To apply and analyse the financial performance of business projects
		CO5	To apply capital budgeting methods for investment proposals
EE232	ELECTRICAL MACHINES-I LAB	CO1	Select Suitable methods to find out the regulation and equivalent circuits for transformers
		CO2	Experiment for dc motors and dc generators to get its performance characteristics.
EE234	CIRCUITS AND MEASUREMENTS LAB	CO1	Students will be able to analyse voltage current relations of RLC circuits and Verify DC network theorems by setting up various electric circuits
		CO2	Students will be able to measure power in a single and three phase circuits by various methods and Calibrate various meters used in electrical systems

Course Code	Course Title	Course Outcomes	DEFINITION OF COURSE OUTCOMES
		CO3	Students will be able to determine magnetic characteristics of different electrical devices and Analyse the characteristics of various types of transducer systems
		CO4	Students will be able to determine electrical parameters using various bridges and analyse the performance of various electronic devices for an instrumentation systems and, to develop the team management and documentation capabilities

List of Course Outcomes			
Course Code	**Course Title**	**Course Outcomes**	**DEFINITION OF COURSE OUTCOMES**
SEMESTER V			
EE301	POWER GENERATION TRANSMISSION AND PROTECTION	CO1	Students will be able to understand and analyse different types of power plants and economics of operation in power systems
		CO2	Students will be able to analyse inductance and capacitance of transmission lines and modelling of transmission lines
		CO3	Students will be able to acquire knowledge on sag, sting efficiency of insulators , grading of cables and transmission voltage levels
		CO4	Students will be able to understand HVDC transmission, FACTS and power distribution systems
		CO5	Students will be able to acquire knowledge on the concept of switchgear protection and protective relaying schemes
		CO6	Students will be able to understand the protection techniques used in generators, transformers, transmission lines and causes of over voltages in power systems
EE303	LINEAR CONTROL THEORY	CO1	Students will be able to understand the concept of open loop and closed loop system and to solve transfer function of mechanical and electromechanical systems and to analyse the system using block diagram representation and signal flow graph representation
		CO2	Students will be able to perform the time domain analyse of the first and second order control systems and also discuss the control system components
		CO3	Students will be able to analyse the steady state error and dynamic analysis and explain and execute the concept of stability of control system

		CO4	Students will be able to apply the concept of root locus to analyse the stability of the linear control system
		CO5	Students will be able to analyse the frequency domain specification based on bade plot
		CO6	Students will be able to apply Nyquist stability criterion to obtain the stability of the system
EE305	POWER ELECTRONICS	CO1	Choose appropriate power semiconductor devices in converter circuits and develop their triggering circuits
		CO2	Analyse various types of power electronic converters and apply different switching techniques
		CO3	Select appropriate power converter for specific application
		CO4	Design dc-dc regulator circuits and chopper circuits
EE307	SIGNALS AND SYSTEMS	CO1	Define and classify signals. List the operations performed on signals. List and examine the properties of a system. Determine the impulse response of an LTI system using Differential and difference equations. Compute special functions of DT signals
		CO2	Analysis of systems using Laplace Transform. Relate transfer function and differential equation. Determine the time and frequency responses from poles and zeros
		CO3	Analysis of CT periodic signals using Trigonometric, Exponential and Cosine Fourier series representation. Analysis of Harmonic series in common signals. Discuss Fourier transform for aperiodic signals. Check the Fourier Transform existence in signals using Dirichlet's condition. List and examine the properties of Fourier Transform. Determine Frequency response of LTI systems.
		CO4	State and prove sampling theorem. Interpret the signal re construction from sampling method using Zero order and First order hold circuits.
		CO5	Calculate Z-transform for DT signals. List the methods to compute inverse z transform. List and examine the properties of Z Transform. Determine region of convergence to test stability and causality condition in systems. Determine Z-transfer function using difference equation of LTI Systems
		CO6	Analysis of Fourier representation of discrete time signals. Define DTFT for DT signals Determine Frequency response of simple DT systems. Define Non Linear System; list the types and Properties of Non Linear Systems. Define Random signals and Processes
EE309	MICROPROCES SORS AND EMBEDDED SYSTEMS	CO1	Justify and explain the use of microprocessors in different applications
		CO2	Choose and use a microprocessor for an application.
		CO3	Combine different technologies for the betterment of society
		CO4	Develop an idea about the basics of embedded systems
		CO5	Design and interface microcontroller-based embedded system
		CO6	Design different embedded systems for different applications

EE367	NEW AND RENEWABLE ENERGY RESOURCES	CO1	Get the knowledge about various energy resources and energy storage
		CO2	Familiarize different types of solar thermal system, solar collector and solar radiation measurement.
		CO3	Understand different Solar Electric system
		CO4	Familiarize with solar energy from ocean & power generation (OETC)
		CO5	Ability to understand wind energy and wind energy conversion system
		CO6	Understand biomass energy, small hydro power generation and emerging technologies.
EE341	DESIGN PROJECT	CO1	Develop a concept and elaborate it through a detailed design by dividing a system concept into component subsystems
		CO2	Build protypes of key subsystems and design appropriate tests to measure and evaluate the performance of protypes
		CO3	Communicate report the teams logistical and technical approaches to the design project using language and graphic appropriates
EE331	DIGITAL ELECTRONICS AND EMBEDDED SYSTEMS LAB	CO1	Design, setup and analyse various digital circuits
		CO2	Students will be able to program and explain 8085 microprocessors for different applications
		CO3	Students will be able to program and use advanced microprocessors
		CO4	Students will be able to program and interface 8051 microcontrollers
		CO5	Students will be able to combine different system for practical applications
EE333	ELECTRICAL MACHINES LAB-II	CO1	To find the regulation of alternators by different methods
		CO2	To obtain the characteristics of Three phase and Single phase Induction Motors & induction generators

