SE (2019 Pattern)

Course Title: Solid Mechanics

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	DEFINE various types of stresses and strain developed on determinate and indeterminate members. .
CO2	DRAW Shear force and bending moment diagram for various types of transverse loading and support.
CO3	COMPUTE the slope & deflection, bending stresses and shear stresses on a beam.
CO4	CALCULATE torsional shear stress in shaft and buckling on the column.
CO5	APPLY the concept of principal stresses and theories of failure to determine stresses on a 2-D element.
CO6	UTILIZE the concepts of SFD & BMD, torsion and principal stresses to solve combined loading application based problems.

Course Title: Solid Modeling and Drafting

Course Outcomes (CO's):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	UNDERSTAND basic concepts of CAD system, need and scope in Product Lifecycle Management.
CO2	UTILIZE knowledge of curves and surfacing features and methods to create complex solid geometry.
CO3	CONSTRUCT solid models, assemblies using various modeling techniques & PERFORM mass property analysis, including creating and using a coordinate system.
CO4	APPLY geometric transformations to simple 2D geometries.
CO5	USE CAD model data for various CAD based engineering applications viz. production drawings, 3D printing, FEA, CFD, MBD, CAE, CAM, etc..
CO6	USE PMI & MBD approach for communication.

Course Title: Engineering Thermodynamics

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	DESCRIBE the basics of thermodynamics with heat and work interactions.
CO2	APPLY laws of thermodynamics to steady flow and non-flow processes.
CO3	APPLY entropy, available and non available energy for an Open and Closed System.
CO4	DETERMINE the properties of steam and their effect on performance of vapour power cycle.
CO5	ANALYSE the fuel combustion process and products of combustion.
CO6	SELECT various instrumentations required for safe and efficient operation of steam generator.

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Course Title: Engineering Materials and Metallurgy

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	COMPARE crystal structures and ASSESS different lattice parameters.
CO2	CORRELATE crystal structures and imperfections in crystals with mechanical behaviour of materials.
CO3	DIFFERENTIATE and DETERMINE mechanical properties using destructive and non-destructive testing of materials.
CO4	IDENTIFY & ESTIMATE different parameters of the system viz., phases, variables, component, grains, grain boundary, and degree of freedom. etc.
CO5	ANALYSE effect of alloying element & heat treatment on properties of ferrous & nonferrous alloy.
CO6	SELECT appropriate materials for various applications.

Course Title: Electrical and Electronics Engineering

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	APPLY programming concepts to UNDERSTAND role of Microprocessor and Microcontroller in embedded systems.
CO2	DEVELOP interfacing of different types of sensors and other hardware devices with Atmega328 based Arduino Board.
CO3	UNDERSTAND the operation of DC motor, its speed control methods and braking.
CO4	DISTINGUISH between types of three phase induction motor and its characteristic features.
CO5	EXPLAIN about emerging technology of Electric Vehicle (EV) and its modular subsystems.
CO6	CHOOSE energy storage devices and electrical drives for EVs.

Course Title: Geometric Dimensioning and Tolerancing Lab

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	SELECT appropriate IS and ASME standards for drawing.
CO2	READ & ANALYSE variety of industrial drawings.
CO3	APPLY geometric and dimensional tolerance, surface finish symbols in drawing.
CO4	EVALUATE dimensional tolerance based on type of fit, etc..
CO5	SELECT an appropriate manufacturing process using DFM, DFA, etc.

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Course Title: Engineering Mathematics - III
Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	SOLVE higher order linear differential equations and its applications to model and analyze mass spring systems.
CO2	APPLY Integral transform techniques such as Laplace transform and Fourier transform to solve differential equations involved in vibration theory, heat transfer and related mechanical engineering applications.
CO3	APPLY Statistical methods like correlation, regression in analyzing and interpreting experimental data applicable to reliability engineering and probability theory in testing and quality control.
CO4	PERFORM Vector differentiation & integration, analyze the vector fields and APPLY to fluid flow problems.
CO5	SOLVE Partial differential equations such as wave equation, one and two dimensional heat flow equations.

Course Title: Kinematics of Machinery
Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	APPLY kinematic analysis to simple mechanisms
CO2	ANALYZE velocity and acceleration in mechanisms by vector and graphical method
CO3	SYNTHESIZE a four bar mechanism with analytical and graphical methods
CO4	APPLY fundamentals of gear theory as a prerequisite for gear design
CO5	CONSTRUCT cam profile for given follower motion

Course Title: Applied Thermodynamics
Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	DETERMINE COP of refrigeration system and ANALYZE psychrometric processes.
CO2	DISCUSS basics of engine terminology, air standard, fuel air and actual cycles.
CO3	IDENTIFY factors affecting the combustion performance of SI and CI engines.
CO4	DETERMINE performance parameters of IC Engines and emission control.
CO5	EXPLAIN working of various IC Engine systems and use of alternative fuels.
CO6	CALCULATE performance of single and multi stage reciprocating compressors and DISCUSS rotary positive displacement compressors.

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Course Title: Engineering Materials and Metallurgy

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	COMPARE crystal structures and ASSESS different lattice parameters.
CO2	CORRELATE crystal structures and imperfections in crystals with mechanical behaviour of materials.
CO3	DIFFERENTIATE and DETERMINE mechanical properties using destructive and non-destructive testing of materials.
CO4	IDENTIFY & ESTIMATE different parameters of the system viz., phases, variables, component, grains, grain boundary, and degree of freedom. etc.
CO5	ANALYSE effect of alloying element & heat treatment on properties of ferrous & nonferrous alloy.
CO6	SELECT appropriate materials for various applications.

Course Title: Electrical and Electronics Engineering

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	APPLY programming concepts to UNDERSTAND role of Microprocessor and Microcontroller in embedded systems.
CO2	DEVELOP interfacing of different types of sensors and other hardware devices with Atmega328 based Arduino Board.
CO3	UNDERSTAND the operation of DC motor, its speed control methods and braking.
CO4	DISTINGUISH between types of three phase induction motor and its characteristic features.
CO5	EXPLAIN about emerging technology of Electric Vehicle (EV) and its modular subsystems.
CO6	CHOOSE energy storage devices and electrical drives for EVs.

Course Title: Geometric Dimensioning and Tolerancing Lab

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	SELECT appropriate IS and ASME standards for drawing.
CO2	READ & ANALYSE variety of industrial drawings.
CO3	APPLY geometric and dimensional tolerance, surface finish symbols in drawing.
CO4	EVALUATE dimensional tolerance based on type of fit, etc..
CO5	SELECT an appropriate manufacturing process using DFM, DFA, etc.

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Course Title: Project Based Learning - II

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	IDENTIFY the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aims and objectives.
CO2	ANALYZE the results and arrive at valid conclusions.
CO3	PROPOSE a suitable solution based on the fundamentals of mechanical engineering by possibly integration of previously acquired knowledge.
CO4	CONTRIBUTE to society through proposed solutions by strictly following professional ethics and safety measures.
CO5	USE of technology in proposed work and demonstrate learning in oral and written form.
CO6	DEVELOP ability to work as an individual and as a team member.

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Course Title: Fluid Mechanics

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO 1	DETERMINE various properties of fluid
CO 2	APPLY the laws of fluid statics and concepts of buoyancy
CO 3	IDENTIFY types of fluid flow and terms associated in fluid kinematics
CO 4	APPLY principles of fluid dynamics to laminar flow
CO 5	ESTIMATE friction and minor losses in internal flows and DETERMINE boundary layer formation over an external surface
CO 6	CONSTRUCT mathematical correlation considering dimensionless parameters, also ABLE to predict the performance of prototype using model laws

Course Title: Manufacturing Processes

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	SELECT appropriate moulding, core making and melting practice and estimate pouring time, solidification rate and DESIGN riser size and location for sand casting process
CO2	UNDERSTAND mechanism of metal forming techniques and CALCULATE load required for flat rolling
CO3	DEMONSTRATE press working operations and APPLY the basic principles to DESIGN dies and tools for forming and shearing operations
CO4	CLASSIFY and EXPLAIN different welding processes and EVALUATE welding characteristics
CO5	DIFFERENTIATE thermoplastics and thermosetting and EXPLAIN polymer processing techniques
CO6	UNDERSTAND the principle of manufacturing of fibre-reinforce composites and metal matrix composites

Course Title: Machine Shop

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	PERFORM welding using TIG/ MIG/ Resistance/Gas welding technique
CO2	MAKE Fibre-reinforced Composites by hand lay-up process or spray lay-up techniques
CO3	PERFORM cylindrical/surface grinding operation and CALCULATE its machining time
CO4	DETERMINE number of indexing movements required and acquire skills to PRODUCE a spur gear on a horizontal milling machine
CO5	PREPARE industry visit report
CO6	UNDERSTAND procedure of plastic processing

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Course Title: **Mechatronics**

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	**DEFINE** key elements of mechatronics, principle of sensor and its characteristics.
CO2	**UTILIZE** concept of signal processing and **MAKE** use of interfacing systems such as ADC, DAC, Digital I/O.
CO3	**DETERMINE** the transfer function by using block diagram reduction technique.
CO4	**EVALUATE** Poles and Zero, frequency domain parameter for mathematical modeling for mechanical system.
CO5	**APPLY** the concept of different controller modes to an industrial application.
CO6	**DEVELOP** the ladder programming for industrial application.

