

**Course Outcomes**

**Regulation 2017**

**MA8353 Transforms and Partial Differential Equations**

<b>CO1</b>	Understand how to solve the given standard partial differential equations.
<b>CO2</b>	Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
<b>CO3</b>	Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations
<b>CO4</b>	Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
<b>CO5</b>	Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

**CE8301 Strength of Materials I**

<b>CO1</b>	Understand the concepts of stress and strain, principal stresses and principal planes.
<b>CO2</b>	Determine Shear force and bending moment in beams and understand concept of theory of simple bending.
<b>CO3</b>	Calculate the deflection of beams by different methods and selection of method for determining slope or deflection
<b>CO4</b>	Apply basic equation of torsion in design of circular shafts and helical springs
<b>CO5</b>	Analyze the pin jointed plane and space trusses

**CE8302 Fluid Mechanics**

<b>CO1</b>	Get a basic knowledge of fluids in static, kinematic and dynamic equilibrium.
<b>CO2</b>	Understand and solve the problems related to equation of motion.
<b>CO3</b>	Gain knowledge about dimensional and model analysis.
<b>CO4</b>	Learn types of flow and losses of flow in pipes.
<b>CO5</b>	Understand and solve the boundary layer problems.

**CE8351 Surveying**

<b>CO1</b>	The use of various surveying instruments and mapping
<b>CO2</b>	Measuring Horizontal angle and vertical angle using different instruments
<b>CO3</b>	Methods of Levelling and setting Levels with different instruments
<b>CO4</b>	Concepts of astronomical surveying and methods to determine time, longitude, latitude and azimuth
<b>CO5</b>	Concept and principle of modern surveying

**CE8391 Construction Materials**

<b>CO1</b>	Compare the properties of most common and advanced building materials.
<b>CO2</b>	understand the typical and potential applications of lime, cement and aggregates
<b>CO3</b>	know the production of concrete and also the method of placing and making of

	concrete elements.
<b>CO4</b>	understand the applications of timbers and other materials
<b>CO5</b>	Understand the importance of modern material for construction.

#### **CE8392 Engineering Geology**

<b>CO1</b>	Will be able to understand the importance of geological knowledge such as earth, earthquake, volcanism and the action of various geological agencies.
<b>CO2</b>	Will get basics knowledge on properties of minerals.
<b>CO3</b>	Gain knowledge about types of rocks, their distribution and uses.
<b>CO4</b>	Will understand the methods of study on geological structure.
<b>CO5</b>	Will understand the application of geological investigation in projects such as dams, tunnels, bridges, roads, airport and harbour

#### **CE8311 Construction Materials Laboratory**

<b>CO1</b>	The students will have the required knowledge in the area of testing of construction materials and components of construction elements experimentally.
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#### **CE8361 Surveying Laboratory**

<b>CO1</b>	Students completing this course would have acquired practical knowledge on handling basic survey instruments including Theodolite, Tacheometry, Total Station and GPS and have adequate knowledge to carryout Triangulation and Astronomical surveying including general field marking for various engineering projects and Location of site etc.
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#### **HS8381 Interpersonal Skills/Listening and Speaking**

<b>CO1</b>	Listen and respond appropriately.
<b>CO2</b>	Participate in group discussions
<b>CO3</b>	Make effective presentations
<b>CO4</b>	Participate confidently and appropriately in conversations both formal and informal

#### **MA8491 Numerical Methods**

<b>CO1</b>	Understand the basic concepts and techniques of solving algebraic and transcendental equations.
<b>CO2</b>	Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations.
<b>CO3</b>	Apply the numerical techniques of differentiation and integration for engineering problems.
<b>CO4</b>	Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
<b>CO5</b>	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

#### **CE8401 Construction Techniques and Practices**

<b>CO1</b>	know the different construction techniques and structural systems
<b>CO2</b>	Understand various techniques and practices on masonry construction, flooring, and roofing.
<b>CO3</b>	Plan the requirements for substructure construction.
<b>CO4</b>	Know the methods and techniques involved in the construction of various types of

	super structures
<b>CO5</b>	Select, maintain and operate hand and power tools and equipment used in the building construction sites.

#### **CE8402 Strength of Materials II**

<b>CO1</b>	Determine the strain energy and compute the deflection of determinate beams, frames and trusses using energy principles.
<b>CO2</b>	Analyze propped cantilever, fixed beams and continuous beams using theorem of three moment equation for external loadings and support settlements.
<b>CO3</b>	find the load carrying capacity of columns and stresses induced in columns and cylinders
<b>CO4</b>	Determine principal stresses and planes for an element in three dimensional state of stress and study various theories of failure
<b>CO5</b>	Determine the stresses due to Unsymmetrical bending of beams, locate the shear center, and find the stresses in curved beams.

#### **CE8403 Applied Hydraulic Engineering**

<b>CO1</b>	Apply their knowledge of fluid mechanics in addressing problems in open channels.
<b>CO2</b>	Able to identify a effective section for flow in different cross sections
<b>CO3</b>	To solve problems in uniform, gradually and rapidly varied flows in steady state conditions
<b>CO4</b>	Understand the principles, working and application of turbines
<b>CO5</b>	Understand the principles, working and application of pumps

#### **CE8404 Concrete Technology**

<b>CO1</b>	The various requirements of cement, aggregates and water for making concrete
<b>CO2</b>	The effect of admixtures on properties of concrete
<b>CO3</b>	The concept and procedure of mix design as per IS method
<b>CO4</b>	The properties of concrete at fresh and hardened state
<b>CO5</b>	The importance and application of special concretes.

#### **CE8491 Soil Mechanics**

<b>CO1</b>	Classify the soil and assess the engineering properties, based on index properties.
<b>CO2</b>	Understand the stress concepts in soils
<b>CO3</b>	Understand and identify the settlement in soils.
<b>CO4</b>	Determine the shear strength of soil
<b>CO5</b>	Analyze both finite and infinite slopes.

#### **CE8481 Strength of Materials Laboratory**

<b>CO1</b>	The students will have the required knowledge in the area of testing of materials and components of structural elements experimentally
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#### **CE8461 Hydraulic Engineering Laboratory**

<b>CO1</b>	The students will be able to measure flow in pipes and determine frictional losses.
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<b>CO2</b>	The students will be able to develop characteristics of pumps and turbines.
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**HS8461 Advanced Reading and Writing**

<b>CO1</b>	Write different types of essays.
<b>CO2</b>	Write winning job applications.
<b>CO3</b>	Read and evaluate texts critically.
<b>CO4</b>	Display critical thinking in various professional contexts.

**CE8501 Design of Reinforced Cement Concrete Elements**

<b>CO1</b>	Understand the various design methodologies for the design of RC elements.
<b>CO2</b>	Know the analysis and design of flanged beams by limit state method and sign of beams for shear, bond and torsion
<b>CO3</b>	Design the various types of slabs and staircase by limit state method.
<b>CO4</b>	Design columns for axial, uniaxial and biaxial eccentric loadings.
<b>CO5</b>	Design of footing by limit state method.

**CE8502 Structural Analysis I**

<b>CO1</b>	Analyze continuous beams, pin-jointed indeterminate plane frames and rigid plane frames by strain energy method
<b>CO2</b>	Analyse the continuous beams and rigid frames by slope deflection method.
<b>CO3</b>	Understand the concept of moment distribution and analysis of continuous beams and rigid frames with and without sway.
<b>CO4</b>	Analyse the indeterminate pin jointed plane frames continuous beams and rigid frames using matrix flexibility method
<b>CO5</b>	Understand the concept of matrix stiffness method and analysis of continuous beams, pin jointed trusses and rigid plane frames.

**EN8491 Water Supply Engineering**

<b>CO1</b>	an insight into the structure of drinking water supply systems, including water transport, treatment and distribution
<b>CO2</b>	the knowledge in various unit operations and processes in water treatment
<b>CO3</b>	an ability to design the various functional units in water treatment
<b>CO4</b>	an understanding of water quality criteria and standards, and their relation to public health
<b>CO5</b>	the ability to design and evaluate water supply project alternatives on basis of chosen criteria

**CE8591 Foundation Engineering**

<b>CO1</b>	Understand the site investigation, methods and sampling.
<b>CO2</b>	Get knowledge on bearing capacity and testing methods.
<b>CO3</b>	Design shallow footings.
<b>CO4</b>	Determine the load carrying capacity, settlement of pile foundation.
<b>CO5</b>	Determine the earth pressure on retaining walls and analysis for stability.

**CE8511 Soil Mechanics Laboratory**

<b>CO1</b>	Students are able to conduct tests to determine both the index and engineering properties of soils and to characterize the soil based on their properties.
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**CE8512 Water and Waste Water Analysis Laboratory**

<b>CO1</b>	Quantify the pollutant concentration in water and wastewater
<b>CO2</b>	Suggest the type of treatment required and amount of dosage required for the treatment
<b>CO3</b>	Examine the conditions for the growth of micro-organisms

**CE8601 Design of Steel Structural Elements**

<b>CO1</b>	Understand the concepts of various design philosophies
<b>CO2</b>	Design common bolted and welded connections for steel structures
<b>CO3</b>	Design tension members and understand the effect of shear lag.
<b>CO4</b>	Understand the design concept of axially loaded columns and column base connections
<b>CO5</b>	Understand specific problems related to the design of laterally restrained and unrestrained steel beams.