List of Course Outcomes			
Course Code	**Course Title**	**Course Outcomes**	**DEFINITION OF COURSE OUTCOMES**
SEMESTER VI			
EE302	ELECTROMAGNETICS	CO1	Students will be able to define different coordinate system and apply them to analyse fields & potentials due to static charges
		CO2	Students will be able to explain the physical meaning of the differential equations for electrostatic and magnetic fields
		CO3	Students will be able to understand how materials are affected by electric and magnetic fields
		CO4	Students will be able to understand the relation between the fields under time varying situations
		CO5	Students will be able to understand principles of propagation of uniform plane waves
		CO6	Students can apply electromagnetic interference and compatibility
EE304	ADVANCED CONTROL THEORY	CO1	Design and analyse Lead, Lag and Lead – lag compensator using frequency domain method
		CO2	Design and analyse Lead, Lag and Lead – lag compensator using time domain method and to fine tune PID controllers and understand the roles of P, I and D in feedback control
		CO3	To acquire the knowledge of state space and state feedback in modern control systems and Represent any system in any canonical form.
		CO4	Test the controllability and observability of a given system. Design of pole assignment and observer using state feedback. To derive the discrete-time mathematical models in both time domain (difference equations, state equations) and z-domain (transfer function using z-transform).
		CO5	Identify and analyse non-linear systems using describing function analysis
		CO6	Analyse linear and non-linear systems using Lyapunov function and design Lyapunov function for stable systems
EE306	POWER SYSTEM ANALYSIS	CO1	Students will be able to analyse power system networks under normal and fault conditions
		CO2	Students will be able to compute symmetrical and unsymmetrical fault studies on the power system

		CO3	Students will be able to compute load flow studies under normal and abnormal conditions
		CO4	Students will be able to analyse steady state and dynamic response of power system control
		CO5	Students can compute optimal solution for unit commitment and economic dispatch
		CO6	Students will be able to apply different techniques for maintaining system stability
EE308	ELECTRIC DRIVES	CO1	To understand a drive being applied in 4 different Quadrants of operation and analyse its dynamic and steady state stability
		CO2	To apply the concept for DC drive in real time applications.
		CO3	To analyse chopper controlled dc drives and cycloconverter fed drives and to apply this in real time applications
		CO4	To understand different speed control techniques used in three phase induction motor.
		CO5	To differentiate between voltage source inverter and current source inverter fed induction motor drives and understand the concept of space vector
		CO6	To apply different speed control schemes in synchronous motor drives
HS300	PRINCIPLES OF MANAGEMENT	CO1	To identify and discuss the relevance and different perspectives of management concepts
		CO2	To describe and utilize management techniques for meeting current and future management challenges faced by the organization
		CO3	To compare the management theories and models critically and to inspect and question its validity in the real world
		CO4	To assess different decision making situations and develop methods to solve problems faced by management
		CO5	To make use of principles of management in order to execute the role of a manager
		CO6	
EE372	BIOMEDICAL INSTRUMENTATION	CO1	Get the knowledge about human physiology and understand different sources of bioelectric potentials.
		CO2	Familiarize different types bio potential electrodes and working of ECG machine.
		CO3	Understand different methods of measurement of blood pressure and heart sound
		CO4	Familiarize with different pace-makers, EMG, EEG and respiratory parameter measurements
		CO5	Ability to understand working of different type of ventilators, X-ray machine and Ultra sonic imaging system.
		CO6	Understand different instruments for clinical laboratory, Electrical Safety, methods of accident prevention and get knowledge about tele-medicine
EE332	SYSTEMS AND CONTROL LAB	CO1	Students will be able to familiarize and will be able to do program / plot bode and responses using MATLAB.

		CO2	Students will be able to explain the transfer function of different components of control system
		CO3	Students will be able to relate the frequency response of different compensators and step response
EE334	POWER ELECTRONICS AND DRIVES LAB	CO1	Students will be able to identify and explain different circuits and corresponding waveforms in power electronic circuits
		CO2	Students will be able to select a firing circuits for specific applications
		CO3	Students will be able to recognize various power semiconductor devices that are used in power electronic applications
		CO4	Students will learn to model different power electronic circuits
EE352	COMPREHENSIVE EXAM	CO1	Students will be able to improve their interview skills
		CO2	Students will be able to develop confidence in themselves related to knowledge gained in the field of engineering

List of Course Outcomes			
Course Code	Course Title	Course Outcomes	DEFINITION OF COURSE OUTCOMES
SEMESTER VII			
EE401	ELECTRONIC COMMUNICATION	CO1	The students will get basic knowledge about analog modulation techniques and Familiarize some of the FM and AM transmitters and receivers
		CO2	The students will infer the basic working of monochrome and colour television and obtain a basic idea about the RADAR
		CO3	summarize the modulation techniques used for digital signals
		CO4	Learn about the basic concepts of Satellite communications
			Infer different wireless technologies and concept of cellular systems
EE403	DISTRIBUTED GENERATIOIN	CO1	Understand the evaluation, electric grid, distribution generation and microgrid also have a good understanding of present grid and the need of smart grid and its opportunities, challenges and benefits

		CO2	Able to analyse the smart grid storage devices, distributed energy resources and control of microgrids and its application
	AND SMART GRIDS	CO3	Able to get an idea about protection issues for microgrids, various components of smart grids, tariffs, intelligent electronic devices and home and building automations
		CO4	Able to understand and apply load management methods
		CO5	Able to understand the communications methods in smart grids, smart substation architecture and feeder automation
		CO6	Able to understand the cloud computing and power quality issues in smart grid
EE405	ELECTRIC SYSTEM DESIGN	CO1	Students have understanding of Rules and Regulations of Electrical design
		CO2	Students learned to apply knowledge of design in low and medium electrical installation
		CO3	Students learned to apply knowledge of design in transmission substation electrical installation and earthing design
		CO4	Students learned to apply knowledge in short circuit calculation and pre-commissioning test of cables and transformer
		CO5	Students learned to apply knowledge of design of lighting and electrical installation
		CO6	Students learned to apply knowledge in solar system design & energy conservation
EE407	DIGITAL SIGNAL PROCESSING	CO1	To interpret discrete time systems using DFT
		CO2	To develop structures for the realization of digital filters
		CO3	To design IIR filters
		CO4	To design FIR filters
		CO5	To interpret the effects of finite word length in digital filters
		CO6	To explain the architecture and applications of DSP processor
EE409	ELECTRICAL MACHINE DESIGN	CO1	Understand and analyse the concept and theory of design, ventilation and enclosures of all electrical machines that will encourage students to take up innovative ideas
		CO2	Understand and design of core dimension, overall dimensions, and cooling techniques of single and three phase transformers
		CO3	Analyse and design armature winding, field winding , commutator and brushes and compensating winding of dc machines
		CO4	Understand and design stator and rotor design of alternators
		CO5	Understand and design the stator and rotor design of all three phase induction motors so as to get an idea of its application
		CO6	Understand about electrical cad and finite element analysis on electric machines
		CO1	Students will be able to choose a suitable drive scheme for developing an electric hybrid vehicle depending on resources

Ee469	ELECTRIC HYBRID VEHICLES	CO2	Design and develop basic schemes of electric vehicles and hybrid electric vehicles
		CO3	Choose proper energy storage systems for vehicle applications
		CO4	Identify various communication protocols and technologies used in vehicle networks
EE431	POWER SYSTEM LAB	CO1	Analyse a power system by carrying out load flow and short circuit experimentations.
		CO2	Analyse Power System Stability
		CO3	Design a solar panel required for a specified area.
		CO4	Validate the performance of Power System devices by appropriate tests
EE451	SEMINAR AND PROJECT PRILIIMINARIES	CO1	The students will be able to Analyse a current topic of professional interest and present it before an audience
		CO2	Identify an engineering problem, analyse it and propose a work plan to solve it.