Course Title: Elective **A: Advanced Forming & Joining Processes**

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	**ANALYSE** the effect of friction in metal forming deep drawing and IDENTIFICATION of surface defects and their remedies in deep drawing operations
CO2	**ASSESS** the parameters for special forming operation and SELECT appropriate special forming operation for particular applications
CO3	**ANALYSE** the effect of HAZ on microstructure and mechanical properties of materials
CO4	**CLASSIFY** various solid state welding process and **SELECT** suitable welding processes for particular applications
CO5	**CLASSIFY** various advanced welding process and **SELECT** suitable welding processes for particular applications.
CO6	**INTERPRET** the principles of sustainable manufacturing and its role in manufacturing industry.

Course Title: Elective **B:Machining Science &Technology**

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	**DEFINE** metal cutting principles and mechanics of metal cutting and tool life.
CO2	**DESCRIBE** features of gear and thread manufacturing processes.
CO3	**SELECT** appropriate grinding wheel and demonstrate the various surface finishing processes.
CO4	**SELECT** appropriate jigs/fixtures and to draw the process plan for a given component.
CO5	**SELECT & EVALUATE** various parameters of process planning.

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TE (2019 Pattern)

Course Title: Numerical and Statistical Methods

Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**SOLVE** system of equations using direct and iterative numerical methods.
CO2	**ESTIMATE** solutions for differential equations using numerical techniques.
CO3	**DEVELOP** solution for engineering applications with numerical integration.
CO4	**DESIGN** and **CREATE** a model using a curve fitting and regression analysis.
CO5	**APPLY** statistical Technique for quantitative data analysis.
CO6	**DEMONSTRATE** the data, using the concepts of probability and linear algebra.

Course Title: **Heat and Mass Transfer**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**ANALYZE & APPLY** the modes of heat transfer equations for one dimensional thermal system.
CO2	**DESIGN a** thermal system considering fins, thermal insulation and & Transient heat conduction.
CO3	**EVALUATE** the heat transfer rate in natural and forced convection & validate with experimentation results.
CO4	**INTERPRET** heat transfer by radiation between objects with simple geometries, for black and grey surfaces.
CO5	**ABILITY** to analyze the rate of mass transfer using Fick's Law of Diffusion and understands mass diffusion in different coordinate systems.
CO6	**DESIGN & ANALYSIS** of heat transfer equipments and investigation of its performance.

Course Title: **Design of Machine Elements**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**DESIGN AND ANALYZE** the cotter and knuckle Joints, levers and components subjected to eccentric loading.
CO2	**DESIGN** shafts, keys and couplings under static loading conditions.
CO3	**ANALYZE** different stresses in power screws and **APPLY** those in the procedure to design screw jack.
CO4	**EVALUATE** dimensions of machine components under fluctuating loads.
CO5	**EVALUATE & INTERPRET** the stress developed on the different type of welded and threaded joints.
CO6	**APPLY** the design and development procedure for different types of springs.

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Course Title: **Digital Manufacturing Laboratory**

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	**DEVELOP** a component using conventional machines, CNC machines and Additive Manufacturing Techniques.
CO2	**ANALYZE** cutting tool parameters for machining given job.
CO3	**DEMONSTRATE** simulation of manufacturing process using Digital Manufacturing Tools.
CO4	**SELECT** and **DESIGN** jigs and Fixtures for a given component.
CO5	**SELECT** and **DESIGN** jigs and Fixtures for a given component
CO6	**DEMONESTRATE** different parameters for CNC retrofitting and reconditioning.

Course Title: **Skill Development**

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	**APPLY**& **DEMONSTRATE** procedure of assembly & disassembly of various machines.
CO2	**DESIGN & DEVELOP** a working/model of machine parts or any new product.
CO3	**EVALUATE** fault with diagnosis on the machines, machine tools and home appliances.
CO4	**IDENTIFY** & **DEMONSTRATE** the various activities performed in an industry such as maintenance, design of components, material selection.

Course Title: Artificial Intelligence & Machine Learning

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	**DEMONSTRATE** fundamentals of artificial intelligence and machine learning.
CO2	**APPLY** feature extraction and selection techniques.
CO3	**APPLY** machine learning algorithms for classification and regression problems.
CO4	**DEVISE AND DEVELOP** a machine learning model using various steps.
CO5	**EXPLAIN** concepts of reinforced and deep learning.
CO6	**SIMULATE** machine learning model in mechanical engineering problems.

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CO6	**GENERATE** CNC program for Turning / Milling processes and generate tool path using CAM software.

Course Title: Elective **B: Surface Engineering**
Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	**DEFINE** the basic's principle & mechanism of surface degradation.
CO2	**ANALYSE & SELECT** correct corrosion prevention techniques for a different service condition.
CO3	**DEMONSTRATE** the role of surface engineering of materials to modify/improve the surface properties.
CO4	**SELECT** the suitable surface heat treatments to improve the surface properties.
CO5	**APPLY** the surface modification technique to modify surface properties.
CO6	**ANALYSE & EVALUTE** various surface coating defects using various testing/characterization method.

Course Title: **Measurement Laboratory**
Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	**EVALUATE** causes of errors in Vernier calipers, micrometers by performing experiments in standard metrological conditions, noting deviations at actual and by plotting cause and effect diagram, to reduce uncertainty in measurement.
CO2	**ANALYZE** strain measurement parameters by taking modulus of elasticity in consideration to acknowledge its usage in failure detection and force variations.
CO3	**EXAMINE** surface Textures, surface finish using equipment's like Talysurf and analyze surface finish requirements of metrological equipment's like gauges, jaws of vernier calipers, micrometers, magnifying glasses of height gauge and more, to optimize surface finish accuracy requirements and cost of measurement.
CO4	**MEASURE** the dimensional accuracy using Comparator and limit gauges and appraise their usage in actual measurement or comparison with standards set to reduce measurement lead time.
CO5	**PERFORM** Testing of Flow rate, speed and temperature measurements and their effect on performance in machines and mechanisms like hydraulic or pneumatic trainers, lathe machine etc. to increase repeatability and reproducibility.
CO6	**COMPILE** the information of opportunities of entrepreneurships/business in various sectors of metrology like calibrations, testing, coordinate and laser metrology etc in an industry visit report.

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Course Title: Computer Aided Engineering

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**DEFINE** the use of CAE tools and **DESCRIBE** the significance of shape functions in finite element formulations.
CO2	**APPLY** the various meshing techniques for better evaluation of approximate results.
CO3	**APPLY** material properties and boundary condition to SOLVE 1-D and 2-D element stiffness matrices to obtain nodal or elemental solution.
CO4	**ANALYZE** and **APPLY** various numerical methods for different types of analysis.
CO5	**EVALUATE** and **SOLVE** non-linear and dynamic analysis problems by analyzing the results obtained from analytical and computational method.
CO6	**GENERATE** the results in the form of contour plot by the USE of CAE tools.

Course Title: **Design of Transmission Systems**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**APPLY** the principle of Spur & Helical gear design for industrial application and **PREPARE** a manufacturing drawing with the concepts of GD&T.
CO2	**EXPLAIN** and **DESIGN** Bevel & Worm gear considering design parameters as per design standards.
CO3	**SELECT&DESIGN** Rolling and Sliding Contact Bearings from manufacturer's catalogue for a typical application considering suitable design parameters.
CO4	**DEFINE** and **DESIGN** various types of Clutches, Brakes, used in automobile.
CO5	**APPLY** various concept to **DESIGN** Machine Tool Gear box, for different applications
CO6	**ELABORATE** various modes of operation, degree of hybridization and allied terms associated with hybrid electric vehicles.

Course Title: Elective **A: Composite Materials**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**DEFINE & COMPARE** composites with traditional materials.
CO2	**IDENTIFY & ESTIMATE** different parameters of the Polymer Matrix Composite
CO3	**CATEGORISE** and **APPLY** Metal Matrix Process from possessions landscape.
CO4	**DETERMINE** volume/weight fraction and strength of Composites.
CO5	**SELECT** appropriate testing and inspection method for composite materials.
CO6	**SELECT** composites materials for various applications.

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BE (2015 Pattern)

Course Title: Hydraulics and Pneumatics (2015 Pattern)

Course Outcomes (CO's):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	Describe the basic principles of fluid power and positive displacement hydraulic pumps
CO2	Illustrate the working principles, applications of hydraulic actuators, power units and accessories
CO3	Explain the working principles, applications of fluid power control devices
CO4	Interpret the working of industrial hydraulics circuits, methods of contamination control
CO5	Describe the Components, Control Valves and Circuits of Pneumatics
CO6	Select the appropriate components required for hydraulic and pneumatic systems

Course Title: CAD CAM & Automation

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	Apply homogeneous transformation to 2D/3D dimensional CAD entities.
CO2	Analyze analytical & synthetic curves, surfaces and solid.
CO3	Understand fundamentals of finite element method, & determine stress, strain, and displacement in simple mechanical components like spring, bar, truss.
CO4	Develop CNC part program for turning/milling.
CO5	Explain suitable rapid prototyping methods for engineering problems.
CO6	Understand different automation strategies and fundamentals of robotics.

Course Title:Dynamics of Machinery

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	Estimate natural frequency for single DOF undamped& damped free vibratory systems.
CO2	Determine response to forced vibrations due to harmonic excitation.
CO3	Estimate natural frequencies, mode shapes for 2 DOF undamped free vibratory systems.
CO4	Apply balancing techniques for static and dynamic balancing of multi cylinder engines.
CO5	Describe vibration measuring instruments along with vibration control methods.
CO6	Explain noise, its measurement & noise reduction techniques.