**CE8602 Structural Analysis II**

<b>CO1</b>	Draw influence lines for statically determinate structures and calculate critical stress resultants.
<b>CO2</b>	Understand Muller Breslau principle and draw the influence lines for statically indeterminate beams.
<b>CO3</b>	Analyse of three hinged, two hinged and fixed arches.
<b>CO4</b>	Analyse the suspension bridges with stiffening girders
<b>CO5</b>	Understand the concept of Plastic analysis and the method of analyzing beams and rigid frames.

**CE8603 Irrigation Engineering**

<b>CO1</b>	Have knowledge and skills on crop water requirements.
<b>CO2</b>	Understand the methods and management of irrigation.
<b>CO3</b>	Gain knowledge on types of Impounding structures
<b>CO4</b>	Understand methods of irrigation including canal irrigation.
<b>CO5</b>	Get knowledge on water management on optimization of water use.

**CE8604 Highway Engineering**

<b>CO1</b>	Get knowledge on planning and aligning of highway.
<b>CO2</b>	Geometric design of highways
<b>CO3</b>	Design flexible and rigid pavements.
<b>CO4</b>	Gain knowledge on Highway construction materials, properties, testing methods
<b>CO5</b>	Understand the concept of pavement management system, evaluation of distress and maintenance of pavements.

**EN8592 Wastewater Engineering**

<b>CO1</b>	An ability to estimate sewage generation and design sewer system including sewage pumping stations
<b>CO2</b>	The required understanding on the characteristics and composition of sewage, self-

	purification of streams
<b>CO3</b>	An ability to perform basic design of the unit operations and processes that are used in sewage treatment
<b>CO4</b>	Understand the standard methods for disposal of sewage. □
<b>CO5</b>	Gain knowledge on sludge treatment and disposal

#### **CE8611 Highway Engineering Laboratory**

<b>CO1</b>	Student knows the techniques to characterize various pavement materials through relevant tests.
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#### **CE8612 Irrigation and Environmental Engineering Drawing**

<b>CO1</b>	The students after completing this course will be able to design and draw various units of Municipal water treatment plants and sewage treatment plants.
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#### **HS8581 Professional Communication**

<b>CO1</b>	Make effective presentations
<b>CO2</b>	Participate confidently in Group Discussions.
<b>CO3</b>	Attend job interviews and be successful in them.
<b>CO4</b>	Develop adequate Soft Skills required for the workplace

#### **CE8701 Estimation, Costing and Valuation Engineering**

<b>CO1</b>	Estimate the quantities for buildings,
<b>CO2</b>	Rate Analysis for all Building works, canals, and Roads and Cost Estimate.
<b>CO3</b>	Understand types of specifications, principles for report preparation, tender notices types.
<b>CO4</b>	Gain knowledge on types of contracts
<b>CO5</b>	Evaluate valuation for building and land.

#### **CE8702 Railways, Airports, Docks and Harbour Engineering**

<b>CO1</b>	Understand the methods of route alignment and design elements in Railway Planning and Constructions.
<b>CO2</b>	Understand the Construction techniques and Maintenance of Track laying and Railway stations.
<b>CO3</b>	Gain an insight on the planning and site selection of Airport Planning and design.
<b>CO4</b>	Analyze and design the elements for orientation of runways and passenger facility systems.
<b>CO5</b>	Understand the various features in Harbours and Ports, their construction, coastal protection works and coastal Regulations to be adopted.

#### **CE8703 Structural Design and Drawing**

<b>CO1</b>	Design and draw reinforced concrete Cantilever and Counterfort Retaining Walls
<b>CO2</b>	Design and draw flat slab as per code provisions
<b>CO3</b>	Design and draw reinforced concrete and steel bridges
<b>CO4</b>	Design and draw reinforced concrete and steel water tanks
<b>CO5</b>	Design and detail the various steel trusses and cantry girders

#### **GI8014 Geographic Information System**

<b>CO1</b>	Have basic idea about the fundamentals of GIS.
<b>CO2</b>	Understand the types of data models.
<b>CO3</b>	Get knowledge about data input and topology.
<b>CO4</b>	Gain knowledge on data quality and standards.
<b>CO5</b>	Understand data management functions and data output

#### **GE8071 Disaster Management**

<b>CO1</b>	Differentiate the types of disasters, causes and their impact on environment and society
<b>CO2</b>	Assess vulnerability and various methods of risk reduction measures as well as mitigation.
<b>CO3</b>	Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management

#### **CE8001 Ground Improvement Techniques**

<b>CO1</b>	Gain knowledge on methods and selection of ground improvement techniques.
<b>CO2</b>	Understand dewatering techniques and design for simple cases
<b>CO3</b>	Get knowledge on insitu treatment of cohesionless and cohesive soils.
<b>CO4</b>	Understand the concept of earth reinforcement and design of reinforced earth.
<b>CO5</b>	Get to know types of grouts and grouting technique.

#### **EN8591 Municipal Solid Waste Management**

<b>CO1</b>	understanding of the nature and characteristics of municipal solid wastes and the regulatory requirements regarding municipal solid waste management.
<b>CO2</b>	Reduction, reuse and recycling of waste.
<b>CO3</b>	ability to plan and design systems for storage, collection, transport, processing and disposal of municipal solid waste
<b>CO4</b>	knowledge on the issues on solid waste management from an integrated and holistic perspective, as well as in the local and international context.
<b>CO5</b>	Design and operation of sanitary landfill.

#### **CE8016 Groundwater Engineering**

<b>CO1</b>	Understand aquifer properties and its dynamics
<b>CO2</b>	Get an exposure towards well design and practical problems
<b>CO3</b>	Develop a model for groundwater management.
<b>CO4</b>	Students will be able to understand the importance of artificial recharge and groundwater quality concepts
<b>CO5</b>	Gain knowledge on conservation of groundwater.

#### **CE8020 Maintenance, Repair and Rehabilitation of Structures**

<b>CO1</b>	The importance of maintenance and assessment method of distressed structures.
<b>CO2</b>	The strength and durability properties, their effects due to climate and temperature.
<b>CO3</b>	Recent development in concrete
<b>CO4</b>	The techniques for repair and protection methods
<b>CO5</b>	Repair, rehabilitation and retrofitting of structures and demolition methods.

**Department of Mechanical Engineering**  
**Course outcomes**  
**SEMESTER III**

**MA8353 - Transforms and Partial Differential Equations**

<b>CO1</b>	Understand how to solve the given standard partial differential equations.
<b>CO2</b>	Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
<b>CO3</b>	Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
<b>CO4</b>	Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
<b>CO5</b>	Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

**ME8391 - Engineering Thermodynamics**

<b>CO1</b>	Apply the first law of thermodynamics for simple open and closed systems under steady and unsteady conditions.
<b>CO2</b>	Apply second law of thermodynamics to open and closed systems and calculate entropy and availability.
<b>CO3</b>	Apply Rankine cycle to steam power plant and compare few cycle improvement methods.
<b>CO4</b>	Derive simple thermodynamic relations of ideal and real gases.
<b>CO5</b>	Calculate the properties of gas mixtures and moist air and its use in psychometric processes.

**CE8394 - Fluid Mechanics and Machinery**

<b>CO1</b>	Apply mathematical knowledge to predict the properties and characteristics of a fluid.
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<b>CO2</b>	Can analyse and calculate major and minor losses associated with pipe flow in piping networks.
<b>CO3</b>	Can mathematically predict the nature of physical quantities.
<b>CO4</b>	Can critically analyse the performance of pumps.
<b>CO5</b>	Can critically analyse the performance of turbines.

**ME8351 - Manufacturing Technology – I**

<b>CO1</b>	Explain different metal casting processes, associated defects, merits and demerits.
<b>CO2</b>	Compare different metal joining processes.
<b>CO3</b>	Summarize various hot working and cold working methods of metals.
<b>CO4</b>	Explain various sheet metal making processes.
<b>CO5</b>	Distinguish various methods of manufacturing plastic components.

**EE8353 - Electrical Drives and Controls**

<b>CO1</b>	Understand the basic concepts of different types of electrical machines and their performance.
<b>CO2</b>	Knowledge about D.C motors and induction motors.
<b>CO3</b>	Knowledge about the conventional and solid-state drives.
<b>CO4</b>	Understanding the conventional and solid state speed control of D.C drives.
<b>CO5</b>	Understanding the conventional and solid state speed control of A.C drives.

**ME8361 - Manufacturing Technology Laboratory – I**

<b>CO1</b>	Demonstrate the safety precautions exercised in the mechanical workshop.
<b>CO2</b>	Make the workpiece as per given shape and size using Lathe.
<b>CO3</b>	Join two metals using arc welding.
<b>CO4</b>	Use sheet metal fabrication tools and make simple tray and funnel.
<b>CO5</b>	Use different moulding tools, patterns and prepare sand moulds.