List of Course Outcomes			
Course Code	Course Title	Course Outcomes	DEFINITION OF COURSE OUTCOMES
SEMESTER VIII			
EE402	SPECIAL ELECTRICAL MACHINES	CO1	The students will gain knowledge in the construction and principle of operation of servomotors
		CO2	Able to explain the performance and control of stepper motors and their applications
		CO3	Able to describe the operation and characteristics of single phase special electrical machines
		CO4	Gain knowledge in analysing power circuits and switching circuits of reluctance motors
		CO5	Understand the construction ,working ,principle of brushless dc motor and analyse the performance
		CO6	Understand the principle of operation, constructional features of Linear motors
EE404	INDUSTRIAL INSTRUMENTATION AND AUTOMATION	CO1	Select instruments and transducers for various physical variables
		CO2	Get an insight on data acquisition, processing and monitoring system

		CO3	Design various signal conditioning systems for transducers.
		CO4	Analyse dynamic responses of various systems.
		CO5	Get the concepts of virtual instrumentation and current source inverter fed induction motor drives and understand the concept of space vector.
		CO6	Understand the programming realization of PLC
EE474	ENERGY MANAGEMENT AND AUDITING	CO1	To analyse the principle and planning of energy management so as to implement peak demand controls methodologies in different conditions and to discuss types of Industrial loads and optimal load scheduling
		CO2	To implement the energy management opportunities in motors, lightings, electrolysis, heating, boilers, furnace waste heat recovery, refrigeration and air conditioning and steam
		CO3	Describe the need, procedure and instruments of energy audit
		CO4	Different methods used for the economic analysis of energy projects
CE482	ENVIRONMENTAL IMPACT ASSESSMENT	CO1	Describe, explain and interpret basic aspects of the various forms of pollution in environmental systems.
		CO2	Recognize and predict causes and effects of the various forms of pollution.
		CO3	Explain the impacts due to deforestation, ozone layer depletion, climate change and land degradation
		CO4	Explain essential elements and methodologies used in the EIA process.
		CO5	Analyse and review project level EIAs.
EE492	PROJECT	CO1	The students will be able to think innovatively on the development of components, products, processes or technologies in the engineering field
		CO2	Apply knowledge gained in solving real life engineering problems

DEPARTMENT OF MECHANICAL ENGINEERING

Program Educational Objectives (PEO)

PEO 1. Apply their engineering knowledge and skills in professional engineering practice and also in non-engineering fields to identify and address technical and societal problems.

PEO 2. Compliment their intellectual development by pursuing graduate education or other professional development programs.

PEO 3. Evolve as responsible engineers capable of conducting sustainable innovative research and development in diversified domains.

PEO 4. Honed to work as team builders, working professionally and ethically to accomplish organizational goals.

Program Outcomes (PO)

On successful completion of the under-graduate programme B.Tech. Mechanical Engineering, the Mechanical Engineering graduates will,

PO1. Apply knowledge of mathematics, science and engineering to arrive solutions

PO2. Identify, formulate and analyze engineering problems through technical literature.

PO3. Design a component, a process and a system to meet desired needs considering economic, environmental, social, ethical, health and safety, manufacturability and sustainability.

PO4. 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. Use the techniques, skills, and modern engineering tools for modeling and prediction of problems by understanding the limitations.

PO6. Recognize the importance of health and safety, societal, cultural responsibility in the design and implementation of engineering projects.

PO7. Know and apply societal and environmental context to engineering solutions for sustainable development

PO8. Apply the standards and professional ethics in engineering practice.

PO9. Function effectively as a member or leader of a team

PO10. Express effectively, comprehend and write reports on the engineering activities

PO11. Apply engineering and management principles to manage projects in multidisciplinary environments.

PO12. Engage themselves in life-long learning by recognizing the need and technological changes.

Program Specific Outcomes (PSO)

PSO 1. Apply the knowledge of mathematics, physics, basics of other engineering disciplines, mechanics, thermal sciences, fluid mechanics and management principles for solving complex and diverse problems in the field of mechanical engineering.

PSO 2. Implement the principles of design, analysis and interpretation of data to the mechanical systems and processes

PSO 3. Use modern tools such as CAD/CAM/ CIM/CFD, IT, IOT and 3D printing techniques in the mechanical engineering practice.

COURSE OUTCOMES (COs)

CO-PO- 2015 Scheme-KTU

Semester	1
Course Code	BE101-02
Course Name	Introduction To Mechanical Engineering

Sl. No.	Course Outcomes
BE101-02.1	Describe about fundamentals and laws of thermodynamics and apply the concept to study the working of Carnot engine
BE101-02.2	Explain about some of the energy conversion devices like engines, turbines and air compressor and discuss about basics of rocket propulsion
BE101-02.3	Illustrate about basics of refrigeration and air conditioning and apply its use to various industries
BE101-02.4	Explain the basics of automobile and aeronautical engineering to recognize the working of automobile and jet engines
BE101-02.5	List the different engineering materials and discuss the various methods of material testing
BE101-02.6	Explain the various manufacturing processes like casting, forging, rolling etc

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CO-PO- 2015 Scheme-KTU

Semester	1
Course Code	BE110
Course Name	Engineering Graphics

Sl. No.	Course Outcomes
BE 110.1	Student will be able to understand the theory of projection.
BE 110.2	Student will be able to draw orthographic projections and sections.
BE 110.3	Student should develop the ability to develop 3D model and convert 3-D models to free hand sketches.
BE 110.4	Student will become familiar with AutoCAD 2-D and 3-D drawings.
BE 110.5	Student will be able to improve their visualization skills for developing new products.
BE 110.6	Students will be able to draw real images of objects and curves of intersection of solids like cylinder, prism and cone.