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Course Title: **Fluid Power & Control Laboratory**
Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**DEFINE** working principle of components used in hydraulic and pneumatic systems.
CO2	**IDENTIFY & EXPLAIN** various applications of hydraulic and pneumatic systems.
CO3	**SELECT** an appropriate component required for hydraulic and pneumatic systems using manufactures' catalogues.
CO4	**SIMULATE & ANALYSE** various hydraulic and pneumatic systems for industrial/mobile applications.
CO5	**DESIGN** a hydraulic and pneumatic system for the industrial applications.
CO6	**DESIGN & DEMONESTRATE** various IoT, PLC based controlling system using hydraulics and pneumatics.

Course Title: **Internship/Mini project**
Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**DEMONSTRATE** professional competence through industry internship.
CO2	**APPLY** knowledge gained through internships to complete academic activities in a professional manner.
CO3	**CHOOSE** appropriate technology and tools to solve given problem.
CO4	**DEMONSTRATE** abilities of a responsible professional and use ethical practices in day to day life.
CO5	**DEVELOP** network and social circle, and **DEVELOPING** relationships with industry people.
CO6	**ANALYZE** various career opportunities and **DECIDE** career goals.

Course Title: **Mini project**
Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**EXPLAIN** plan and execute a Mini Project with team.
CO2	**IMPLEMENT** hardware/software/analytical/numerical techniques, etc
CO3	**DEVELOP** a technical report based on the Mini project.
CO4	**DELIVER** technical seminar based on the Mini Project work carried out.

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Course Title: Elective II- Operations Research
Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	Execute the LLP using Two Phase Method and Decision Theory to solve problems.
CO2	Evaluate the existing utilization of the resources and propose a better solution using transportation models.
CO3	Analyze the conflicting situations and evaluate the optimal strategy using Game Theory and replacement analysis.
CO4	Implement the project management techniques like CPM, PERT, Crashing Analysis and Monte-Carlo Simulation method.
CO5	Evaluate the waiting time, idle time and process time using Queuing and Sequencing Models.
CO6	Optimize multi stage decision making problems using Integer Programming and Dynamic Programming.

Course Title: Elective II- ENERGY AUDIT AND MANAGEMENT
Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	Carry out energy audit of their residence/ society / college.
CO2	Carry out electric tariff calculation for any installation.
CO3	Manage the peak load and power factor of any installation.
CO4	Suggest different methods to optimize the energy consumption for any process and develop ecofriendly methods.
CO5	Adopt new methods to improve overall efficiency of system e.g. co-generation, non-conventional methods of energy production.

Course Title: Energy Engineering
Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	To study the power generation scenario, the components of thermal power plant, improved Rankin cycle, Cogeneration cycle
CO2	To understand details of steam condensing plant, analysis of condenser, the an environmental impacts of thermal power plant, method to reduce various pollution from thermal power plant
CO3	To study layout, component details of hydroelectric power plant, hydrology and elements, types of nuclear power plant
CO4	To understand components; layout of diesel power plant , components; different cycles; methods to improve thermal efficiency of gas power plant
CO5	To study the working principle , construction of power generation from non-conventional sources of energy
CO6	To learn the different instrumentation in power plant and basics of economics of power generation.

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Course Title:Elective I- COMPUTATIONAL FLUID DYNAMICS

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	Analyse and model fluid flow and heat transfer problem
CO2	Apply numerical technique to discretize and solve governing differential equation for two dimension heat conduction equation
CO3	Solve basic advection and convection diffusion equations and understands the role in fluid flow and heat transfer
CO4	Evaluate flow parameters in internal and external flow using simple algorithm
CO5	Discuss basic introduction to turbulent flow model

Course Title: Elective I- Heating, Ventilation, Air Conditioning and Refrigeration Engineering

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	Determine the performance parameters of trans-critical & ejector refrigeration systems
CO2	Estimate thermal performance of compressor, evaporator, condenser and cooling tower.
CO3	Describe refrigerant piping design, capacity & safety controls and balancing of vapour compressor system.
CO4	Explain importance of indoor and outdoor design conditions, IAQ, ventilation and air distribution system.
CO5	Estimate heat transmission through building walls using CLTD and decrement factor &time lag methods with energy-efficient and cost-effective measures for building envelope.
CO6	Explain working of types of desiccant, evaporative, thermal storage, radiant cooling, clean room and heat pump air-conditioning systems.

Course Title:Elective II- Automobile Engineering

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	To compare and select the proper automotive system for the vehicle.
CO2	To analyse the performance of the vehicle.
CO3	To diagnose the faults of automobile vehicles.
CO4	To apply the knowledge of EVs, HEVs and solar vehicles

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Course Title: Elective IV- Advanced Manufacturing Processes

Course Outcomes (CO's):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	Classify and understand various special forming processes.
CO2	Understand and identify applicability of advanced joining processes.
CO3	Understand and identify applicability of hybrid non-conventional machining techniques.
CO4	Select appropriate micro and nano fabrication techniques for engineering applications.
CO5	Understand and apply various additive manufacturing technology for product development
CO6	Identify material characterization techniques to by using Microscopy and Spectroscopy

Course Title: Elective IV- Solar and Wind Energy

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	Design of solar food drier for domestic purpose referring existing system
CO2	Design of parabolic dish solar cooker for domestic purpose referring existing system
CO3	Design of solar photovoltaic system for domestic purpose referring existing system
CO4	Design miniature wind mill for domestic purpose referring existing system

Course Title: Elective IV- Product Design and Development

Course Outcomes (CO's):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	Understand essential factors for product design
CO2	Design product as per customer needs and satisfaction
CO3	Understand Processes and concepts during product development
CO4	Understand methods and processes of Forward and Reverse engineering
CO5	Carry various design processes as DFA, DFMEA, design for safety
CO6	Understand the product life cycle and product data management

Course Title:Project

Course Outcomes (CO's):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	**Find out the gap between existing mechanical systems and develop new creative new mechanical system.**
CO2	**Learn about the literature review.**
CO3	**Get the experience to handle various tools, tackles and machines.**

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Course Title: Mechanical System Design
Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	Understand the difference between component level design and system level design.
CO2	Design various mechanical systems like pressure vessels, machine tool gear boxes, material handling systems, etc. for the specifications stated/formulated.
CO3	Learn optimum design principles and apply it to mechanical components.
CO4	Handle system level projects from concept to product.

Course Title: Elective III- Tribology
Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	The course will enable the students to know the importance of Tribology in Industry
CO2	The course will enable the students to know the basic concepts of Friction, Wear, Lubrications and their measurements.
CO3	Identify the performance of different types of bearings and analytical analysis thereof.
CO4	Apply the principles of surface engineering for different applications of tribology.

Course Title: Elective III- Industrial Engineering
Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	Apply the Industrial Engineering concept.
CO2	Understand, analyze and implement different concepts involved in method study.
CO3	Design and Develop different aspects of work system and facilities.
CO4	Understand and Apply Industrial safety standards, financial management practices.
CO5	Undertake project work based on modeling & simulation area.

Course Title: Elective III- Robotics
Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	Identify different type of robot configuration with relevant terminology.
CO2	Select suitable sensors, actuators and drives for robotic systems.
CO3	Understand kinematics in robotic systems.
CO4	Design robot with desired motion with suitable trajectory planning.
CO5	Select appropriate robot programming for given application.
CO6	Understand need of IoT, machine learning, simulation in robotics.

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Department of Artificial Intelligence and Data Science

Academic Year 2023-24

	2023-24 SEM-III SE
Course Code	**Name of Course**
210241	**Discrete Mathematics**
210241.1	CO1: Formulate problems precisely, solve the problems, apply formal proof techniques, and explain the reasoning clearly.
210241.2	CO2: Apply appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts
210241.3	CO3: Design and analyze real world engineering problems by applying set theory, propositional logic and to construct proofs using mathematical induction
210241.4	CO4: Specify, manipulate and apply equivalence relations; construct and use functions and apply these concepts to solve new problems
210241.5	CO5: Calculate numbers of possible outcomes using permutations and combinations; to model and analyze computational processes using combinatorics.
210241.6	CO6:Model and solve computing problem using tree and graph and solve problems using appropriate algorithms.
210241.7	CO7:Analyze the properties of binary operations, apply abstract algebra in coding theory and evaluate the algebraic structures.
210242	**Fundamentals of Data Structures**
210242.1	CO1:Design the algorithms to solve the programming problems, identify appropriate algorithmic strategy for specific application, and analyze the time and space complexity.
210242.2	CO2:Discriminate the usage of various structures, Design/Program/Implement the appropriate data structures; use them in implementations of abstract data types and Identity the appropriate data structure in approaching the
210242.3	CO3:Demonstrate use of sequential data structures- Array and Linked lists to store and process data.
210242.4	CO4:Understand the computational efficiency of the principal algorithms for searching and sorting and choose the most efficient one for the application.
210242.5	CO5:Compare and contrast different implementations of data structures (dynamic and static).
210242.6	CO6:Understand, Implement and apply principles of data structures-stack and queue to solve computational problems
210243	**Object Oriented Programming(OOP)**
210243.1	CO1: Apply constructs- sequence, selection and iteration; classes and objects, inheritance, use of predefined classes from libraries while developing software.
210243.2	CO2: Design object-oriented solutions for small systems involving multiple objects.
210243.3	CO3: Use virtual and pure virtual function and complex programming situations.
210243.4	CO4: Apply object-oriented software principles in problem solving.
210243.5	CO5: Analyze the strengths of object-oriented programming.
210243.6	CO6: Develop the application using object oriented programming language(C++).
210244	**Computer Graphics**
210244.1	CO1:Identify the basic terminologies of Computer Graphics and interpret the mathematical foundation of the concepts of computer graphics.
210244.2	CO2:Apply mathematics to develop Computer programs for elementary graphic operations.
210244.3	CO3:Illustrate the concepts of windowing and clipping and apply various algorithms to fill and clip polygons.
210244.4	CO4:Understand and apply the core concepts of computer graphics, including transformation in two and three dimensions, viewing and projection.
210244.5	CO5:Understand the concepts of color models, lighting, shading models and hidden surface elimination.
210244.6	CO6:Create effective programs using concepts of curves, fractals, animation and gaming
217521	**Operating Systems**