**ME8381 - Computer Aided Machine Drawing Laboratory**

<b>CO1</b>	Ability to draw assembly drawings both manually and using standard CAD packages.
<b>CO2</b>	Understand and interpret drawings of machine components.
<b>CO3</b>	Follow the drawing standards, Fits and Tolerances.

<b>CO4</b>	Re-create part drawings, sectional views and assembly drawings as per standards.
<b>CO5</b>	Knowledge in handling 2D drafting, 3D modeling and Dimensioning.
<b>EE8361 - Electrical Engineering Laboratory</b>	
<b>CO1</b>	Ability to perform speed characteristic of different electrical machine.
<b>CO2</b>	Ability to perform Load test on DC Shunt & DC Series motor.
<b>CO3</b>	Ability to perform Speed control of DC shunt motor.
<b>CO4</b>	Ability to perform O.C & S.C Test on a single phase transformer.
<b>CO5</b>	Ability to perform Load test on three phase squirrel cage Induction motor.
<b>CO1</b>	Ability to perform Speed control of three phase slip ring Induction Motor.

**HS8381 - Interpersonal Skills/Listening & Speaking**

<b>CO1</b>	Listen and respond appropriately.
<b>CO2</b>	Participate in group discussions
<b>CO3</b>	Make effective presentations
<b>CO4</b>	Participate confidently and appropriately in conversations both formal and informal.

**SEMESTER IV**

**MA8452 - Statistics And Numerical Methods**

<b>CO1</b>	Apply the concept of testing of hypothesis for small and large samples in real life problems.
<b>CO2</b>	Apply the basic concepts of classifications of design of experiments in the field of agriculture.
<b>CO3</b>	Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
<b>CO4</b>	Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
<b>CO5</b>	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

**ME8492 - Kinematics of Machinery**

<b>CO1</b>	Discuss the basics of mechanism.
<b>CO2</b>	Calculate velocity and acceleration in simple mechanisms.
<b>CO3</b>	Develop CAM profiles.

<b>CO4</b>	Solve problems on gears and gear trains.
<b>CO5</b>	Examine friction in machine elements.
<b>ME8451 - Manufacturing Technology – II</b>	
<b>CO1</b>	Explain the mechanism of material removal processes.
<b>CO2</b>	Describe the constructional and operational features of centre lathe and other special purpose lathes.
<b>CO3</b>	Describe the constructional and operational features of shaper, planner, milling, drilling, sawing and broaching machines.
<b>CO4</b>	Explain the types of grinding and other super finishing processes apart from gear manufacturing processes.
<b>CO5</b>	Summarize numerical control of machine tools and write a part program.

**ME8491 - Engineering Metallurgy**

<b>CO1</b>	Explain alloys and phase diagram, Iron-Iron carbon diagram and steel classification.
<b>CO2</b>	Explain isothermal transformation, continuous cooling diagrams and different heat treatment processes.
<b>CO3</b>	Clarify the effect of alloying elements on ferrous and non-ferrous metals.
<b>CO4</b>	Summarize the properties and applications of non metallic materials.
<b>CO5</b>	Explain the testing of mechanical properties.

**CE8395 - Strength of Materials for Mechanical Engineers**

<b>CO1</b>	Understand the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principal planes.
<b>CO2</b>	Understand the load transferring mechanism in beams and stress distribution due to shearing force and bending moment.
<b>CO3</b>	Apply basic equation of simple torsion in designing of shafts and helical spring.
<b>CO4</b>	Calculate the slope and deflection in beams using different methods.
<b>CO5</b>	Analyze and design thin and thick shells for the applied internal and external pressures.

**ME8493 - Thermal Engineering – I**

<b>CO1</b>	Apply thermodynamic concepts to different air standard cycles and solve problems.
<b>CO2</b>	Solve problems in single stage and multistage air compressors.

<b>CO3</b>	Explain the functioning and features of IC engines, components and auxiliaries.
<b>CO4</b>	Calculate performance parameters of IC Engines.
<b>CO5</b>	Explain the flow in Gas turbines and solve problems.

**ME8462 - Manufacturing Technology Laboratory – II**

<b>CO1</b>	Use different machine tools to manufacturing gears.
<b>CO2</b>	Ability to use different machine tools to manufacturing gears.
<b>CO3</b>	Ability to use different machine tools for finishing operations.
<b>CO4</b>	Ability to manufacture tools using cutter grinder.
<b>CO5</b>	Develop CNC part programming.

**CE8381 - Strength of Materials and Fluid Mechanics and Machinery Laboratory**

<b>CO1</b>	Understand the mechanical properties of materials when subjected to different types of loading.
<b>CO2</b>	Ability to perform Tension & Torsion tests on Solid materials.
<b>CO3</b>	Ability to perform Hardness & Compression test on Solid materials.
<b>CO4</b>	Ability to perform Deformation test on Solid materials.

**HS8461 - Advanced Reading and Writing**

<b>CO1</b>	Write different types of essays.
<b>CO2</b>	Write winning job applications.
<b>CO3</b>	Read and evaluate texts critically.
<b>CO4</b>	Display critical thinking in various professional contexts.

**SEMESTER V**

**ME8595 - Thermal Engineering – II**

<b>CO1</b>	Solve problems in Steam Nozzle.
<b>CO2</b>	Explain the functioning and features of different types of Boilers and auxiliaries and calculate performance parameters.
<b>CO3</b>	Explain the flow in steam turbines, draw velocity diagrams for steam turbines and solve problems.
<b>CO4</b>	Summarize the concept of Cogeneration, Working features of Heat pumps and Heat exchangers.

<b>CO5</b>	Solve problems using refrigerant table / charts and psychrometric charts.
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#### **ME8593 - Design of Machine Elements**

<b>CO1</b>	Understand the influence of steady and variable stresses in machine component design.
<b>CO2</b>	Apply the concepts of design to shafts, keys and couplings.
<b>CO3</b>	Apply the concepts of design to temporary and permanent joints.
<b>CO4</b>	Apply the concepts of design to energy absorbing members, connecting rod and crank shaft.
<b>CO5</b>	Apply the concepts of design to bearings.

#### **ME8501 - Metrology and Measurements**

<b>CO1</b>	Describe the concepts of measurements to apply in various metrological instruments
<b>CO2</b>	Outline the principles of linear and angular measurement tools used for industrial applications
<b>CO3</b>	Explain the procedure for conducting computer aided inspection
<b>CO4</b>	Demonstrate the techniques of form measurement used for industrial components
<b>CO5</b>	Discuss various measuring techniques of mechanical properties in industrial applications

#### **ME8594 - Dynamics of Machines**

<b>CO1</b>	Calculate static and dynamic forces of mechanisms.
<b>CO2</b>	Calculate the balancing masses and their locations of reciprocating and rotating masses.
<b>CO3</b>	Compute the frequency of free vibration.
<b>CO4</b>	Compute the frequency of forced vibration and damping coefficient.
<b>CO5</b>	Calculate the speed and lift of the governor and estimate the gyroscopic effect on automobiles, ships and airplanes.

#### **ME8072 - Renewable Sources of Energy**

<b>CO1</b>	Discuss the importance and Economics of renewable Energy
<b>CO2</b>	Discuss the method of power generation from Solar Energy
<b>CO3</b>	Discuss the method of power generation from Wind Energy
<b>CO4</b>	Explain the method of power generation from Bio Energy

<b>CO5</b>	Explain the Tidal energy, Wave Energy, OTEC, Hydro energy, Geothermal Energy, Fuel Cells and Hybrid Systems.
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**ME8511 - Kinematics and Dynamics Laboratory**

<b>CO1</b>	Explain gear parameters, kinematics of mechanisms, gyroscopic effect and working of lab equipments.
<b>CO2</b>	Determine mass moment of inertia of mechanical element, governor effort and range sensitivity, natural frequency and damping coefficient, torsional frequency, critical speeds of shafts, balancing mass of rotating and reciprocating masses, and transmissibility ratio.

**ME8512 - Thermal Engineering Laboratory**

<b>CO1</b>	Conduct tests on heat conduction apparatus and evaluate thermal conductivity of materials.
<b>CO2</b>	Conduct tests on natural and forced convective heat transfer apparatus and evaluate heat transfer coefficient.
<b>CO3</b>	Conduct tests on radioactive heat transfer apparatus and evaluate Stefan Boltzmann constant and emissivity.
<b>CO4</b>	Conduct tests to evaluate the performance of parallel/counter flow heat exchanger apparatus and reciprocating air compressor.
<b>CO5</b>	Conduct tests to evaluate the performance of refrigeration and air-conditioning test rigs.

**ME8513 - Metrology and Measurements Laboratory**

<b>CO1</b>	Measure the gear tooth dimensions, angle using sine bar, straightness and flatness, thread parameters, temperature using thermocouple, force, displacement, torque and vibration.
<b>CO2</b>	Calibrate the vernier, micrometer and slip gauges and setting up the comparator for the inspection.