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Semester	1
Course Code	BE 100
Course Name	ENGINEERING MECHANICS

Sl. No.	Course Outcomes
BE100.1	Understand the fundamental concepts and laws of mechanics and draw free body diagrams to determine the resultant of forces and/or moments.
BE100.2	Use the knowledge about different types of beams, supports and loads to determine the support reactions developed in the beam and also to solve the force system in space using vector approach
BE100.3	Determine the centroid and moment of inertia of surfaces and solids using parallel and perpendicular axis theorems and to calculate the area and volume of basic figures using theorem of Pappus and Guldinus
BE100.4	Solve problems related to friction and apply principle of virtual work to determine the support reactions in beam.
BE100.5	Apply the laws of motion, kinematics of motion and their interrelationship to systems in general plane motion and practical engineering problems
BE100.6	Understand the concepts in simple harmonic motion and vibrations and to calculate the parameters of bodies executing such motion

Semester	2
Course Code	BE102
Course Name	Design And Engineering

Sl. No.	Course Outcomes
BE102.1	Analyze the different elements involved in good design and apply them in practice when called for
BE102.2	Aware of the product oriented and user oriented aspects of an optimal design
BE102.3	Produce an innovative design concept by incorporating the different segments of knowledge gained
BE102.4	Value the different perspective of design factors covering functions, cost, sustainability, environmental impact, safety and others

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Semester	3
Course Code	ME203
Course Name	MECHANICS OF FLUIDS

Sl. No.	Course Outcomes
ME203.1	Ability to calculate pressure variations in accelerating fluids using Euler's and Bernoulli's equations
ME203.2	Become conversant with the concepts of flow measurements and flow through pipes and be able to describe them.
ME203.3	Apply the momentum and energy equations to fluid flow problems based on an analysis of the various system specifications (i.e. viscid, inviscid, rotational, irrotational, steady, unsteady etc.).
ME203.4	Evaluate head loss in pipes and conduits and recommend suitable engineering criteria for fluid flow, power transmission, etc..
ME203.5	Use dimensional analysis to design physical or numerical experiments applying dynamic similarity.

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Semester	3
Course Code	ME205
Course Name	THERMODYNAMICS

Sl. No.	Course Outcomes
ME205.1	Understand the laws of thermodynamics and their applications.
ME205.2	Apply the principles of thermodynamics for the analysis of steady flow energy systems.
ME205.3	Apply the concepts, laws and methodologies of thermodynamics into analysis of cyclic processes.
ME205.4	Analyze selected thermodynamic problems and obtain reasonably accurate solutions with the aid of engineering data (charts, graphs, etc.) and available approximate thermodynamic equations.
ME205.5	Relate the various gas equations to assess the conditions of mixtures of ideal and real gases.
ME205.6	Illustrate the processes involved in theoretical and actual combustion by making use of the various thermodynamic relations.

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CO-PO- 2015 Scheme-KTU

Semester	3
Course Code	ME231
Course Name	COMPUTER AIDED MACHINE DRAWING LAB

Sl. No.	Course Outcomes
ME231.1	The students are able to use and illustrate the different machines and parts through engineering drawings
ME231.2	Students can identify the necessary data to explain the part characteristics required for the preparation of a production drawing.
ME231.3	They are familiarized with the different option available in 2D and 3D drafting and use them to produce engineering drawings
ME231.4	Students can identify the machine parts and assemble them, and produce the part drawings.

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Semester	4
Course Code	ME 202
Course Name	Advanced Mechanics of Solids

Sl. No.	Course Outcomes
ME 202.1	Apply concepts of three dimensional stress and strain in solids.
ME 202.2	Understand the theory of elasticity at basic level and apply it to solve engineering problems.
ME 202.3	Apply stress function and governing equations to members subjected to stress.
ME 202.4	Compute the stresses in curved beams subjected to bending and beams subjected to unsymmetrical bending.
ME 202.5	Demonstrate the usage of energy methods for solving structural mechanics problems.
ME 202.6	Solve torsion problems in non-circular bars and thin walled members.

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Semester	4
Course Code	ME204
Course Name	THERMAL ENGINEERING

Sl. No.	Course Outcomes
ME204.1	To gain knowledge of steam boilers and its working as well as analyze the different steam power cycles and steam nozzles.
ME204.2	To understand the working of steam turbines and apply the principles of thermodynamics to solve engineering problems.
ME204.3	To understand the working of various internal combustion engines and analyze its underlying thermodynamic cycles.
ME204.4	To understand the performance testing of IC engines and evaluate various performance parameters and gain knowledge about IC engine fuels and combustion chemistry.
ME204.5	To gain knowledge of various components of exhaust gases from IC engine responsible for air pollution and its remedies by understanding combustion phenomena and design of combustion chambers in IC engines.
ME204.6	To understand and analyze the gas turbine cycle and its modifications and gain knowledge about combustion in gas turbines.

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Semester	4
Course Code	ME-206
Course Name	FLUID MACHINERY

Sl. No.	Course Outcomes
ME-206.1	Students will be able to define the principles and working of Hydraulic Machines.
ME-206.2	Students will be able to estimate the hydrodynamic forces on various types of vanes and to calculate the performance of various hydraulic machines.
ME-206.3	Students will be able to design an appropriate pump/turbine with reference to given application/situation. Carry out calculations involved in design of pump/turbine.
ME-206.4	Students will be able to understand the relation between various performance parameters and to interpret characteristic curves of a given pump/turbine/compressor.
ME-206.5	Students will be able to define the principles and working of various type of compressors.

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Semester	4
Course Code	ME210
Course Name	Metallurgy and Materials Engineering

Sl. No.	Course Outcomes
ME210.1	Identify the crystal structures of metallic materials
ME210.2	Analyze the binary phase diagrams of different alloys
ME210.3	Correlate the microstructure with properties, processing and performance of metals
ME210.4	Recognize the failure of metals with structural change
ME210.5	Select materials for design and construction
ME210.6	Apply core concepts in materials science to solve engineering problems

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Semester	4
Course Code	ME220
Course Name	Manufacturing Technology

Sl. No.	Course Outcomes
ME220.1	To give an exposure to different techniques of casting and molds required.
ME220.2	To provide an exposure to different rolling processes and different rolled products
ME220.3	To familiarize with different forging methods, cautions to be adopted in die design.
ME220.4	To give an introduction to various work and tool holding devices used in manufacturing and apply the basic principles of clamping to clamp complex shaped objects
ME220.5	To introduce to the bending, shearing and drawing processes of sheet metal working and allied machines
ME220.6	To give an understanding of welding metallurgy and weldability and to introduce various metal joining techniques.