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217521.1	CO1: Enlist functions of OS and types of system calls
217521.2	CO2: Apply process scheduling algorithms to solve a given problem
217521.3	CO3: Illustrate deadlock prevention, avoidance and recovery
217521.4	CO4: Explain memory management technique
217521.5	CO5: Illustrate I/O and file management policies
217521.6	CO6: Describe Linux process management
217522	**Data Structures Laboratory**
217522.1	CO1: Use algorithms on various linear data structure using sequential organization to solve real life problems.
217522.2	CO2: Analyze problems to apply suitable searching and sorting algorithm to various applications.
217522.3	CO3: Analyze problems to use variants of linked list and solve various real life problems.
217522.4	CO4: Designing and implement data structures and algorithms for solving different kinds of problems
217523	**OOP and Computer Graphics Laboratory**
217523.1	CO1:Understand and apply the concepts like inheritance, polymorphism, exception handling and generic structures for implementing reusable programming codes.
217523.2	CO2:Analyze the concept of file and apply it while storing and retrieving the data from secondary storages.
217523.3	CO3:Analyze and apply computer graphics algorithms for line-circle drawing, scan conversion
217523.4	CO4:Understand the concept of windowing and clipping and apply various algorithms to fill and clip polygons.
217523.5	CO5:Apply logic to implement, curves, fractals, animation and gaming programs.
217524	**Operating Systems Laboratory**
217524.1	CO1: Choose the best CPU scheduling algorithm for a given problem instance
217524.2	CO2: Demonstrate interprocess communication
217524.3	CO3: Apply deadlock avoidance algorithm
217524.4	CO4: Compare performance of page replacement algorithms
217524.5	CO5: Demonstrate the fundamental UNIX commands & system calls
217525	**Business Communication Skills**
217525.1	CO1:Express effectively through verbal/oral communication and improve listening skills
217525.2	CO2:Write precise briefs or reports and technical documents.
217525.3	CO3:Prepare for group discussion / meetings / interviews and presentations.
217525.4	CO4:Explore goal/target setting, self-motivation and practicing creative thinking.
217525.5	CO5:Operate effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership qualities
217526	**Humanity and Social Science**
217526.1	CO1:Aware of the various issues concerning humans and society.
217526.2	CO2:Aware about their responsibilities towards society.
217526.3	CO3: Sensitized about broader issues regarding the social, cultural, economic and human aspects, involved in social changes.
217526.4	CO4:Able to understand the nature of the individual and the relationship between self and the community.
217526.5	CO5:Able to understand major ideas, values, beliefs, and experiences that have shaped human history and cultures.
217527-IV	**Mandatory Audit Course 3 : "Smart Cities"**
217527-IV.1	CO1: Understand the dynamic behavior of the urban system by going beyond the physical appearance and by focusing on representations, properties and impact factors
217527-IV.2	CO2: Explore the city as the most complex human-made organism with a metabolism that can be modeled in terms of stocks and flows
217527-IV.3	CO3: Knowledge about data-informed approaches for the development of the future city, based on crowd sourcing and sensing
217527-IV.4	CO4: Knowledge about the latest research results in for the development and management of future cities

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	2023-24 SEM-IV SE
217528	**Statistics**
217528.1	CO1: Identify the use of appropriate statistical terms to describe data
217528.2	CO2: Use appropriate statistical methods to collect, organize, display, and analyze relevant data.
217528.3	CO3: Use distribution functions for random variables
217528.4	CO4: Distinguish between correlation coefficient and regression
217528.5	CO5: Understand tests for hypothesis and its significance
217529	**Internet of Things**
217529.1	CO1: Have a thorough understanding of the structure, function and characteristics of computer systems and Understand the structure of various number systems and its application in digital design
217529.2	CO2: Develop the skill set to build IoT systems and sensor interfacing.
217529.3	CO3: Explain the concept of Internet of Things and identify the technologies that make up the internet of things
217529.4	CO4: Analyze trade-offs in interconnceted wireless embedded device networks
217529.5	CO5: Design a simple IoT system comprising sensors by analyzing the requirements of IoT Application
217529.6	CO6: Identify the Application of IoT in automation of Commercial and Real World examples
210252	**Data Structures and Algorithms**
210252.1	CO1: Identify and articulate the complexity goals and benefits of a good hashing scheme for real- world applications.
210252.2	CO2: Apply non-linear data structures for solving problems of various domain.
210252.3	CO3: Design and specify the operations of a nonlinear-based abstract data type and implement them in a high-level programming language.
210252.4	CO4: Analyze the algorithmic solutions for resource requirements and optimization
210252.5	CO5: Use efficient indexing methods and multiway search techniques to store and maintain data.
210252.6	CO6: Use appropriate modern tools to understand and analyze the functionalities confined to the secondary storage
210253	**Software Engineering**
210253.1	CO1:Analyze software requirements and formulate design solution for a software.
210253.2	CO2:Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
210253.3	CO3:Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development
210253.4	CO4:Model and design User interface and component-level.
210253.5	CO5:Identify and handle risk management and software configuration management
210253.6	CO6:Utilize knowledge of software testing approaches, approaches to verification and validation.
210253.7	CO7:Construct software of high quality – software that is reliable, and that is reasonably easy to understand, modify and maintain efficient, reliable, robust and cost-effective software solutions.
217530	**Management Information Systems**
217530.1	CO1 : Explain the concepts of Management Information System and Business intelligence for MIS.
217530.2	CO2 : Illustrate the need of information systems in global business and ethical issues
217530.3	CO3 : List the IT infrastructure components and explain security in the Information System.
217530.4	CO4 : Demonstrate the importance of project management and extend its use in the international information system.
217530.5	CO5 : Illustrate the concepts of decision support systems for business applications.
217530.6	CO6 : Relate artificial intelligence and data science for Management Information System.
217531	**Internet of Things Laboratory**
217531.1	CO1: Understand IOT Application Development using Raspberry Pi/ Beagle board/ Arduino board
217531.2	CO2: Develop and modify the code for various sensor based applications using wireless sensormodules and working with a variety of modules like environmental modules.
217531.3	CO3: Make use of Cloud platform to upload and analyse any sensor data

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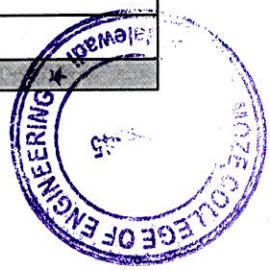

217532	**Data Structures and Algorithms Laboratory**
217532.1	CO1: Understand the ADT/libraries, hash tables and dictionary to design algorithms for a specific problem.
217532.2	CO2: Choose most appropriate data structures and apply algorithms for graphical solutions of the problems.
217532.3	CO3: Apply and analyze non linear data structures to solve real world complex problems.
217532.4	CO4: Apply and analyze algorithm design techniques for indexing, sorting, multi-way searching, file organization and compression.
217532.5	CO5: Analyze the efficiency of most appropriate data structure for creating efficient solutions for engineering design situations.
217533	**Project Based Learning II**
217533.1	CO1:Identify the real life problem from societal need point of view
217533.2	CO2:Choose and compare alternative approaches to select most feasible one
217533.3	CO3:Analyze and synthesize the identified problem from technological perspective
217533.4	CO4:Design the reliable and scalable solution to meet challenges
217533.5	CO5:Evaluate the solution based on the criteria specified
217533.6	CO6: Inculcate long life learning attitude towards the societal problems
217534	**Code of Conduct**
217534.1	CO1:Understand the basic perception of profession, professional ethics, various moral and social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
217534.2	CO2:Aware of professional rights and responsibilities of an engineer, responsibilities of an engineer for safety and
217534.3	CO3:Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development
217534.4	CO4: Acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives.
217535-III	**Mandatory Audit course 4: "The Science of Happiness"**
217535-III.1	CO1:Understand what happiness is and why it matters to you
217535-III.2	CO2:Learn how to increase your own happiness
217535-III.3	CO3:Understand of the power of social connections and the science of empathy
217535-III.4	CO4:Understand what is mindfulness and its real world applications

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Department of Artificial Intelligence and Data Science

Academic Year 2023-24

Program Specific Outcomes (PSO)

A graduate of the Artificial Intelligence &Data Science Program will demonstrate-	
PSO1	**Professional Skills**-The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, networking, artificial intelligence and data science for efficient design of computer-based systems of varying complexities.
PSO2	**Problem-Solving Skills**- The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.
PSO3	**Successful Career and Entrepreneurship**- The ability to employ modern computer languages, environments and platforms in creating innovative career paths to be an entrepreneur and to have a zest

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Program Outcomes

Students are expected to know and be able to–

PO1	Engineering knowledge	Apply the knowledge of mathematics, science, Engineering fundamentals, and an Engineering specialization to the solution of complex Engineering problems.
PO2	Problem analysis	Identify, formulate, review research literature and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and Engineering sciences.
PO3	Design / Development of Solutions	Design solutions for complex Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and
		Environmental considerations.
PO4	Conduct Investigations of Complex Problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern Tool Usage	Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modeling to complex Engineering activities with an understanding of the limitations.
PO6	The Engineer and Society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices.
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 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 Skills	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 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.