**SEMESTER VI**

**ME8651 - Design of Transmission Systems**

<b>CO1</b>	Apply the concepts of design to belts, chains and rope drives.
<b>CO2</b>	Apply the concepts of design to spur, helical gears.
<b>CO3</b>	Apply the concepts of design to worm and bevel gears.
<b>CO4</b>	Apply the concepts of design to gear boxes.
<b>CO5</b>	Apply the concepts of design to cams, brakes and clutches

<b>ME8691 - Computer Aided Design and Manufacturing</b>	
<b>CO1</b>	Explain the 2D and 3D transformations, clipping algorithm, Manufacturing models and Metrics
<b>CO2</b>	Explain the fundamentals of parametric curves, surfaces and Solids
<b>CO3</b>	Summarize the different types of Standard systems used in CAD
<b>CO4</b>	Apply NC & CNC programming concepts to develop part programme for Lathe & Milling Machines
<b>CO5</b>	Summarize the different types of techniques used in Cellular Manufacturing and FMS

**ME8693 - Heat And Mass Transfer**

<b>CO1</b>	Apply heat conduction equations to different surface configurations under steady state and transient conditions and solve problems
<b>CO2</b>	Apply free and forced convective heat transfer correlations to internal and external flows through/over various surface configurations and solve problems
<b>CO3</b>	Explain the phenomena of boiling and condensation, apply LMTD and NTU methods of thermal analysis to different types of heat exchanger configurations and solve problems
<b>CO4</b>	Explain basic laws for Radiation and apply these principles to radiative heat transfer between different types of surfaces to solve problems
<b>CO5</b>	Apply diffusive and convective mass transfer equations and correlations to solve problems for different applications

**ME8692 - Finite Element Analysis**

<b>CO1</b>	Summarize the basics of finite element formulation.
<b>CO2</b>	Apply finite element formulations to solve one dimensional Problems.
<b>CO3</b>	Apply finite element formulations to solve two dimensional scalar Problems.
<b>CO4</b>	Apply finite element method to solve two dimensional Vector problems.
<b>CO5</b>	Apply finite element method to solve problems on iso parametric element and dynamic Problems.

**ME8694 - Hydraulics and Pneumatics**

<b>CO1</b>	Explain the Fluid power and operation of different types of pumps.
<b>CO2</b>	Summarize the features and functions of Hydraulic motors, actuators and Flow control valves

<b>CO3</b>	Explain the different types of Hydraulic circuits and systems
<b>CO4</b>	Explain the working of different pneumatic circuits and systems
<b>CO5</b>	Summarize the various trouble shooting methods and applications of hydraulic and pneumatic systems.

**ME8091 - Automobile Engineering**

<b>CO1</b>	Recognize the various parts of the automobile and their functions and materials.
<b>CO2</b>	Discuss the engine auxiliary systems and engine emission control.
<b>CO3</b>	Distinguish the working of different types of transmission systems.
<b>CO4</b>	Explain the Steering, Brakes and Suspension Systems.
<b>CO5</b>	Predict possible alternate sources of energy for IC Engines.

**ME8681 - CAD / CAM Laboratory**

<b>CO1</b>	Draw 3D and Assembly drawing using CAD software
<b>CO2</b>	Demonstrate manual part programming with G and M codes using CAM

**HS8581 - Professional Communication**

<b>CO1</b>	Make effective presentations
<b>CO2</b>	Participate confidently in Group Discussions.
<b>CO3</b>	Attend job interviews and be successful in them.
<b>CO4</b>	Develop adequate Soft Skills required for the workplace

**SEMESTER VII**

**ME8792 - Power Plant Engineering**

<b>CO1</b>	Explain the layout, construction and working of the components inside a thermal power plant.
<b>CO2</b>	Explain the layout, construction and working of the components inside a Diesel, Gas and Combined cycle power plants.
<b>CO3</b>	Explain the layout, construction and working of the components inside nuclear power plants.
<b>CO4</b>	Explain the layout, construction and working of the components inside Renewable energy power plants.

**ME8793 - Process Planning and Cost Estimation**

<b>CO1</b>	Select the process, equipment and tools for various industrial products.
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<b>CO2</b>	Prepare process planning activity chart.
<b>CO3</b>	Explain the concept of cost estimation.
<b>CO4</b>	Compute the job order cost for different type of shop floor.
<b>CO5</b>	Calculate the machining time for various machining operations.

**ME8791 - Mechatronics**

<b>CO1</b>	Discuss the interdisciplinary applications of Electronics, Electrical, Mechanical and Computer Systems for the Control of Mechanical, Electronic Systems and sensor technology.
<b>CO2</b>	Discuss the architecture of Microprocessor and Microcontroller, Pin Diagram, Addressing Modes of Microprocessor and Microcontroller.
<b>CO3</b>	Discuss Programmable Peripheral Interface, Architecture of 8255 PPI, and various device interfacing
<b>CO4</b>	Explain the architecture, programming and application of programmable logic controllers to problems and challenges in the areas of Mechatronic engineering.
<b>CO5</b>	Discuss various Actuators and Mechatronics system using the knowledge and skills acquired through the course and also from the given case studies

**ME8099 - Robotics**

<b>CO1</b>	Explain the concepts of industrial robots, classification, specifications and coordinate systems. Also summarize the need and application of robots in different sectors.
<b>CO2</b>	Illustrate the different types of robot drive systems as well as robot end effectors.
<b>CO3</b>	Apply the different sensors and image processing techniques in robotics to improve the ability of robots.
<b>CO4</b>	Develop robotic programs for different tasks and familiarize with the kinematics motions of robot.
<b>CO5</b>	Examine the implementation of robots in various industrial sectors and interpolate the economic analysis of robots.

**ME8097 - Non Destructive Testing and Evaluation**

<b>CO1</b>	Explain the fundamental concepts of NDT
<b>CO2</b>	Discuss the different methods of NDE
<b>CO3</b>	Explain the concept of Thermography and Eddy current testing
<b>CO4</b>	Explain the concept of Ultrasonic Testing and Acoustic Emission
<b>CO5</b>	Explain the concept of Radiography

### **ME8073 - Unconventional Machining Processes**

<b>CO1</b>	Explain the need for unconventional machining processes and its classification
<b>CO2</b>	Compare various thermal energy and electrical energy based unconventional machining processes.
<b>CO3</b>	Summarize various chemical and electro-chemical energy based unconventional machining processes.
<b>CO4</b>	Explain various nano abrasives based unconventional machining processes.
<b>CO5</b>	Distinguish various recent trends based unconventional machining processes.

### **ME8711 - Simulation and Analysis Laboratory**

<b>CO1</b>	Simulate the working principle of air conditioning system, hydraulic and pneumatic cylinder and cam follower mechanisms using MATLAB.
<b>CO2</b>	Analyze the stresses and strains induced in plates, brackets and beams and heat transfer problems.
<b>CO3</b>	Calculate the natural frequency and mode shape analysis of 2D components and beams.

### **ME8781 - Mechatronics Laboratory**

<b>CO1</b>	Demonstrate the functioning of mechatronics system with various pneumatic, hydraulic and electrical systems.
<b>CO2</b>	Demonstrate the functioning of control systems with the help of PLC and microcontrollers.

## **SEMESTER VIII**

### **MG8591 - Principles Of Management**

<b>CO1</b>	Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management
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### **IE8693 - Production Planning and Control**

<b>CO1</b>	Upon completion of this course, the students can able to prepare production planning and control activities such as work study, product planning, production scheduling, Inventory Control.
<b>CO2</b>	They can plan manufacturing requirements manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP).

### **ME8811 - Project Work**

<b>CO1</b>	On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology
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<b>CO1</b>	Design combinational and sequential Circuits.
<b>CO2</b>	Simulate using software package.
<b>CO3</b>	Study various number systems and simplify the logical expressions using Boolean functions
<b>CO4</b>	Design various synchronous and asynchronous circuits.
<b>CO5</b>	Introduce asynchronous sequential circuits and PLDs and introduce digital simulation for development of application oriented logic circuits.

#### **EE8391 - Electromagnetic Theory**

<b>CO1</b>	Understand the basic mathematical concepts related to electromagnetic vector fields.
<b>CO2</b>	Understand the basic concepts about electrostatic fields, electrical potential, energy density and their applications.
<b>CO3</b>	Acquire the knowledge in magneto static fields, magnetic flux density, vector potential and its applications.
<b>CO4</b>	Understand the different methods of emf generation and Maxwell's equations
<b>CO5</b>	Understand the basic concepts electromagnetic waves and characterizing parameters and compute Electromagnetic fields and apply them for design and analysis of electrical equipment and systems

#### **EE8301-Electrical Machines - I**

<b>CO1</b>	Analyze the magnetic-circuits.
<b>CO2</b>	Acquire the knowledge in constructional details of transformers.
<b>CO3</b>	Understand the concepts of electromechanical energy conversion.
<b>CO4</b>	Acquire the knowledge in working principles of DC Generator.
<b>CO5</b>	acquire the knowledge in working principles of DC Motor and acquire the knowledge in various losses taking place in D.C. Machines

### **SEMESTER: IV**

#### **EE8401–Electrical Machines - II**

<b>CO1</b>	understand the construction and working principle of Synchronous Generator
<b>CO2</b>	understand MMF curves and armature windings
<b>CO3</b>	Acquire knowledge on Synchronous motor.
<b>CO4</b>	understand the construction and working principle of Special Machines
<b>CO5</b>	Design of transmission line parameters, Tower spotting, methods of grounding and predetermine the performance characteristics of Synchronous Machines.