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Semester	4
Course Code	ME230
Course Name	Fluid Mechanics and Machines Laboratory

Sl. No.	Course Outcomes
ME230.1	To understand the working principles of different flow measurement equipments and hydraulic machines with its procedures and applications.
ME230.2	To analyze the performance characteristics of different pumps and turbines.
ME230.3	To develop skill of experimentation techniques for the study of flow phenomena in pipes and channels.
ME230.4	To apply the different pressure measuring devices in instruments and hydraulic machines.
ME230.5	To acquaint with the stability conditions for floating bodies.

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Semester	4
Course Code	ME232
Course Name	Thermal Engineering Lab

Sl. No.	Course Outcomes
ME232.1	Determine the performance curves of different types of IC engines
ME232.2	Conduct experiments for the determination of viscosity, calorific value of different fuels
ME232.3	Able to understand the various charecteristics of compressors and blowers

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Semester	5
Course Code	ME301
Course Name	Mechanics of Machinery

Sl. No.	Course Outcomes
ME301.1	Knowledge in different types of mechanisms and their inversions, and to calculate their degrees of freedom.
ME301.2	Knowledge to conduct displacement, velocity and acceleration analysis of planar mechanisms.
ME301.3	To conduct synthesis of mechanism, and to construct a mechanism for a specified output motion.
ME301.4	Knowledge to design and develop a cam for a specified follower motion.
ME301.5	Knowledge in gear terminologies and to calculate velocity of gears in a gear train.

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Semester	5
Course Code	ME303
Course Name	Machines Tools & Digital Manufacturing

Sl. No.	Course Outcomes
ME303.1	Analyze various machining process and calculate relevant quantities such us velocities, forces and powers
ME303.2	Identify and explain the function of the basic components of a machine tool.
ME303.3	Understand the limitations of various machining process with regard to shape formation and surface texture.
ME303.4	Apply cutting mechanics to metal machining based on cutting force and power consumption
ME303.5	Understand the use of various machine tools and their fields of application
ME303.6	Get a basic knowledge on the importance of digital manufacturing

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Semester	5
Course Code	HS300
Course Name	PRINCIPLES OF MANAGEMENT

Sl. No.	Course Outcomes
HS300.1	To understand mangerial roles, management and challenages of management
HS300.2	To critically analyse and evaluate management theories and practices
HS300.3	To know about plan types
HS300.4	To formulate decision fopr organizations
HS300.5	To do staffing & HR related functions
HS300.6	To generally describe and interpret the types of leadership and control to exercise in doing things in the organisation

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Semester	5
Course Code	ME341
Course Name	DESIGN PROJECT

Sl. No.	Course Outcomes
ME341.1	Think innovatively on the development of components, products, processes or technologies in the engineering field
ME341.2	Identify and analyze a current problem of interest
ME341.3	Develop a methodology and work plan to solve the problem

Semester	5
Course Code	ME367
Course Name	NON DESTRUCTIVE TESTING

Sl. No.	Course Outcomes
ME367.1	Students can know the importance of NDT by inspecting the components using visual inspection and interpreting the defects.
ME367.2	The students are capable of explaining the properties of penetrants and developers and assess/select the appropriate DP process and ultimately evaluate the indications based on the acceptance criteria.
ME367.3	Students will be able to relate the theories of magnetism to explain the detection of defects using MPI. The appropriate process can be selected based on the type of component and orientation of crack.
ME367.4	To discuss the physics of ultrasonic waves and to examine and evaluate sub surface cracks using UT Method.
ME367.5	Students recall the basics of radiography which can be used in the selection of radiographic process and further evaluate the films to identify sub surface defects.
ME367.6	This module reviews the principles of eddy current testing and explains the application of ECT in thickness measurement of coatings and inspect for sub surface defects.

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Semester	6
Course Code	ME302
Course Name	Heat and Mass Transfer

Sl. No.	Course Outcomes
ME302.1	Solve problems involving steady state heat conduction with and without heat generation in simple geometries
ME302.2	Evaluate heat transfer coefficients for Natural convection and Forced convection situations using empirical relations.
ME302.3	Design Heat Exchangers and Fins and evaluate its performance.
ME302.4	Solve problems involving transient heat conduction and Understand the basics of Heat pipe, Boiling and Condensation
ME302.5	Estimate radiation heat transfer between black body and gray body surfaces.
ME302.6	Solve problems involving mass transfer due to diffusion, chemical reaction and convection.

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Semester	6
Course Code	ME304
Course Name	DYNAMICS OF MACHINERY

Sl. No.	Course Outcomes
ME304.1	Develop the design and practical problem solving skills in the area of mechanisms through static force analysis
ME304.2	Develop the design and practical problem solving skills in the area of mechanisms through dynamic force analysis
ME304.3	Apply energy principles to determine the energy fluctuations of a flywheel and Demonstrate the concepts of static and dynamic balancing to rotating and reciprocating machine parts and analyse them for the amount of unbalance.
ME304.4	Interpret the precessional motion and gyroscopic couple and apply them for the stability analysis of automobiles, ships and aircrafts
ME304.5	Understand the basics of vibration and apply the concepts in design problems of mechanisms

Semester	6
Course Code	ME306
Course Name	Advanced Manufacturing Technology

Sl. No.	Course Outcomes
ME306.1	The student is able to understand the fundamental principles of the powder metallurgy part production and predict the response of a powder metallurgy produced product
ME306.2	Students will be able to design and program basic PLC circuits for entry-level PLC applications.
ME306.3	Program and operate a CNC mill and lathe
ME306.4	The student shall understand the working, mechanism of metal removal in the various unconventional machining process and their effect and applications.
ME306.5	The students gain theoretical and practical skills related to metal forming so in future work they can design products for ease of manufacture.
ME306.6	Appreciate the use of micro machining and rapid prototype process

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Semester	6
Course Code	ME308
Course Name	COMPUTER AIDED DESIGNAND ANALYSIS

Sl. No.	Course Outcomes
ME308.1	Students able to express the concept of CAD/CAM/CIM and Other terminologies used in the development and manufacturing of a product.
ME308.2	Students able to demonstrate different methods for geometric modelling in CAD.
ME308.3	Students able to evaluate the types of curves used in creating a geometry.
ME308.4	Students able to formulate stiffness matrix to analyse structural and thermal problems
ME308.5	Students analyse structural finite element problems by getting knowledge about various finite element methods.