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Sr. No.	Course Code	Course Name
		SE Semester - III
1	210241	Discrete Mathematics
2	210242	Fundamentals of Data Structures
3	210243	Object Oriented Programming
5	210244	Computer Graphics
6	217521	Operating Systems
7	217522	Data Structures Laboratory
8	217523	OOP and Computer Graphics Laboratory
10	217524	Operating Systems Laboratory
	217525	Business Communication Skills
	217526	Humanity and Social Science
11	217527	Mandatory Audit Course 3*
		217527-I Green Construction and Design
		217527-II Social Awareness and Governance Program
		217527-III Environmental Studies
		217527-V Foreign Language (one of Japanese/Spanish/French/German)
		SE Semester - IV
11	217528	Statistics
12	217529	Internet of Things
13	210252	Data Structures and Algorithms
14	210253	Software Engineering
15	217530	Management Information System
16	217531	Internet of Things Laboratory
17	217532	Data Structures and Algorithms Laboratory
19	217533	Project Based Learning II
20	217534	Code of Conduct
21	217535	Mandatory Audit Course 4#
		217535-I Water Management
		217535-II Intellectual Property Rights and Patents
		217535-III The Science of Happiness
		217535-IV Stress Relief: Yoga and Meditation
		217535-V Foreign Language (one of Japanese/Spanish/French/German)

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(Recognized by AICTE, New Delhi; Approved by Govt. of Maharashtra;
Affiliated to Pune University)
25/1/3, Balewadi, Pune – 411045. Ph: 020-27390500
Website: www.gsmozecoe.co.in Email: gsmoze@yahoo.co.in

Department of Civil Engineering

PROGRAM OUTCOME

Programme Outcomes describe what students are expected to know or be able to do by the time of graduation from the programme. The POs for Under Graduate Course in Electronics and Telecommunication Engineering are able to

1. Apply the knowledge of technical fundamentals, mathematics and applied science for solving the domain problems.
2. Identify, Analyse complex engineering problems and review the literature for the same.
3. Design the processes, implement the system for the welfare, safety, and environmental need of the society.
4. Perform experiment, and interpret results
5. Use technical skills and tools for electronic system development.
6. Understand the importance of electronics and telecommunication in modern era.
7. Identify the needs of society for development, growth and human values
8. Understand the legal, professional, ethical responsibilities
9. Work effectively in diversified, multidisciplinary environment to achieve common goal
10. Ability to communicate effectively and possess soft skills
11. Engage themselves in continuous educational, professional and entrepreneurship development
12. Apply effectively electronics and telecommunication engineering and management skills and act as a team leader to solve industrial and social problem.

PROGRAM SPECIFIC OUTCOMES (PSO'S)

PSO1 – Inculcating communicational skills, and leadership attributes towards the team work also developing critical thinking abilities with competence in use of computational tools for current research and industry needs

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PSO2 – Understanding and applying the mathematical and scientific concepts for analytical and design skills concerned with civil engineering practice

PSO3 –Enrich the knowledge in various specializations of Civil engineering (Eg: Structural, Geotechnical, Transportation, Environmental Engineering) by means of research and innovative practices

Course Outcomes

SE

Course Code	Subject:
201001	**Building Technology and Architectural Planning**
	Identify types of building and basic requirements of building components.
	Make use of Architectural Principles and Building byelaws for building construction.
	Plan effectively various types of Residential Building forms according to their utility, functions with reference to National Building Code.
	Plan effectively various types of Public Buildings according to their utility functions with reference to National Building Code.
	Make use of Principles of Planning in Town Planning, Different Villages and Safety aspects.
	Understand different services and safety aspects
201002	**Mechanics of structure**
	Understand concept of stress-strain and determine different types of stress, strain in determinate, indeterminate homogeneous and composite structures.
	Calculate shear force and bending moment in determinate beams for different loading conditions and illustrate shear force and bending moment diagram.
	Explain the concept of shear and bending stresses in beams and demonstrate shear and bending stress distribution diagram.
	Use theory of torsion to determine the stresses in circular shaft and understand the concept of Principal stresses and strains.
	5Analyze axially loaded and eccentrically loaded columns.
	Determine the slopes and deflection of determinate beams and trusses.

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201003	**Fluid Mechanics**
	Understand the use of Fluid Properties, concept of Fluid statics, basic equation of Hydrostatics, measurement of fluid pressure, buoyancy & floatation and its application for solving practical problems.
	Understand the concept of fluid kinematics with reference to Continuity equation and fluid dynamics with reference to Modified Bernoulli's equation and its application to practical problems of fluid flow
	Understand the concept of laminar and turbulent flow and flow through pipes and its application to determine major and minor losses and analyze pipe network using Hardy Cross method.
	Understand the concept of open channel flow, uniform flow and depth-Energy relationships in open channel flow and make the use of Chezy's and Manning's formulae for uniform flow computation and design of most economical channel section.
	Understand the concept of gradually varied flow in open channel and fluid flow around submerged objects, compute GVF profile and calculate drag and lift force on fully submerged body.
207009	**Engineering Geology**
	Explain about the basic concepts of engineering geology, various rocks, and minerals both in lab and on the fields and their inherent characteristics and their uses in civil engineering constructions.
	Exploring the importance of mass wasting processes and various tectonic processes that hampers the design of civil engineering projects and its implications on environment and sustainability.
	Recognize effect of plate tectonics, structural geology and their significance and utility in civil engineering activities.
	Incorporate the various methods of survey, to evaluate and interpret geological nature of the rocks present at the foundations of the dams, percolation tanks, tunnels and to infer site / alignment/ level free from geological defects.
	Assess the Importance of geological nature of the site, precautions and treatments to improve the site conditions for dams, reservoirs, and tunnels.
	Explain geological hazards and importance of ground water and uses of

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	common building stones.
201008	**Geotechnical Engineering**
	1. Identify and classify the soil based on the index properties and its formation process
	2. Explain permeability and seepage analysis of soil by construction of flow net.
	3. Illustrate the effect of compaction on soil and understand the basics of stress distribution.
	4. Express shear strength of soil and its measurement under various drainage conditions.
	5. Evaluate the earth pressure due to backfill on retaining structures by using different theories.
	6. Analysis of stability of slopes for different types of soils.
201009	**Surveying**
	Define and Explain basics of plane surveying and differentiate the instruments used for it.
	Express proficiency in handling surveying equipment and analyse the surveying data from these equipment.
	Describe different methods of surveying and find relative positions of points on the surface of earth.
	Execute curve setting for civil engineering projects such as roads, railways etc.
	Articulate advancements in surveying such as space based positioning systems
	Differentiate map and aerial photographs, also interpret aerial photographs.
201010	**Concrete Technology**
	Able to select the various ingredients of concrete and its suitable proportion to achieved desired strength.
	Able to check the properties of concrete in fresh and hardened state.
	Get acquainted to concreting equipments, techniques and different types of special concrete.
	Able to predict deteriorations in concrete and get acquainted to various repairing methods and techniques.

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201011	**Structural Analysis**
	Understand the basic concept of static and kinematic indeterminacy and analysis of indeterminate beams.
	Analyze redundant trusses and able to perform approximate analysis of multi-story multi-bay frames.
	Implement application of the slope deflection method to beams and portal frames.
	Analyze beams and portal frames using moment distribution method.
	Determine response of beams and portal frames using structure approach of stiffness matrix method.
	Apply the concepts of plastic analysis in the analysis of steel structures.
201012	**Project Management**
	Describe project life cycle and the domains of Project Management.
	Explain networking methods and their applications in planning and management
	Categorize the materials as per their annual usage and also Calculate production rate of construction equipment
	Demonstrates resource allocation techniques and apply it for manpower planning.
	Understand economical terms and different laws associated with project management
	Apply the methods of project selection and recommend the best economical project.

TE

Course Code	Subject
301001	**Hydrology and Water Resource Engineering**
	Define and explain different components of Hydrological cycle and methods of its measurements
	Design irrigation scheme for dam and considering crop water requirements in nearby area
	Study of Aquifers and its types
	Study of the runoff from given rainfall, hydrograph and its types

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	Understanding various aspects for planning of reservoir
	Students are able to design water management schemes and lift irrigation system
301002	**Water Supply Engineering**
	Define identify, describe reliability of water sources, estimate water requirement for various sectors
	Ascertain and interpret water treatment method required to be adopted with respect to source and raw water characteristics
	Design various components of the water treatment plant and distribution system.
	Understand and compare contemporary issues and advanced treatment operations and process available in the market, including packaged water treatment plants
	Design elevated service reservoir capacity and understand the rainwater harvesting
	Understand the requirement of a water treatment plant for infrastructure and Government schemes.
301003	**Design of Steel Structures**
	Ability to learn different method of design of steel structures and design of tension member
	Ability to design compression member and built up section used as column
	Ability to design eccentrically loaded column and its base.
	Ability to design laterally supported and laterally unsupported beam.
	Ability to study beam to beam connection, beam to column connection and design of welded plate girder.
	Ability to design roof truss and gantry girder.
301004	**Engineering Economics and Financial Management**
	Understand basics of construction economics
	Develop an understanding of financial management in civil engineering projects
	Prepare and analyze the contract account
	Decide on right source of fund for construction projects
	Understand working capital and its estimation for civil engineering projects
	06 Illustrate the importance of tax planning & understand role of financial regulatory bodies
301005 c	**Elective I Construction Management**

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	Understand the overview of construction sector.