#### **EE8402 -Transmission and Distribution**

<b>CO1</b>	Understand the importance and the functioning of transmission line parameters.
<b>CO2</b>	Understand the concepts of Lines and Insulators and acquire knowledge on the performance of Transmission lines.
<b>CO3</b>	Understand the importance of distribution of the electric power in power system.
<b>CO4</b>	acquire knowledge on Underground Capabilities
<b>CO5</b>	Become familiar with the function of different components used in Transmission and Distribution levels of power system and modelling of these components.

**EE8501 - Power System Analysis**

<b>CO1</b>	model the power system under steady state operating condition
<b>CO2</b>	understand and apply iterative techniques for power flow analysis
<b>CO3</b>	model and carry out short circuit studies on power system
<b>CO4</b>	model and analyze stability problems in power system
<b>CO5</b>	Acquire knowledge on Fault analysis and model and understand various power system components and carry out power flow, short circuit and stability studies.

**EE8552- Power Electronics**

<b>CO1</b>	Understand the clear view about the power electronic basic devices Diode, SCR, TRIAC, GTO, BJT, MOSFET, and IGBT.
<b>CO2</b>	Analyze the AC-DC converters.
<b>CO3</b>	Analyze and design the DC-DC converters.
<b>CO4</b>	Analyze and designing of DC-AC converters.
<b>CO5</b>	Design and implementation of AC-AC converters and Choose the converters for real time applications.

**SEMESTER VI**

**EE8601-Solid State Drives**

<b>CO1</b>	Understand and suggest a converter for solid state drive and select suitability drive for the given application.
<b>CO2</b>	Study about the steady state operation and transient dynamics of a motor load system.
<b>CO3</b>	analyze the operation of the converter/chopper fed dc drive
<b>CO4</b>	Analyze the operation and performance of AC motor drives.
<b>CO5</b>	analyze and design the current and speed controllers for a closed loop solid state DC motor drive

**EE8602–Protection and Switchgear**

<b>CO1</b>	Understand and analyze Electromagnetic and Static Relays and suggest suitability circuit breaker.
<b>CO2</b>	Find the causes of abnormal operating conditions of the apparatus and system.
<b>CO3</b>	Analyze the characteristics and functions of relays and protection schemes.
<b>CO4</b>	Study about the apparatus protection, static and numerical relays.
<b>CO5</b>	Acquire knowledge on functioning of circuit breaker.

**SEMESTER VII**

**EE8701 - High Voltage Engineering**

<b>CO1</b>	Understand Transients in power system
<b>CO2</b>	Understand Generation and measurement of high voltage.
<b>CO3</b>	Understand High voltage testing.
<b>CO4</b>	Understand various types of over voltages in power system.
<b>CO5</b>	Measure over voltages and test power apparatus and insulation coordination

**EE8702 - Power System Operation and Control**

<b>CO1</b>	Understand the day-to-day operation of electric power system.
<b>CO2</b>	Analyze the control actions to be implemented on the system to meet the minute-to-minute variation of system demand.
<b>CO3</b>	Understand the significance of power system operation and control.
<b>CO4</b>	Acquire knowledge on real power-frequency interaction.
<b>CO5</b>	Understand there active power-voltage interaction and design SCADA and its application for real time operation.

### SEMESTER: VIII

#### **EE8015 - Electric Energy Generation, Utilization and Conservation**

<b>CO1</b>	Understand the main aspects of generation, utilization and conservation.
<b>CO2</b>	Identify an appropriate method of heating for any particular industrial application.
<b>CO3</b>	Evaluate domestic wiring connection and debug any faults occurred.
<b>CO4</b>	Construct an electric connection for any domestic appliance like refrigerator as well as to design a battery charging circuit for a specific household application.
<b>CO5</b>	Realize the appropriate type of electric supply system as well as to evaluate the performance of a traction unit and understand the main aspects of Traction.

### Department of Computer Science and Engineering Course Outcomes Regulation-2017

#### **HS8151- Communicative English**

<b>CO1</b>	Read articles of a general kind in magazines and newspapers.
<b>CO2</b>	Participate effectively in informal conversations; introduce themselves and their friends and express opinions in English.
<b>CO3</b>	Comprehend conversations and short talks delivered in English.
<b>CO4</b>	Write short essays of a general kind and personal letters and emails in English.
<b>CO5</b>	Demonstrate the role of a variety of technologies/media in accessing, retrieving, managing, and communicating information

#### **MA8151- Engineering Mathematics-I**

<b>CO1</b>	Use both the limit definition and rules of differentiation to differentiate functions.
<b>CO2</b>	Apply differentiation to solve maxima and minima problems.

<b>CO3</b>	Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
<b>CO4</b>	Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
<b>CO5</b>	Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.

#### **PH8151 -Engineering Physics**

<b>CO1</b>	The students will gain knowledge on the basics of properties of matter and its applications.
<b>CO2</b>	The students will acquire knowledge on the concepts of waves and optical devices and their applications in fiber optics.
<b>CO3</b>	Comprehend conversations and short talks delivered in English. The students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers.
<b>CO4</b>	The students will get knowledge on advanced physics concepts of quantum theory and its applications in tunneling microscopes.
<b>CO5</b>	The students will understand the basics of crystals, their structures and different crystal growth techniques.

#### **CY8151-Engineering Chemistry**

<b>CO1</b>	Classify the polymers and their utility in the industries and describe the techniques of polymerization and properties of polymers.
<b>CO2</b>	Relate various thermodynamic functions such as enthalpy, entropy, free energy and their importance and equilibrium constants and its significance.
<b>CO3</b>	Explain the photo physical processes such as fluorescence and phosphorescence and various components of UV and IR spectrophotometer.
<b>CO4</b>	Illustrate the phase transitions of one component and two component systems and the types of alloys and their applications in industries.
<b>CO5</b>	Outline the synthesis, characteristics and the applications of nano materials.

#### **GE8151-Problem Solving & Python Programming**

<b>CO1</b>	Develop algorithmic solutions to simple computational problems
<b>CO2</b>	Read, write, execute by hand simple Python programs.
<b>CO3</b>	Structure simple Python programs for solving problems.
<b>CO4</b>	Decompose a Python program into functions.
<b>CO5</b>	Represent compound data using Python lists, tuples, and dictionaries.

#### **GE8152 - Engineering Graphics**

<b>CO1</b>	Familiarize with the fundamentals and standards of Engineering graphics.
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<b>CO2</b>	Perform freehand sketching of basic geometrical constructions and multiple views of objects.
<b>CO3</b>	Project orthographic projections of lines and plane surfaces.
<b>CO4</b>	Draw projections and solids and development of surfaces.
<b>CO5</b>	Visualize and to project isometric and perspective sections of simple solids.

**Problem Solving & Python Programming Lab: GE8161**

<b>CO1</b>	Write, test, and debug simple Python programs.
<b>CO2</b>	Implement Python programs with conditionals and loops.
<b>CO3</b>	Develop Python programs step-wise by defining functions and calling them.
<b>CO4</b>	Use Python lists, tuples, dictionaries for representing compound data.
<b>CO5</b>	Read and write data from/to files in Python.

**BS8162 - Physics and Chemistry Laboratory Lab**

<b>CO1</b>	Classify the Bravais lattices, and different types of crystal structures & growth techniques.
<b>CO2</b>	Demonstrate the properties of elasticity and heat transfer of objects.
<b>CO3</b>	Explain Black body Radiation and properties of matter waves and Schrodinger wave equations.
<b>CO4</b>	Illustrate the phase transitions of one component and two component systems and the types of alloys and their applications in industries.
<b>CO5</b>	Outline the synthesis, characteristics and the applications of nano materials.

**HS8251 - Technical English:**

<b>CO1</b>	Read technical texts and write area- specific texts effortlessly.
<b>CO2</b>	Listen and comprehend lectures and talks in their area of specialization successfully.
<b>CO3</b>	Speak appropriately and effectively in varied formal and informal contexts.
<b>CO4</b>	Write reports and winning job applications.
<b>CO5</b>	Examine the characteristics of laser and optical fiber.

**BE8255 - Basic Electrical Electronics and Measurement Engineering**

<b>CO1</b>	Discuss the essentials of electric circuits and analysis.
<b>CO2</b>	Discuss the basic operation of electric machines and transformers.

<b>CO3</b>	Introduction of renewable sources and common domestic loads.
<b>CO4</b>	Introduction to measurement and metering for electric circuits.
<b>CO5</b>	Introduction to transducers and oscilloscope.

**Environmental Science and Engineering: GE8291**

<b>CO1</b>	Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
<b>CO2</b>	Public awareness of environmental is at infant stage.
<b>CO3</b>	Ignorance and incomplete knowledge have led to misconceptions
<b>CO4</b>	Development and improvement in std. of living has lead to serious environmental disasters
<b>CO5</b>	Analyze the impact of Environmental integrated themes and social issues.