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Semester	6
Course Code	ME312
Course Name	Metrology and Instrumentation

Sl. No.	Course Outcomes
ME312.1	Explain the basics of standards of measurement and identify various linear and angular measuring instruments and comparators
ME312.2	Recognize the concept of limits, fits & tolerances and gauges and understand about optical measuring instruments like interferometers, optical flats and optical collimator
ME312.3	Measure the various elements of screw thread, surface texture and surface roughness
ME312.4	Explain about Coordinate Measuring Machine its types and illustrate machine vision
ME312.5	Classify measuring devices and compare its various performance characteristics and explain about various stages in generalized measuring system
ME312.6	Demonstrate the working various measuring devices for measuring temperature, force, torque, vibration and strain to benefit the society

Semester	6
Course Code	ME332
Course Name	COMPUTER AIDED DESIGN AND ANALYSIS LAB

Sl. No.	Course Outcomes
ME332.1	To gain knowledge in Computer Aided Design Methods and Procedures
ME332.2	To understand and solve simple structural, heat and fluid flow problems using software

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Semester	6
Course Code	ME334
Course Name	MANUFACTURING TECHNOLOGY LABORATORY – II

Sl. No.	Course Outcomes
ME334.1	Explain the working principle of various measuring instruments
ME334.2	Identify the appropriate production process and machines
ME334.3	Demonstrate the working of common machine tools CNC lathe and machining centre.

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Semester	6
Course Code	ME362
Course Name	CONTROL SYSTEM ENGINEERING

Sl. No.	Course Outcomes
ME362.1	To introduce the concepts of controls and modeling of physical systems.
ME362.2	To give idea on time response analysis and stability of systems.
ME362.3	To use different methods to analyse stability of control systems.
ME362.4	To introduce the graphical method to find out the transfer function.
ME362.5	To give idea on frequency response plotting.
ME362.6	To introduce the concept of compensation.

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Semester	7
Course Code	IE 306
Course Name	Supply Chain And Logistics Management

Sl. No.	Course Outcomes
IE 306.1	To introduce the subject. An introduction on General Features of Supply chain
IE 306.2	To understand the planning demand & Supply
IE 306.3	To have a thorough understanding of Aggregate Planning anf Network Design, Location and Layout Design
IE 306.4	To introduce the Inventory System and Multi Echelon Inventory Systems
IE 306.5	To have a detailed look at Logistics Management
IE 306.6	To impart knowledge on the reverse Logistics and Advanced logistics decision Models

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Semester	7
Course Code	ME401
Course Name	Design of machine elements -I

Sl. No.	Course Outcomes
ME401.1	The students will describe the design process, material selection, calculation of stresses and stress concentrations under variable loading.
ME401.2	After learning this module, the students will be able to demonstrate the ability to apply the fundamentals of stress analysis, theories of failure and fatigue loading in the design of machine components..
ME401.3	After learning this module, the students will demonstrate the ability by performing correctly the design and analysis of temporary and threaded joints.
ME401.4	After learning this module, the students will demonstrate the ability by performing the design and analysis of riveted, welded and permanent joints
ME401.5	After learning this module , the students will demonstrate the ability by performing correctly the design and analysis of springs
ME401.6	After learning this module , the students will demonstrate the ability by performing the design, analysis and sizing of shafts and couplings

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Semester	7
Course Code	ME403
Course Name	Advanced Energy Engineering

Sl. No.	Course Outcomes
ME403.1	To understand global and Indian energy scenario &compare different conventional power plants.
ME403.2	To gain knowledge about solar thermal energy systems, understand methods of its harvesting, estimate economic aspects involved and its sustainability attributes.
ME403.3	To gain knowledge about basics of wind energy; understand & analyze wind energy conversion systems; understand solar-wind hybrid systems and wind power economics.
ME403.4	To gain knowledge about biomass energy and understand various biomass conversion processes, and estimate economic aspects involved and future prospects.
ME403.5	To understand the Geothermal, Tidal , Wave, MHD, small scale hydro power plants, fuel cells, Hydrogen energy conversion systems, hybrid systems; estimate economic aspects involved and technical feasibility
ME403.6	To understand Environmental impacts of energy conversion

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Semester	7
Course Code	ME405
Course Name	REFRIGERATION AND AIR CONDITIONING

Sl. No.	Course Outcomes
ME405.1	To know about basic refrigeration process and to indentify as well as illustrate air refrigeration.
ME405.2	To understand different refrigeration methods and apply the same for various temperature and pressure conditions
ME405.3	To select the right refrigerant for a particular practical situation. Apply the knowledge of working principles of refrigerating to attain sustainable refrigeration methods
ME405.4	To discuss applications of refrigeration and to demonstrate the working of various components used in refrigeration systems
ME405.5	To understand and Analyze the air conditioning processes using principles of Psychrometry
ME405.6	Apply the basic principles of air conditioning and design different type of air conditioning systems and duct systems for industrial applications

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Semester	7
Course Code	ME407
Course Name	Mechatronics

Sl. No.	Course Outcomes
ME407.1	Students will understand the basic structure of Mechatronics system,sensors and encoders.
ME407.2	Students will gain knowledge on the various types of hydraulic andpneumatic actuators used.
ME407.3	Students will develop and idea about Micro Electro Mechanical System, Deep Reactive Ion Etching (DRIE) and LIGA Process
ME407.4	Students will be able to select various mechatronics elements in the design of modern CNC machines
ME407.5	Students will gain fundamental knowledge in system modelling and Mechatronics in Robotics.
ME407.6	Students will be able to assess case studies of mechatronic systems.

Semester	7
Course Code	ME409
Course Name	COMPRESSIBLE FLUID FLOW

Sl. No.	Course Outcomes
ME409.1	To familiarize with behavior of compressible gas flow.
ME409.2	To understand the difference between subsonic and supersonic flow, isentropic and adiabatic flow.
ME409.3	To familiarize the behavior of normal shock and oblique shock.
ME409.4	To give an idea on fanno flow.
ME409.5	To give idea on rayleigh flow.
ME409.6	To familiarize with high speed test facilities.

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Semester	7
Course Code	ME 451
Course Name	Seminar and Project Preliminary

Sl. No.	Course Outcomes
ME 451.1	Know the recent advancements in technology through literature surveys and present it before an audience
ME 451.2	Identify and analyze a current problem of interest
ME 451.3	Develop a methodology and work plan to solve the problem
ME 451.4	Make impressive reports and presentations through effective communicative and written skills
ME 451.5	Inculcate a culture of dissemination of knowledge among peer group

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Semester	7
Course Code	ME463
Course Name	Automobile Engineering

Sl. No.	Course Outcomes
ME463.1	Practically identify different automotive systems and subsystems. Also to develop a strong base for understanding future developments in the automobile industry
ME463.2	Understand the principles of clutches and transmission
ME463.3	Analyze and comprehend the steering mechanism of vehicle
ME463.4	Understand the principles of suspension and stability factors of vehicle
ME463.5	Analyze and comprehend the braking systems of an automobile
ME463.6	Comprehend the aerodynamic principles and recognize its application on vehicles.