	Illustrate construction scheduling, work study and work measurement.
	Acquaint various labor laws and financial aspects of construction
	Explain elements of risk management and value engineering.
	State material and human resource management techniques in construction.
	Understand basics of artificial intelligence techniques in civil engineering.
301006	**Seminar**
	Identify technical / practical problems in the field of civil engineering.
	Inculcate the ability to describe, interpret and analyze technical content.
	Develop competence in preparing report which will enhance critical thinking and develop the skill of technical writing along with presentation.
301011	**Audit Course - Sustainable Energy Systems**
	To understand the impact of engineering solutions on a global, economic, environmental and societal context.
	To design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability
301012	**Waste Water Engineering**
	Recall sanitation infrastructure, quantification and characterization of wastewater, natural purification of streams
	Design preliminary and primary unit operations in waste water treatment plant

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	Understand theory and mechanism of aerobic biological treatment system and to design activated sludge process
	Understand and design suspended and attached growth wastewater treatment systems
	Explain and apply concept of contaminant removal by anaerobic, tertiary and emerging wastewater treatment systems
	Compare various sludge management systems and explain the potential of recycle and reuse of wastewater treatment
301013	**Design of RC Structures**
	Apply relevant IS provisions to ensure safety and serviceability of structures, understand the design philosophies and behavior of materials: steel & concrete
	Recognize mode of failure as per LSM and evaluate moment of resistance for singly, doubly rectangular, and flanged sections.
	Design & detailing of rectangular one way and two-way slab with different boundary conditions
	Design & detailing of dog legged and open well staircase
	Design & detailing of singly/doubly rectangular/flanged beams for flexure, shear, bond and torsion.
	Design & detailing of short columns subjected to axial load, uni-axial/bi-axial bending and their footings.
301014	**Remote Sensing and GIS**
	To comprehend fundamentals and principles of RS and GIS techniques.
	To enhance students' capacity to interpret images and extract information of earth surface from multi-resolution imagery at multi-scale level.
	To develop skills of Image processing and GIS
	To utilize RS and GIS techniques in Engineering Geology and civil engineering.
	To study satellite image processing, satellite image interpretation, digitization and generation of thematic maps in a GIS.
	To learn buffering and layer analysis for civil engineering applications

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301015 e	**Elective II Architecture and Town Planning**
	To use principles of architectural planning and understand the futuristic needs of users.
	To discuss and demonstrate the concepts of landscaping, urban renewal and sustainable architecture
	To distinguish and relate planning levels and understand use of act and to develop neighborhood plan
	To interpret need of civic surveys for DP proposal and value planning agencies and ITS
	To understand and demonstrate planning strategy with reference to different acts, guidelines, norms.
	To appraise multifaceted zones like SEZ, CRZ and Special township, understand applications of modern Tools like GIS / GPS / RS in town planning and need of Rural Planning
301015f	**Elective II Solid Waste Management**
	To understand problems of solid waste, estimate and characterize the solid waste and apply the knowledge of laws for municipal solid waste management for handling of MSW.
	To understand government initiatives for management of solid waste, to apply the knowledge of mathematics, science, and engineering for effective solid waste collection systems, for waste collection route optimization and its economics.
	To understand processing of solid waste, material recovery facility and to design composting systems, maintain and operate composting process for effective organic waste recycling.
	To understand working of waste to energy system and to design of bio-methnation and incineration system.
	To design & manage construction and operations of landfill facilities and management of legacy solid waste.
	To understand management and legal requirements of special waste and reuse, recycle and material recovery from solid waste.

BE

Course Code	Subject
401 002	**Transportation Engineering**
	Describe the basic components of transport system and infrastructure, their role, importance and characteristics and conduct traffic surveys to collect traffic data and apply engineering principles

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	to identify and investigate traffic problems and to devise and evaluate sustainable solutions.
	Prepare a horizontal and vertical highway alignment, including super elevation and design transport system components in particular geometric design of roads and intersections which complies with IRC standards.
	Measure and calculate different traffic parameters like speed, flow, travel time and delay
	Explains the properties, role and tests on of highway materials and
	Understand pavement design and its construction process as per IRC-37 and IRC-58
	Understand the advanced pavement construction process and materials
401 003	**Structural Design and Drawing III**
	Student need to understand the different types of materials used in the prestress structures and how it difference from materials used in the R.C.C. structures?
	An ability to calculate losses in prestress member and enlist the different types of losses occurs in the prestress. Explain all types of stress calculation method in the prestress. Student able to design prestress girder/ P.S.C slab.
	Students understand how to calculate earthquake forces in the structures and design of earthquake resisting frame. Explains ductile detailing.
	An ability to design retaining wall with different type of embankments.
	An understanding to design of water tank rest on ground with flexible/ rigid base either with IS code method or with approximate method.
	Student need to understand where combine footing is provided and combine footing designs (slab beam type, trapezoidal type, strap beam combine footing)
401 005	**TQM and MIS in Civil Engineering**

	Be able to understand basic concepts and factors affecting the quality
	Be able to gain basic knowledge about MIS.
	Be able to apply tools and techniques of quality management like six sigma and its impacts
	Be able to understand the various terms of quality and importance of ISO standards and developing quality manual.
	Students should be able to understand overall cost of quality including MIS and Benchmarking.
	Students should be capable to implement modern technology and software in TQM.
401007	**Dams and Hydraulic Structures**
	Understanding of dam its safety and behavioral aspects with instruments
	Analysis and design of Gravity Dam with different stability conditions.
	Undertake design and detailing of Ogee Spillway.
	Students are gained the knowledge of failure aspects of earthen dam and study of diversion headwork
	Design Canal structures for satisfying irrigation in nearby area.
	Suggest types of cross drainage work for available site conditions.
401 008	**Quantity Surveying, Contracts & Tenders**
	Understand Estimates and its types.
	Able to take Out Quantities of different Tasks for Load Bearing Structure
	Able to take Out Quantities of different Tasks for RCC frame Structure and valuation
	Able to do Rate Analysis for tasks by studying specifications
	Able to understand tending and work execution method
	Able to understand contracting and arbitration
401004	**Advanced Concrete Technology**
	Students will know recent aggregates and their compatibility in concrete making
	Understand different types of concrete

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	Students will be able to design modern concrete
	Students will know basic of fiber reinforced concrete
	Able to Understand different properties of fresh and hardend fiber reinforced concrete
	Able to Understand precast elements and concept of ferrocement
401010	**Construction Management**
	To enrich the students with the concepts and applications of Management
	To make learners to understand planning, scheduling and controlling the different activities of construction projects
	To understand the importance of laws related to construction activity and financial aspects of construction projects
	To apply knowledge of advancement in risk management and value engineering of construction projects
	To identify and manage different sources in resource management
	To understand basic terminologies and applications of artificial intelligence in civil engineering

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Department of Computer Engineering

PROGRAM OUTCOME

Programme Outcomes describe what students are expected to know or be able to do by the time of graduation from the programme. The POs for Under Graduate Course in Electronics and Telecommunication Engineering are able to

1. Apply the knowledge of mathematics, science, Engineering fundamentals, and an
2. Identify, formulate, review research literature and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and Engineering sciences.
3. Design solutions for complex Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and Environmental considerations.
4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modeling to complex Engineering activities with an understanding of the limitations.
6. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of Engineering practice.
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. 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

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receive clear instructions.

11. Demonstrate knowledge and understanding of Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.
12. 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'S)

PSO1 – Professional Skills-The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexities.

PSO2 – Problem-Solving Skills- The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

PSO3 –Successful Career and Entrepreneurship- The ability to employ modern computer languages, environments and platforms in creating innovative career paths to be an entrepreneur and to have a zest for higher studies.

Course Outcomes

SE(2019)

Course Code	Subject:
210241	**Discrete Mathematics**
	Formulate problems precisely, solve the problems, apply formal proof techniques, and explain the reasoning clearly.
	Apply appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts.
	Design and analyze real world engineering problems by applying set theory, propositional logic and to construct proofs using mathematical induction.
	Specify, manipulate and apply equivalence relations; construct and use functions and apply these concepts to solve new problems. and analyze computational processes using combinatorics.
	Calculate numbers of possible outcomes using permutations and combinations; to model and analyze computational processes using combinatorics.
	Model and solve computing problem using tree and graph and solve problems using appropriate algorithms.
	Analyze the properties of binary operations, apply abstract algebra in coding theory and evaluate the algebraic structures.
210242	**Fundamentals of Data Structures**
	Design the algorithms to solve the programming problems, identify appropriate algorithmic strategy for specific application, and analyze the time and space complexity.
	Discriminate the usage of various structures, Design/Program/Implement the appropriate data structures; use them in implementations of abstract data types and Identity the appropriate data structure in approaching the problem solution.