**Programming in C - CS8251**

<b>CO1</b>	C Programs using basic programming constructs
<b>CO2</b>	C programs using arrays and strings
<b>CO3</b>	Applications in C using functions and pointers
<b>CO4</b>	C programs using structures and Dynamic memory allocation
<b>CO5</b>	Input/output and file handling in C

**CS8261 - Engineering Practices laboratory**

<b>CO1</b>	Fabricate carpentry components and pipe connections including plumbing works.
<b>CO2</b>	Use welding equipment's to join the structures.
<b>CO3</b>	Make the models using sheet metal works Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings.
<b>CO4</b>	Carry out basic home electrical works and appliances Measure the electrical quantities.
<b>CO5</b>	Elaborate on the components, gates, soldering practices.

**CS8251 - Programming in C lab**

<b>CO1</b>	C Programs using basic programming constructs
<b>CO2</b>	C programs using arrays and strings
<b>CO3</b>	Applications in C using functions and pointers
<b>CO4</b>	C programs using structures and Dynamic memory allocation
<b>CO5</b>	Input/output and file handling in C

**MA8351 - Discrete Mathematics**

<b>CO1</b>	Have knowledge of the concepts needed to test the logic of a program.
<b>CO2</b>	Have an understanding in identifying structures on many levels.
<b>CO3</b>	Be aware of a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.
<b>CO4</b>	Be aware of the counting principles.
<b>CO5</b>	Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.

### **CS8351- Digital Principles and System Design**

<b>CO1</b>	Simplify Boolean functions using Kmap.
<b>CO2</b>	Design and analyze combinational and sequential circuits.
<b>CO3</b>	Implement designs using programmable logic devices.
<b>CO4</b>	Write HDL code for combinational and sequential circuits.
<b>CO5</b>	Design and analyze Programmable logic array and sequential programmable devices

### **CS8391 - Data Structures**

<b>CO1</b>	Simplify Boolean functions using Kmap.
<b>CO2</b>	Apply the different linear and non-linear data structures to problem solutions.
<b>CO3</b>	Critically analyze the various sorting algorithms.
<b>CO4</b>	Apply the different applications of graphs
<b>CO5</b>	Critically analyze the hashing techniques.

### **CS8392 - Object Oriented Programming**

<b>CO1</b>	Develop Java programs using OOP principles
<b>CO2</b>	Develop Java programs with the concept's inheritance and interfaces.
<b>CO3</b>	Build Java applications using exceptions and I/O streams.
<b>CO4</b>	Develop Java applications with threads and generics classes.
<b>CO5</b>	Develop interactive Java programs using swings.

### **CS8395 - Communication Engineering**

<b>CO1</b>	Ability to comprehend and appreciate the significance and role of this course in the present contemporary world.
<b>CO2</b>	Apply analog and digital communication techniques.
<b>CO3</b>	Use data and pulse communication techniques.

<b>CO4</b>	Analyze Source and Error control coding.
<b>CO5</b>	Analyze Spread spectrum multiple access.

### **CS8381 - Data Structures Laboratory**

<b>CO1</b>	Write functions to implement linear and non-linear data structure operations
<b>CO2</b>	Suggest appropriate linear / non-linear data structure operations for solving a given problem
<b>CO3</b>	Appropriately use the linear / non-linear data structure operations for a given problem
<b>CO4</b>	Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval
<b>CO5</b>	Suggest appropriate graph representation and application of graphs

### **CS8383 - Object Oriented Programming Laboratory**

<b>CO1</b>	Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.
<b>CO2</b>	Develop and implement Java programs with array list, exception handling and multithreading.
<b>CO3</b>	Design applications using file processing, generic programming and event handling
<b>CO4</b>	Design a calculator using event-driven programming
<b>CO5</b>	Develop a mini project for any application using Java concepts.

### **CS8382 - Digital Laboratory**

<b>CO1</b>	Apply Boolean simplification techniques to construct combinational logic circuits
<b>CO2</b>	Build combinational logic circuits to perform arithmetic operations.
<b>CO3</b>	Construct Sequential logic circuits to perform Count & Shift operations.
<b>CO4</b>	Develop HDL Code to model Combinational & Sequential logics.
<b>CO5</b>	Develop a simple digital system.

### **CS8491- Computer Architecture**

<b>CO1</b>	Understand the basics structure of computers, operations and instructions.
<b>CO2</b>	Design arithmetic and logic unit
<b>CO3</b>	Understand pipelined execution and design control unit.
<b>CO4</b>	Understand parallel processing architectures

<b>CO5</b>	Understand the various memory systems and I/O communication.
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#### **CS8492 - Database Management Systems**

<b>CO1</b>	Classify the modern and futuristic database applications based on size and complexity.
<b>CO2</b>	Map ER model to Relational model to perform database design effectively.
<b>CO3</b>	Write queries using normalization criteria and optimize queries.
<b>CO4</b>	Compare and contrast various indexing strategies in different database systems.
<b>CO5</b>	Appraise how advanced databases differ from traditional databases.

#### **CS8494- Software Engineering**

<b>CO1</b>	Identify the key activities in managing a software project.
<b>CO2</b>	Compare different process models.
<b>CO3</b>	Concepts of requirements engineering and Analysis Modeling
<b>CO4</b>	Apply systematic procedure for software design and deployment.
<b>CO5</b>	Compare and contrast the various testing and maintenance

#### **CS8481 - Database Management Systems Lab**

<b>CO1</b>	Use typical data definitions and manipulation commands.
<b>CO2</b>	Design applications to test Nested and Join Queries
<b>CO3</b>	Implement simple applications that use Views
<b>CO4</b>	Implement applications that require a Front-end Tool
<b>CO5</b>	Critically analyze the use of Tables, Views, Functions and Procedures

#### **CS8461 - Operating Systems Lab**

<b>CO1</b>	Compare the performance of various CPU Scheduling Algorithms
<b>CO2</b>	Implement Deadlock avoidance and Detection Algorithms
<b>CO3</b>	Implement Semaphores
<b>CO4</b>	Create processes and implement IPC
<b>CO5</b>	Implement File Organization and File Allocation Strategies

#### **HS8461 - Advanced Reading and Writing**

<b>CO1</b>	Write different types of essays.
<b>CO2</b>	Listen and evaluate texts critically.
<b>CO3</b>	Read and evaluate texts critically.

<b>C04</b>	Write winning job applications.
<b>C05</b>	Display critical thinking in various professional contexts.

**MA8551 - Algebra and Number Theory**

<b>C01</b>	Apply the basic notions of groups, rings, fields which will then be used to solve related problems.
<b>C02</b>	Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts
<b>C03</b>	□ Demonstrate accurate and efficient use of advanced algebraic techniques.
<b>C04</b>	Demonstrate their mastery by solving non - trivial problems related to the concepts, and by proving simple theorems about the, statements proven by the text.
<b>C05</b>	Apply integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject.

**CS8591 - Computer Networks**

<b>C01</b>	Understand the basic layers and its functions in computer networks.
<b>C02</b>	Evaluate the performance of a network
<b>C03</b>	Understand the basics of how data flows from one node to another.
<b>C04</b>	Analyze and design routing algorithms.
<b>C05</b>	Design protocols for various functions in the network.

**EC8691 - Microprocessor and Microcontroller**

<b>C01</b>	Understand and execute programs based on 8086 microprocessors.
<b>C02</b>	Design Memory Interfacing circuits.
<b>C03</b>	Design and interface, I/O circuits.
<b>C04</b>	Design and implement 8051 microcontroller-based systems.
<b>C05</b>	Design protocols for various functions in the network.

**CS8501 - Theory of Computation**

<b>C01</b>	Construct automata, regular expression for any pattern.
<b>C02</b>	Write Context free grammar for any construct.
<b>C03</b>	Design Turing machines for any language.
<b>C04</b>	Propose computation solutions using Turing machines.
<b>C05</b>	Derive whether a problem is decidable or not.

**CS8592- Object Oriented Analysis and Design**

<b>C01</b>	Express software design with UML diagrams.
<b>C02</b>	Design software applications using OO concepts.
<b>C03</b>	Identify various scenarios based on software requirements.
<b>C04</b>	Transform UML based software design into pattern-based design using design patterns.
<b>C05</b>	Understand the various testing methodologies for OO software.

**GE552 - Geographic Information Systems**

<b>C01</b>	Have basic idea about the fundamentals of GIS.
<b>C02</b>	Understand the types of data models
<b>C03</b>	Get knowledge about data input and topology.
<b>C04</b>	Gain knowledge on data quality and standards.
<b>C05</b>	Understand data management functions and data output

**EC8681 - Microprocessor and Microcontroller Lab**

<b>C01</b>	Develop ALP for fixed and Floating Point and Arithmetic operations using 8086 microprocessors.
<b>C02</b>	Make use of different I/O interfacing with 8086 microprocessors
<b>C03</b>	Construct different waveforms using 8086 microprocessors
<b>C04</b>	Model serial and parallel interfacing of 8086 microprocessor
<b>C05</b>	Develop assembly language programs for various applications using 8051 microcontrollers

**CS8582 - Object Oriented Analysis and Design Lab**

<b>C01</b>	Design and implement projects using OO concepts.
<b>C02</b>	Use the UML analysis and design diagrams.
<b>C03</b>	Apply appropriate design patterns.
<b>C04</b>	Create code from design.
<b>C05</b>	Compare and contrast various testing techniques

**CS8581 - Network Lab**

<b>C01</b>	Implement various protocols using TCP and UDP.
<b>C02</b>	Compare the performance of different transport layer protocols.
<b>C03</b>	Use simulation tools to analyze the performance of various network protocols.
<b>C04</b>	Analyze various routing algorithms.