Semester	8
Course Code	ME 402
Course Name	Design of machine elements -II

Sl. No.	Course Outcomes
ME 402.1	After learning this module, the students will demonstrate the ability by performing the design and analysis of clutches and brakes
ME 402.2	After learning this module , the students will demonstrate the ability by performing correctly the design and analysis of sliding and rolling contact bearings
ME 402.3	After learning this module , the students will demonstrate the ability by performing correctly the analysis of forces and design of gears
ME 402.4	After learning this module , the students will demonstrate the ability by performing correctly design of belts and chains
ME 402.5	After learning this module , the students will demonstrate the ability by performing correctly material selection and design of connecting rod
ME 402.6	After learning this module , the students will demonstrate the ability by performing correctly material selection and design of pressure vessels

Semester	8
Course Code	ME404
Course Name	INDUSTRIAL ENGINEERING

Sl. No.	Course Outcomes
ME404.1	Exposing/making aware of various tools & techinques amd ,modern application industrial engineering approachs in manufacturing & service sector
ME404.2	To differentiate plant layouts and material handling equipment for industrial applications
ME404.3	Develop work procedures applying principles of work study
ME404.4	To know the nuances of industrial relations and trade union activities and their mechanism to resolve the issues
ME404.5	To apply inventory control techniques in inventory management
ME404.6	To apply quality control practices and testing methods to enusre quality in end products

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Semester	8
Course Code	ME462
Course Name	PROPULSION ENGINEERING

Sl. No.	Course Outcomes
ME462.1	Understand the generation of thrust in air-breathing engines and rockets;
ME462.2	Perform thermodynamic analysis of aircraft engines
ME462.3	Carry out performance analysis of aircraft systems and components
ME462.4	Understand how liquid and solid propellant rockets work
ME462.5	Formulate and solve rocket engine problems
ME462.6	Ability to carry out simple flight performance calculations for rockets

Semester	8
Course Code	ME476
Course Name	Material Handling & Facilities Planning

Sl. No.	Course Outcomes
ME476.1	Identify the value of facility planning on the strategy of a firm
ME476.2	Develop a systematic plant layout
ME476.3	Analyse the safety and environmental aspects in facilities planning
ME476.4	Understand various material handling systems and classification of material handling equipment
ME476.5	Selection and Maintenance of material handling equipment with safety and ergonomics aspects

Semester	8
Course Code	ME 492
Course Name	Project

Sl. No.	Course Outcomes
ME 492.1	Identify and analyze a problem of interest
ME 492.2	Know the recent advancements in technology in the area of interest through literature surveys and present it before an audience
ME 492.3	Develop a methodology and work plan to solve the problem
ME 492.4	Make impressive reports and presentations through effective communicative and written skills
ME 492.5	Inculcate a culture of dissemination of knowledge among peer group

Programme: M. Tech.

Specialisation in Computer Aided Structural Engineering

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 – Knowledge Attainment: Post - Graduates shall have sound proficiency and practical knowledge in various fields of Structural Engineering leading to a successful career.

PEO 2 - Employability / Higher Education / Entrepreneurship: Post-Graduates shall be prepared for employment in Government, Industry or private organizations and have in them a strong desire for Higher Education / Entrepreneurship.

PEO 3 - Integrity and Ethics: Post-Graduates shall conform to professional ethics and contribute to uphold the integrity of their profession

PROGRAMME OUTCOMES (POS)

PO1. Technical Skills: Post-Graduates will develop confidence and technical skills for taking up research, consultancy and teaching as a profession.

PO2. Problem analysis / Development of solutions: Post-Graduates will attain an ability to identify, formulate and design system components or processes that meet the specified needs to solve complex structural engineering problems.

PO3. Conduct investigations of complex problems: Post-Graduates will be able to conduct investigations of complex structural engineering problems using research based knowledge and tests / experiments

PO4. The engineer and society: Post-Graduates will understand the impact of engineering solutions on environment and the society.

PO5. Ethics: Post –Graduates will have a strong Professional and Ethical responsibility.

PO6. Communication: Post-Graduates will be able to communicate effectively in both verbal and written forms to the technical community as well as society.

PO7. Face Challenges: Post-Graduates will develop confidence to face newer challenges in Industry / society.

PO8. Life-long learning: Post-Graduates will develop confidence for self-education and ability for life-long learning.

PO9. Adopt new technology: Post-Graduate will learn to adopt new technology by properly understanding the pros and cons to implement the same successfully.

Programme: M. Tech.

Specialisation in Environmental Engineering

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 – Knowledge Attainment: Post-Graduates shall achieve sound practical proficiency and knowledge in various fields of Environmental Engineering leading to a successful career.

PEO 2 - Employability / Higher Education / Entrepreneurship: Post-Graduates shall be prepared for employment in Government, Industry or private organizations and have in them a strong desire for Higher Education / Entrepreneurship.

PEO 3 – Social Responsibility: Post-Graduates shall use the acquired skills and facts to improve the environmental quality for better habitation.

PEO 4– Integrity and Ethics: Post-Graduates shall conform to professional ethics and contribute to uphold the integrity of their profession

PEO 5 –Communication Skills: Post-Graduates shall develop strong technical communication skills and intra and inter personal skills which would help inculcate in them team spirit, management and leadership qualities.

PEO 6 - Modern Tool Usage: Post-Graduates shall develop in-depth knowledge of the modern skills and tools related to environmental engineering so as to enable them to address the environmental aspects and sustainable issues.

PROGRAMME OUTCOMES (POS)

PO1. Technical Skills: Post-Graduates will develop confidence and technical skills for taking up research, consultancy and teaching as a profession.

PO2. Problem analysis / Development of solutions: Post-Graduates will attain an ability to identify, formulate and design system components or processes that meet the specified needs to solve complex environmental engineering problems.

PO3. Conduct investigations of complex problems: Post-Graduates will be able to conduct investigations of complex environmental problems using research based knowledge and tests / experiments

PO4. The engineer and society: Post-Graduates will understand the impact of engineering solutions on environment and the society.

PO5. Ethics: Post –Graduates will have a strong Professional and Ethical responsibility.

PO6. Communication: Post-Graduates will be able to communicate effectively in both verbal and written forms to the technical community as well as society.

PO7. Face Challenges: Post-Graduates will develop confidence to face newer challenges in Industry / society.

PO8. Life-long learning: Post-Graduates will develop confidence for self-education and ability for life-long learning.