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	Demonstrate use of sequential data structures- Array and Linked lists to store and process data.
	Understand the computational efficiency of the principal algorithms for searching and sorting and choose the most efficient one for the application.
	Compare and contrast different implementations of data structures (dynamic and static).
	Understand, Implement and apply principles of data structures-stack and queue to solve computational problems.
210243	**Object Oriented Programming(OOP)**
	Apply constructs- sequence, selection and iteration; classes and objects, inheritance, use of predefined classes from libraries while developing software.
	Design object-oriented solutions for small systems involving multiple objects.
	Use virtual and pure virtual function and complex programming situations.
	Apply object-oriented software principles in problem solving.
	Analyze the strengths of object-oriented programming.
	Develop the application using object oriented programming language(C++)
210244	**Computer Graphics**
	Identify the basic terminologies of Computer Graphics and interpret the mathematical foundation of the concepts of computer graphics.
	Apply mathematics to develop Computer programs for elementary graphic operations.
	Illustrate the concepts of windowing and clipping and apply various algorithms to fill and clip polygons.
	Understand and apply the core concepts of computer graphics, including transformation in two and three dimensions, viewing and projection.
	Understand the concepts of color models, lighting, shading models and hidden surface elimination.
	Create effective programs using concepts of curves, fractals, animation and gaming.

210245	**Digital Electronics and Logic Design**
	Simplify Boolean Expressions using K Map.
	Design and implement combinational circuits.
	Design and implement sequential circuits.
	Develop simple real-world application using ASM and PLD.

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	Differentiate and Choose appropriate logic families IC packages as per the given design specifications.
	Explain organization and architecture of computer system
207003	**Engineering Mathematics III**
	Solve Linear differential equations, essential in modelling and design of computer-based systems.
	Apply concept of Fourier transform and Z-transform and its applications to continuous and discrete systems and image processing.
	Apply Statistical methods like correlation and regression analysis and probability theory for data analysis and predictions in machine learning.
	Solve Algebraic and Transcendental equations and System of linear equations using numerical techniques.
	Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing.
210252	**Data Structures and Algorithms**
	Identify and articulate the complexity goals and benefits of a good hashing scheme for real-world applications.
	Apply non-linear data structures for solving problems of various domain.
	Design and specify the operations of a nonlinear-based abstract data type and implement them in a high-level programming language.
	Analyze the algorithmic solutions for resource requirements and optimization
	Use efficient indexing methods and multiway search techniques to store and maintain data.
	Use appropriate modern tools to understand and analyze the functionalities confined to the secondary storage
210253	**Software Engineering**
	Analyze software requirements and formulate design solution for a software.
	Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
	Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.
	Model and design User interface and component-level.
	Identify and handle risk management and software configuration management.
	Utilize knowledge of software testing approaches, approaches to verification and validation.
	Construct software of high quality – software that is reliable, and that is reasonably easy to understand, modify and maintain efficient, reliable, robust and cost-effective software solutions.

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210254	**Microprocessor**
	Exhibit skill of assembly language programming for the application.
	Classify Processor architectures.
	Illustrate advanced features of 80386 Microprocessor.
	Compare and contrast different processor modes.
	Use interrupts mechanism in applications
	Differentiate between Microprocessors and Microcontrollers.
	Identify and analyze the tools and techniques used to design, implement, and debug microprocessor-based systems.
210255	**Principles of Programming Languages**
	Make use of basic principles of programming languages
	Develop a program with Data representation and Computations
	Develop programs using Object Oriented Programming language : Java
	Develop application using inheritance, encapsulation, and polymorphism
	Demonstrate Multithreading for robust application development
	Develop a simple program using basic concepts of Functional and Logical programming paradigm.

TE(2015)

Course Code	Subject
310241	**Theory of Computation**
	Able to design deterministic Turing machine for all inputs and all outputs
	Able to subdivide problem space based on input subdivision using constraints
	Able to apply linguistic theory

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310242	**Database Management Systems (DBMS)**
	Develop the ability to handle databases of varying complexities
	Use advanced database Programming concepts
310243	**Software Engineering and Project Management**
	Decide on a process model for a developing a software project
	Classify software applications and Identify unique features of various domains
	Design test cases of a software system.
	Understand basics of IT Project management.
	Plan, schedule and execute a project considering the risk management.
	Apply quality attributes in software development life cycle.
310244	**Information Systems & Engineering Economics**
	Understand the activities that are undertaken while managing, designing, planning, implementation, and deployment of computerized information systems in an organization.
	Further the student would be aware of various Information System solutions like ERP, CRM, Data warehouses and the issues in successful implementation of these technology solutions in any organizations
	Outline the past history, present position and expected performance of a company engaged in engineering practice or in the computer industry. Perform and evaluate present worth, future worth and annual worth analysis on one of more economic alternatives.
	Be able to carry out and evaluate benefit/cost, life cycle and breakeven analysis on one or more economic alternatives.
310245	**Computer Networks**
	Analyze the requirements for a given organizational structure to select the most appropriate networking architecture, topologies, transmission mediums, and technologies
	Demonstrate design issues, flow control and error control
	Analyze data flow between TCP/IP models using Application, Transport and Network Layer Protocols.
	Illustrate applications of Computer Network capabilities, selection and usage for various sectors of the user community.
	Illustrate Client-Server architectures and prototypes by the means of correct standards and technology. Demonstrate different routing and switching algorithms.

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310250	**Design & Analysis of Algorithms**
	Formulate the problem
	Analyze the asymptotic performance of algorithms
	Decide and apply algorithmic strategies to solve given problem
	Find optimal solution by applying various methods
310251	**Systems Programming & Operating System**
	Analyze and synthesize system software
	Use tools like LEX & YACC.
	Implement operating system functions
310252	**Embedded Systems & Internet of Things**
	Implement an architectural design for IoT for specified requirement
	Solve the given societal challenge using IoT
	Choose between available technologies and devices for the stated IoT challenge.

310253	**Software Modeling and Design**
	Analyze the problem statement (SRS) and choose proper design technique for designing web-based/ desktop application
	Design and analyze an application using UML modeling as fundamental tool
	Apply design patterns to understand reusability in OO design Decide and apply appropriate modern tool for designing and modeling
	Decide and apply appropriate modern testing tool for testing web-based/desktop application
310254	**Web Technology**
	Analyze given assignments to select sustainable web development and design methodology.
	Develop web based applications using suitable client side and server side web technologies.
	Develop solutions to complex problems using appropriate methods, technologies, frameworks, web services and content management Course Contents.

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BE(2015)

Course Code	Subject
410241	**High Performance Computing**
	Describe different parallel architectures, interconnect networks, programming models
	Develop an efficient parallel algorithm to solve given problem
	Analyze and measure performance of modern parallel computing systems Build the logic to parallelize the programming task
410242	**Artificial Intelligence and Robotics**
	Identify and apply suitable Intelligent agents for various AI applications Design smart systems using different informed search / uninformed search or heuristic approaches.
	Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve a given problem.
	Apply the suitable algorithms to solve AI problems
410243	**Data Analytics**
	To write case studies in Business Analytic and Intelligence using mathematical models.
	To present a survey on applications for Business Analytic and Intelligence.
	To write problem solutions for multi-core or distributed, concurrent/Parallel environments
410244(A)	**Ele-I-Pervasive and Ubiquitous Computing**
	To understand the characteristics and principles of Pervasive computing
	To understand the characteristics and principles of Pervasive computing
	To understand the characteristics and principles of Pervasive computing
	To learn the trends of pervasive computing
410245(B)	**Ele-II-Software Testing and Quality Assurance**
	Describe fundamental concepts in software testing such as manual testing, automation testing and software quality assurance.
	Design and develop project test plan, design test cases, test data, and conduct test operations
	Apply recent automation tool for various software testing for testing software
	Apply different approaches of quality management, assurance, and quality standard to software system
	Apply and analyze effectiveness Software Quality Tools
410250	**Machine Learning**
	Distinguish different learning based applications
	Apply different preprocessing methods to prepare training data

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	sets for machine learning.
	Design and implement supervised and unsupervised machine learning algorithms.
	Implement different learning models
	Learn Meta classifiers and deep learning concepts
410251	**Information and Cyber Security**
	Gauge the security protections and limitations provided by today's technology.
	Identify information security and cyber security threats.
	Analyze threats in order to protect or defend it in cyberspace from cyber-attacks.
	Build appropriate security solutions against cyber-attacks.
410252(C)	**Ele-III- Embedded and RTOS**
	Recognize and classify embedded and real-time systems
	Explain communication bus protocols used for embedded and real-time systems
	Classify and exemplify scheduling algorithms
	Apply software development process to a given RTOS application
	Design a given RTOS based application
410253(C)	**Ele-IV-Cloud Computing**
	To install cloud computing environments.
	To develop any one type of cloud
	To explore future trends of cloud computing

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Website: www.gsmozecoe.co.in Email: gsmoze@yahoo.co.in

Department of ENTC

PROGRAM EDUCATION OUTCOME

1. **Core Competency**: To prepare the students with strong base of science and mathematics, subject domain knowledge that will enable them successful career in core electronics and allied industries

2. **Technical Proficiency**: To prepare the students to improve analytical, creative, innovative skills for higher education, research and industrial development.

3. **ManagerialSkills**: To prepare the students to work in group using moral, ethical practice, managerial, entrepreneurial skills for the welfare of the society.