<b>C05</b>	Implement error correction codes.
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**CS8651 - Internet Programming**

<b>C01</b>	Construct a basic website using HTML and Cascading Style Sheets.
<b>C02</b>	Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.
<b>C03</b>	Develop server-side programs using Servlets and JSP.
<b>C04</b>	Construct simple web pages in PHP and to represent data in XML format.
<b>C05</b>	Use AJAX and web services to develop interactive web applications.

**CS8691 - Artificial Intelligence**

<b>C01</b>	Use appropriate search algorithms for any AI problem
<b>C02</b>	Represent a problem using first order and predicate logic
<b>C03</b>	Provide the apt agent strategy to solve a given problem
<b>C04</b>	Design software agents to solve a problem
<b>C05</b>	Design applications for NLP that use Artificial Intelligence.



**Department of Electronics and communication Engineering**

**Course Outcomes**

**Regulation 2017**

**MA8352 Linear Algebra and Partial Differential Equations**

<b>CO1</b>	Explain the fundamental concepts of advanced algebra and their role in modern
<b>CO2</b>	Demonstrate accurate and efficient use of advanced algebraic techniques
<b>CO3</b>	Demonstrate their mastery by solving non - trivial problems related to the concepts and by proving simple theorems about the statements proven by the text.
<b>CO4</b>	Able to solve various types of partial differential equations
<b>CO5</b>	Able to solve engineering problems using Fourier series

**EC8393 Fundamentals of Data Structures in C**

<b>CO1</b>	Implement linear and non-linear data structure operations using C
<b>CO2</b>	Suggest appropriate linear / non-linear data structure for any given data set.
<b>CO3</b>	Apply hashing concepts for a given problem
<b>CO4</b>	Modify or suggest new data structure for an application
<b>CO5</b>	Appropriately choose the sorting algorithm for an application

**EC8351 Electronic Circuits I**

<b>CO1</b>	Acquire knowledge of Working principles, characteristics and applications of BJT
<b>CO2</b>	Working principles, characteristics and applications of FET
<b>CO3</b>	Frequency response characteristics of BJT and FET amplifiers
<b>CO4</b>	Analyze the performance of small signal BJT and FET amplifiers - single stage and multistage amplifiers
<b>CO5</b>	Apply the knowledge gained in the design of Electronic circuits

### **EC8352 Signals and Systems**

<b>CO1</b>	To be able to determine if a given system is linear/causal/stable
<b>CO2</b>	Capable of determining the frequency components present in a deterministic signal
<b>CO3</b>	Capable of characterizing LTI systems in the time domain and frequency domain
<b>CO4</b>	To be able to compute the output of an LTI system in the time domains
<b>CO5</b>	To be able to compute the output of an LTI system in the frequency domains

### **EC8392 Digital Electronics**

<b>CO1</b>	Use digital electronics in the present contemporary world
<b>CO2</b>	Design various combinational digital circuits using logic gates
<b>CO3</b>	Do the analysis and design procedures for synchronous and asynchronous sequential circuits
<b>CO4</b>	Use the semiconductor memories and related technology
<b>CO5</b>	Use electronic circuits involved in the design of logic gates

### **EC8391 Control Systems Engineering**

<b>CO1</b>	Identify the various control system components and their representations.
<b>CO2</b>	Analyze the various time domain parameters.
<b>CO3</b>	Analysis the various frequency response plots and its system.
<b>CO4</b>	Apply the concepts of various system stability criterions.
<b>CO5</b>	Design various transfer functions of digital control system using state variable models

### **EC8381 Fundamentals of Data Structures in C Laboratory**

<b>CO1</b>	Implement linear and non-linear data structure operations using C
<b>CO2</b>	Suggest appropriate linear / non-linear data structure for any given data set.
<b>CO3</b>	Apply hashing concepts for a given problem
<b>CO4</b>	Modify or suggest new data structure for an application
<b>CO5</b>	Appropriately choose the sorting algorithm for an application

### **EC8361 Analog and Digital Circuits Laboratory**

<b>CO1</b>	Design and Test rectifiers, filters and regulated power supplies.
<b>CO2</b>	Design and Test BJT/JFET amplifiers.
<b>CO3</b>	Differentiate cascode and cascade amplifiers.
<b>CO4</b>	Analyze the limitation in bandwidth of single stage and multi stage amplifier
<b>CO5</b>	Measure CMRR in differential amplifier

### **HS8381 Interpersonal Skills/Listening and Speaking**

<b>CO1</b>	Listen and respond appropriately.
<b>CO2</b>	Participate in group discussions
<b>CO3</b>	Make effective presentations
<b>CO4</b>	Participate confidently and appropriately in conversations both formal and informal

### **MA8451 Probability and Random Processes**

<b>CO1</b>	Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
<b>CO2</b>	Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
<b>CO3</b>	Apply the concept random processes in engineering disciplines.
<b>CO4</b>	Understand and apply the concept of correlation and spectral densities.
<b>CO5</b>	The students will have an exposure of various distribution functions and help in acquiring skills in handling situations involving more than one variable. Able to analyze the response of random inputs to linear time invariant systems.

### **EC8452 Electronic Circuits II**

<b>CO1</b>	Analyze different types of amplifier, oscillator and multivibrator circuits
<b>CO2</b>	Design BJT amplifier and oscillator circuits
<b>CO3</b>	Analyze transistorized amplifier and oscillator circuits
<b>CO4</b>	Design and analyze feedback amplifiers
<b>CO5</b>	Design LC and RC oscillators, tuned amplifiers, wave shaping circuits, multivibrators, power amplifier and DC convertors

### **EC8491 Communication Theory**

<b>CO1</b>	Design AM communication systems
<b>CO2</b>	Design Angle modulated communication systems
<b>CO3</b>	Apply the concepts of Random Process to the design of Communication systems
<b>CO4</b>	Analyze the noise performance of AM and FM systems
<b>CO5</b>	Gain knowledge in sampling and quantization

### **EC8451 Electromagnetic Fields**

<b>CO1</b>	Display an understanding of fundamental electromagnetic laws and concepts
<b>CO2</b>	Write Maxwell's equations in integral, differential and phasor forms and explain their physical meaning
<b>CO3</b>	Explain electromagnetic wave propagation in lossy and in lossless media
<b>CO4</b>	Solve simple problems requiring estimation of electric quantities based on these concepts and laws
<b>CO5</b>	Solve simple problems requiring estimation of magnetic field quantities based on these concepts and laws

### **EC8453 Linear Integrated Circuits**

<b>CO1</b>	Design linear and non linear applications of OP – AMPS
<b>CO2</b>	Design applications using analog multiplier and PLL
<b>CO3</b>	Design ADC and DAC using OP – AMPS
<b>CO4</b>	Generate waveforms using OP – AMP Circuits
<b>CO5</b>	Analyze special function ics

### **GE8291 Environmental Science and Engineering**

<b>CO1</b>	Learnt the nature and facts about environment
<b>CO2</b>	Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
<b>CO3</b>	Public awareness of environmental is at infant stage.
<b>CO4</b>	Ignorance and incomplete knowledge has lead to misconceptions
<b>CO5</b>	Development and improvement in std. of living has lead to serious environmental disasters

### **EC8461 Circuits Design and Simulation Laboratory**

<b>CO1</b>	Analyze various types of feedback amplifiers
<b>CO2</b>	Design oscillators, tuned amplifiers, wave-shaping circuits and multivibrators
<b>CO3</b>	Design and simulate feedback amplifiers using SPICE Tool.
<b>CO4</b>	Design and simulate oscillators using SPICE Tool.
<b>CO5</b>	Design and simulate tuned amplifiers, wave-shaping circuits and multivibrators using SPICE Tool.

### **EC8462 Linear Integrated Circuits Laboratory**

<b>CO1</b>	Design amplifiers, oscillators, D-A converters using operational amplifiers.
<b>CO2</b>	Design filters using op-amp and performs an experiment on frequency response.
<b>CO3</b>	Analyze the working of PLL and describe its application as a frequency multiplier.
<b>CO4</b>	Design DC power supply using ics.
<b>CO5</b>	Analyze the performance of filters, multivibrators, A/D converter and analog multiplier using SPICE.