PO9. Adopt new technology: Post-Graduate will learn to adopt new technology by properly understanding the pros and cons to implement the same successfully.

Programme: M. Tech.

Specialisation in Computer Science & Information Systems

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 – Knowledge Attainment: Post - Graduates shall have sound proficiency and practical knowledge of computer science to contribute in research & development(R&D) effectively for the advancement of Information Security.

PEO 2 - Employability / Higher Education / Entrepreneurship: Post-Graduates shall be prepared for employment in Government, Industry or private organizations and have in them a strong desire for Higher Education / Entrepreneurship.

PEO 3– Integrity and Ethics: Post-Graduates shall conform to professional ethics and contribute to uphold the integrity of their profession.

PEO 4–Communication Skills: Post-Graduates shall develop strong technical communication skills and intra and inter personal skills which would help inculcate in them team spirit, management and leadership qualities.

PEO 5 - Modern Tool Usage: Post-Graduates shall develop in-depth knowledge and skills to analyse, design, test and implement various software and be engaged in life - long learning.

PROGRAMME OUTCOMES (POS)

PO1. Technical Skills: Post-Graduates will develop confidence and technical skills for taking up research, consultancy and teaching as a profession.

PO2. Problem analysis / Development of solutions: Post-Graduates will attain an ability to identify, formulate and design system components or processes that meet the specified needs to solve complex computer engineering problems.

PO3. Conduct investigations of complex problems: Post-Graduates will be able to conduct investigations of complex problems in information systems using research based knowledge and tests / experiments

PO4. The engineer and society: Post-Graduates will understand the impact of engineering solutions on the environment and the society.

PO5. Ethics: Post –Graduates will have a strong Professional and Ethical responsibility.

PO6. Communication: Post-Graduates will be able to communicate effectively in both verbal and written forms to the technical community as well as society.

PO7. Face Challenges: Post-Graduates will develop confidence to face newer challenges in Industry / society.

PO8. Life-long learning: Post-Graduates will develop confidence for self-education and ability for life-long learning.

PO9. Adopt new technology: Post-Graduate will learn to adopt new technology by properly understanding the pros and cons to implement the same successfully.

Programme: M. Tech.

Specialisation in Production & Industrial Engineering

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1 - Students shall have the ability to apply their engineering knowledge and skills in professional engineering practice and also in non-engineering fields to identify and address technical and societal problems.

PEO2 - Students shall have the ability to complement their intellectual development by pursuing post graduate education or other professional development programs.

PEO3 - Students shall evolve as responsible engineers capable of conducting sustainable innovative research and development in diversified domains.

PEO4 - Students shall be honed to work as team builders, working professionally and ethically to accomplish organizational goals.

PROGRAMME OUTCOMES (POS)

PO1. Technical Skills: Post-Graduates will develop confidence and technical skills for taking up research, consultancy and teaching as a profession.

PO2. Problem analysis / Development of solutions: Post-Graduates will attain an ability to identify, formulate and design system components or processes that meet the specified needs to solve complex environmental engineering problems.

PO3. Conduct investigations of complex problems: Post-Graduates will be able to conduct investigations of complex environmental problems using research based knowledge and tests / experiments

PO4. The engineer and society: Post-Graduates will understand the impact of engineering solutions on environment and the society.

PO5. Ethics: Post –Graduates will have a strong Professional and Ethical responsibility.

PO6. Communication: Post-Graduates will be able to communicate effectively in both verbal and written forms to the technical community as well as society.

PO7. Face Challenges: Post-Graduates will develop confidence to face newer challenges in Industry / society.

PO8. Life-long learning: Post-Graduates will develop confidence for self-education and ability for life-long learning.

PO9. Adopt new technology: Post-Graduate will learn to adopt new technology by properly understanding the pros and cons to implement the same successfully.

Programme: M. Tech.

Specialisation in Communication Engineering

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: Knowledge Attainment: Post-Graduates shall have expertise and practical knowledge in the field of Communication Engineering**.**

PEO 2: Employability / Research / Entrepreneurship: Post-Graduates shall be equipped for employment /research and encourage them for startups**.**

PEO 3: Social Responsibility: Post-Graduates shall use the acquired skills to find better solutions for socially relevant problems.

PROGRAMME OUTCOMES (POS)

PO1. Engineering knowledge: Post-Graduates will acquire knowledge and technical skills for taking up research and teaching as a profession.

PO2. Problem analysis / Development of solutions: Post-Graduates will attain an ability to identify, formulate and design system components or processes that meet the specified needs to solve complex Communication Engineering problems

PO3. Conduct investigations of complex problems: Post-Graduates shall 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.

PO4. Modern tool usage: Post-Graduates shall develop in-depth knowledge of the modern skills and tools related to Communication Engineering so as to enable them to address the various aspects and issues in this field.

PO5. Integrity and Ethics: Post-Graduates shall conform to professional ethics and contribute to uphold the integrity of their profession.

PO6. Communication Skills: Post-Graduates shall develop strong technical communication skills and intra and inter personal skills which would help inculcate in them team spirit, management and leadership qualities

PO7. Life-long learning: Post-Graduates shall develop the ability to engage in independent and life-long learning in the context of technological changes.

Programme: M. Tech.

Specialisation in VLSI & Embedded Systems

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: Knowledge Attainment: Post-Graduates shall have expertise and practical knowledge in the field of VLSI & Embedded Systems**.**

PEO 2: Employability / Research / Entrepreneurship: Post-Graduates shall be equipped for employment /research and encourage them for startups**.**

PEO 3: Social Responsibility: Post-Graduates shall use the acquired skills to find better solutions for socially relevant problems.

PROGRAMME OUTCOMES (POS)

PO1. Engineering knowledge: Post-Graduates will acquire knowledge and technical skills for taking up research and teaching as a profession.

PO2. Problem analysis / Development of solutions: Post-Graduates will attain an ability to identify, formulate and design system components or processes that meet the specified needs to solve complex VLSI and Embedded Systems problems.

PO3. Conduct investigations of complex problems: Post-Graduates shall 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.

PO4. Modern tool usage: Post-Graduates shall develop in-depth knowledge of the modern skills and tools related to VLSI and Embedded Systems so as to enable them to address the various aspects and issues in this field.

PO5. Integrity and Ethics: Post-Graduates shall conform to professional ethics and contribute to uphold the integrity of their profession.

PO6. Communication Skills: Post-Graduates shall develop strong technical communication skills and intra and inter personal skills which would help inculcate in them team spirit, management and leadership qualities

PO7. Life-long learning: Post-Graduates shall develop the ability to engage in independent and life-long learning in the context of technological changes.