### **EC8501 Digital Communication**

<b>CO1</b>	Apply DFT for the analysis of digital signals and systems
<b>CO2</b>	Design IIR and FIR filters
<b>CO3</b>	Characterize the effects of finite precision representation on digital filters
<b>CO4</b>	Design multirate filters
<b>CO5</b>	Apply adaptive filters appropriately in communication systems

### **EC8552 Computer Architecture And Organization**

<b>CO1</b>	Describe data representation, instruction formats and the operation of a digital computer
<b>CO2</b>	Illustrate the fixed point and floating-point arithmetic for ALU operation
<b>CO3</b>	Discuss about implementation schemes of control unit and pipeline performance
<b>CO4</b>	Explain the concept of various memories, interfacing and organization of multiple processors
<b>CO5</b>	Discuss parallel processing technique and unconventional architectures

### **EC8551 Communication Networks**

<b>CO1</b>	Identify the components required to build different types of networks
<b>CO2</b>	Choose the required functionality at each layer for given application
<b>CO3</b>	Identify solution for each functionality at Transport layer layer
<b>CO4</b>	Identify solution for each functionality at application layer
<b>CO5</b>	Trace the flow of information from one node to another node in the network

### **EC8562 Digital Signal Processing Laboratory**

<b>CO1</b>	Carryout basic signal processing operations
<b>CO2</b>	Demonstrate their abilities towards MATLAB based implementation of various DSP systems
<b>CO3</b>	Analyze the architecture of a DSP Processor
<b>CO4</b>	Design and Implement the FIR and IIR Filters in DSP Processor for performing filtering operation over real-time signals
<b>CO5</b>	Design a DSP system for various applications of DSP

### **EC8561 Communication Systems Laboratory**

<b>CO1</b>	Identify the components required to build different types of networks
<b>CO2</b>	Choose the required functionality at each layer for given application
<b>CO3</b>	Identify solution for each functionality at Transport layer layer
<b>CO4</b>	Identify solution for each functionality at application layer
<b>CO5</b>	Trace the flow of information from one node to another node in the network

### **EC8563 Communication Networks Laboratory**

<b>CO1</b>	Communicate between two desktop computers
<b>CO2</b>	Implement the different protocols
<b>CO3</b>	Program using sockets.
<b>CO4</b>	Implement and compare the various routing algorithms
<b>CO5</b>	Use the simulation tool.

### **EC8691 Microprocessors And Microcontrollers**

<b>CO1</b>	Understand and execute programs based on 8086 microprocessor.
<b>CO2</b>	Design Memory Interfacing circuits.
<b>CO3</b>	Design and interface I/O circuits.
<b>CO4</b>	Design and implement 8051 microcontroller based systems.
<b>CO5</b>	Interface with micro controller circuits.

### **EC8095 VLSI Design**

<b>CO1</b>	Realize the concepts of digital building blocks using MOS transistor.
<b>CO2</b>	Design combinational MOS circuits and power strategies.
<b>CO3</b>	Design and construct Sequential Circuits and Timing systems.
<b>CO4</b>	Design arithmetic building blocks and memory subsystems.
<b>CO5</b>	Apply and implement FPGA design flow and testing.

### **MG8591 Principles Of Management**

<b>CO1</b>	Understand Managerial function of planning
<b>CO2</b>	Understand Managerial function of organizing
<b>CO3</b>	Understand Managerial function of staffing
<b>CO4</b>	Understand Managerial function of leading & controlling
<b>CO5</b>	Understand basic knowledge on international aspect of management

### **EC8651 Transmission Lines And Rf Systems**

<b>CO1</b>	Explain the characteristics of transmission lines and its losses
<b>CO2</b>	Write about the standing wave ratio and input impedance in high frequency transmission lines
<b>CO3</b>	Analyze impedance matching by stubs using smith charts
<b>CO4</b>	Analyze the characteristics of TE and TM waves
<b>CO5</b>	Design a RF transceiver system for wireless communication

### **EC8681 Microprocessors And Microcontrollers Laboratory**

<b>CO1</b>	Write ALP Programmers for fixed and Floating Point and Arithmetic operations
<b>CO2</b>	Interface different I/Os with processor
<b>CO3</b>	Generate waveforms using Microprocessors
<b>CO4</b>	Execute Programs in 8051
<b>CO5</b>	Explain the difference between simulator and Emulator

### **EC8661 VLSI Design Laboratory**

<b>CO1</b>	Write HDL code for basic as well as advanced digital integrated circuit
<b>CO2</b>	Import the logic modules into FPGA Boards
<b>CO3</b>	Synthesize Place and Route the digital IPs
<b>CO4</b>	Design, Simulate and Extract the layouts of Digital & Analog IC Blocks using EDA tools
<b>CO5</b>	Write HDL code for basic as well as advanced digital integrated circuit

### **EC8701 Antennas and Microwave Engineering**

<b>CO1</b>	Apply the basic principles and evaluate antenna parameters and link power budgets
<b>CO2</b>	Design and assess the performance of various antennas
<b>CO3</b>	Understand the different antenna arrays and applications
<b>CO4</b>	Understand the different microwave devices
<b>CO5</b>	Design a microwave system given the application specifications

### **EC8751 Optical Communication**

<b>CO1</b>	Realize basic elements in optical fibers, different modes and configurations.
<b>CO2</b>	Analyze the transmission characteristics associated with dispersion and polarization techniques.
<b>CO3</b>	Design optical sources and detectors with their use in optical communication system.
<b>CO4</b>	Construct fiber optic receiver systems, measurements and coupling techniques.
<b>CO5</b>	Design optical communication systems and its networks.

### **EC8791 Embedded and Real Time Systems**

<b>CO1</b>	Understand the concepts of embedded system design and analysis
<b>CO2</b>	Describe the architecture and programming of ARM processor
<b>CO3</b>	Outline the concepts of embedded systems
<b>CO4</b>	Explain the basic concepts of real time operating system design
<b>CO5</b>	Model real-time applications using embedded-system concepts

### **EC8702 AD HOC and Wireless Sensor Networks**

<b>CO1</b>	Know the basics of Ad hoc networks and Wireless Sensor Networks
<b>CO2</b>	Apply this knowledge to identify the suitable routing algorithm based on the network and user requirement
<b>CO3</b>	Apply the knowledge to identify appropriate physical and MAC layer protocols
<b>CO4</b>	Understand the transport layer and security issues possible in Ad hoc and sensor networks.
<b>CO5</b>	Be familiar with the OS used in Wireless Sensor Networks and build basic modules

### **EC8711- Embedded Laboratory**

<b>CO1</b>	Write programs in ARM for a specific Application
<b>CO2</b>	Interface memory, A/D and D/A convertors with ARM system
<b>CO3</b>	Analyze the performance of interrupt
<b>CO4</b>	Write program for interfacing keyboard, display, motor and sensor.
<b>CO5</b>	Formulate a mini project using embedded system

### **EC8761 Advanced Communication Laboratory**

<b>CO1</b>	Analyze the performance of simple optical link by measurement of losses
<b>CO2</b>	Analyzing the mode characteristics of fiber
<b>CO3</b>	Analyze the Eye Pattern, Pulse broadening of optical fiber and the impact on BER
<b>CO4</b>	Estimate the Wireless Channel Characteristics and Analyze the performance of Wireless Communication System
<b>CO5</b>	Understand the intricacies in Microwave System design

### **GE8077 Total Quality Management**

<b>CO1</b>	Understand the Basics of Total quality management
<b>CO2</b>	Understand the TQM Principles
<b>CO3</b>	Apply the tools and techniques I of quality management to manufacturing and services processes.
<b>CO4</b>	Apply the tools and techniques II of quality management to manufacturing and services processes.
<b>CO5</b>	Understand the quality management systems

### **EC8004 Wireless Networks**

<b>CO1</b>	Understand the concept about Wireless networks, protocol stack and standards
<b>CO2</b>	Understand and analyse the network layer solutions for Wireless networks
<b>CO3</b>	Understand the fundamentals of 3G Services, its protocols and applications
<b>CO4</b>	Have in depth knowledge on internetworking of WLAN and WWAN
<b>CO5</b>	Learned about evolution of 4G Networks, its architecture and applications

### **GE8071 Disaster Management**

<b>CO1</b>	Differentiate the types of disasters, causes and their impact on environment and society
<b>CO2</b>	Assess vulnerability and various methods of risk reduction measures as well as mitigation.
<b>CO3</b>	Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.
<b>CO4</b>	Differentiate the types of disasters, causes and their impact on environment and society
<b>CO5</b>	Assess vulnerability and various methods of risk reduction measures as well as mitigation.

### **GE8076 Professional Ethics**

<b>CO1</b>	Understand the basic Human Values
<b>CO2</b>	Understand the basics of Engineering Ethics
<b>CO3</b>	Apply ethics in society
<b>CO4</b>	Discuss the ethical issues related to engineering
<b>CO5</b>	Realize the responsibilities and rights in the society


**EC8094 Satellite Communication**

<b>CO1</b>	Analyze the satellite orbits
<b>CO2</b>	Analyze the earth segment and space segment
<b>CO3</b>	Analyze the various methods of satellite access
<b>CO4</b>	Analyze the satellite Link design
<b>CO5</b>	Design various satellite applications

**ORO551 Renewable Energy Sources**

<b>CO1</b>	Understanding the physics of solar radiation.
<b>CO2</b>	Ability to classify the solar energy collectors and methodologies of storing solar energy.
<b>CO3</b>	Knowledge in applying solar energy in a useful way
<b>CO4</b>	Knowledge in wind energy and biomass with its economic aspects.
<b>CO5</b>	Knowledge in capturing and applying other forms of energy sources like wind, biogas and geothermal energies.



  
 Name and Signature with seal of  
 of the Head of the Institution..  
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**PERI INSTITUTE OF TECHNOLOGY**