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PROGRAM SPECIFIC OUTCOME

1) Students will be able to apply subject knowledge to design and develop electronics circuits for the industrial need.

2) Students will be able to design and analyse various types of communication systems.

3) Students will be able to apply concepts of signal processing and various algorithms for development of diversified application for industrial needs

PROGRAM OUTCOME

Programme Outcomes describe what students are expected to know or be able to do by the time of graduation from the programme. The POs for Under Graduate Course in Electronics and Telecommunication Engineering are able to

1. Apply the knowledge of technical fundamentals, mathematics and applied science for solving the domain problems.
2. Identify Analyse complex engineering problems and review the literature for the same.
3. Design the processes; implement the system for the welfare, safety, and environmental need of the society.
4. Perform experiment, and interpret results
5. Use technical skills and tools for electronic system development.
6. Understand the importance of electronics and telecommunication in modern era.
7. Identify the needs of society for development, growth and human values
8. Understand the legal, professional, ethical responsibilities
9. Work effectively in diversified, multidisciplinary environment to achieve common goal
10. Ability to communicate effectively and possess soft skills
11. Engage themselves in continuous educational, professional and entrepreneurship development
12. Apply effectively electronics and telecommunication engineering and management skills and act as a team leader to solve industrial and social problem.

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Department of ENTC

Course Outcomes

SE

Course Code	Subject:
207005	Engineering Mathematics III
204181	Electronic Circuits
204182	Digital Circuits
204183	Electrical Circuits
204184	Data Structures
204189	Electronics Skill Development
204191	Signals and systems
204192	Control Systems
204193	Principles of Communication Systems
204194	Object Oriented Programming
204199	EMPLOYABILITY SKILL DEVELOPMENT
204200	Project Based Learning

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Engineering Mathematics -III (207005)

Credits: Th – 04, Tu -1

Course Code: 207005 **Teaching Scheme:** Theory: 04 hrs/week Tutorial: 01 hrs/week		Examination Scheme: **In-Sem: 30 Marks** **End-Sem (Theory):70 Marks** **TW : 25 Marks**

Objectives:

- To make the students familiarize with concepts and techniques in Ordinary differential equations, Fourier Transform, Z-Transform, Numerical methods, Vector calculus and functions of a Complex variable.
- The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power, useful in their disciplines.

Outcomes: On completion of the course, learner will be able to –

CO1: Solve higher order linear differential equation using appropriate techniques for modelling, analyzing of electrical circuits and control systems.
CO2: Apply concept of Fourier transform & Z-transform and its applications to continuous & discrete systems, signal & image processing and communication systems.
CO3: Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing.
CO4: Perform vector differentiation & integration, analyze the vector fields and apply to electromagnetic fields & wave theory.
CO5: Analyze Complex functions, Conformal mappings, Contour integration applicable to electrostatics, digital filters, signal and image processing.

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Electronic Circuits (204181)

Credits: Th – 03, Pr -02

Course Code: 204181 **Teaching Scheme:** Lectures: 3Hrs/ Week Practical :2Hr/Week Total Teaching Hours :36		**Examination Scheme:** In-Sem : 30 Marks End-Sem(Theory): 70Marks Practical : 50 Marks

Objectives: To make the students understand

- Semiconductor device MOSFET, its characteristics, parameters & applications.
- Concepts of feedbacks in amplifiers & oscillators.
- Operational amplifier, concept, parameters & applications.
- ADC, DAC as an interface between analog & digital domains.
- Voltage to current and current to voltage converters.
- Concepts, characteristics & applications of PLL.

Outcomes: On completion of the course, learner will be able to -

CO1: Assimilate the physics, characteristics and parameters of MOSFET towards its application as amplifier.

CO2: Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators, for given specifications.

CO3: Analyze and assess the performance of linear and switching regulators, with their variants, towards applications in regulated power supplies.

CO4: Explain internal schematic of Op-Amp and define its performance parameters.

CO5: Design, Build and test Op-amp based analog signal processing and conditioning circuits towards various real time applications.

CO6: Understand and compare the principles of various data conversion techniques and PLL with their applications.

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Digital Circuits (204182)		
Credits: Th – 03, Pr -02		
Course Code: 204182 **Teaching Scheme:** Lectures: 3Hrs/ Week Practical :2Hr/Week Total Teaching Hours :36		**Examination Scheme:** In-Sem: 30 Marks End-Sem(Theory): 70Marks Practical : 50 Marks

Objectives: To make the students understand

- The fundamental principles of two-valued logic and various devices used to implement logical operations on variables.
- Boolean algebra, Karnaugh maps and its application to the design and characterization of digital circuits.
- To analyze logic processes and implement logical operations using combinational logic circuits.
- The principles of logic design and use of simple memory devices, flip-flops, and sequential circuits.
- Concepts of sequential circuits and to analyze sequential systems in terms of state machines.
- □ System design approach using programmable logic devices.

Outcomes: On completion of the course, learner will be able to -

CO1: Identify and prevent various hazards and timing problems in a digital design.
CO2: Use the basic logic gates and various reduction techniques of digital logic circuit.
CO3: Analyze, design and implement combinational logic circuits.
CO4: Analyze, design and implement sequential circuits.
CO5: Differentiate between Mealy and Moore machines.
CO6: Analyze digital system design using PLD.

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Electrical Circuits (204183)

Credits: Th – 03, Pr -02

Course Code: 204183 **Teaching Scheme:** Lectures: 3Hrs/ Week Practical :2Hr/Week Total Teaching Hours :36		**Examination Scheme:** In-Sem : 30 Marks End-Sem(Theory): 70Marks TW : 25 Marks

Objectives:

- To analyze simple DC and AC circuits with circuit simplification techniques.
- To formulate and analyze driven and source free RL and RC circuits.
- To formulate & determine network parameters for given network.
- To understand the constructional details, characteristics, features and application areas of various types of electric motors.

Outcomes: On completion of the course, learner will be able to -

CO1: Analyze the simple DC and AC circuit with circuit simplification techniques.
CO2: Formulate and analyze driven and source free RL and RC circuits.
CO3: Formulate & determine network parameters for given network and analyze the given network using Laplace Transform to find the network transfer function.
CO4: Explain construction, working and applications of DC Machines / Single Phase & Three Phase AC Motors.
CO5: Explain construction, working and applications of special purpose motors & understand motors used in electrical vehicles.
CO6: Analyze and select a suitable motor for different applications.

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Data Structures (204184)

Course Code: 204184 **Teaching Scheme:** Theory: 03 hrs/week Practical: 02 hrs/week		Examination Scheme: **In-Sem: 30 Marks** **End-Sem (Theory):70 Marks** **Oral : 25 Marks**

Objectives: To learn basic concepts of C Programming language.

- To learn different sorting and searching algorithms and their analysis.
- To learn linear data structures: Stack and Queue, Linked List and their applications.
- To learn nonlinear data structures: Tree, Graph and their applications.
- To study the systematic ways of solving problem, various methods of organizing large amount of data.
- To solve problems using data structures such as binary tree, binary search tree, and graph and writing programs.

Outcomes: On completion of the course, learner will be able to -

CO1: Solve mathematical problems using C programming language.
CO2: Implement sorting and searching algorithms and calculate their complexity.
CO3: Develop applications of stack and queue using array.
CO4: Demonstrate applicability of Linked List.
CO5: Demonstrate applicability of nonlinear data structures - Binary Tree with respect to its time complexity.
CO6: Apply the knowledge of graph for solving the problems of spanning tree and shortest path algorithm.

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Electronic Skill Development (204189)

Course Code: 204189 **Teaching Scheme:** Practical: 02 hrs/week		Examination Scheme: **TW: 25 Marks**

Objectives:

Basic Electronics Engineering, Fundamentals of Programming, Open source electronics platform based on easy-to-use hardware and software (preferably Arduino)

Outcomes: At the end of the course, the students should be able to

1. Understand fundamental of various Electronic Components and Connections.
2. Understand and describe specifications, features and applications using Arduino and micro python
3. Understand and designing layout of PCB using PCB design software
4. Carry out required measurement using various instruments under different setups.
5. Able to Calculate Power budget for an electronic circuit
6. Understand the use of Various types of Batteries and solar power generation system

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Signal and Systems (204191)

Course code:204191 **Teaching Scheme:** Lecture : 03 hr/week Tutorial : 01 Hr /Week		**Examination Scheme:** **In-Sem: 30 Marks** **End-Sem (Theory):70 Marks** **TW : 25 Marks**

Course Objectives:

- To understand the mathematical representation of continuous and discrete time signals and systems.
- To classify signals and systems into different categories.
- To analyze Linear Time Invariant (LTI) systems in time and transform domains.
- To build basics for understanding of courses such as signal processing, control system and communication.
- To develop basis of probability and random variables.

Course Outcomes: On completion of the course, learner will be able to -

CO1: Identify, classify basic signals and perform operations on signals.
CO2: Identify, Classify the systems based on their properties in terms of input output relation and in terms of impulse response and will be able to determine the convolution between to signals.
CO3: Analyze and resolve the signals in frequency domain using Fourier series and Fourier Transform.
CO4: Resolve the signals in complex frequency domain using Laplace Transform, and will be able to apply and analyze the LTI systems using Laplace Transforms.
CO5: Define and Describe the probability, random variables and random signals. Compute the probability of a given event, model, compute the CDF and PDF.
CO6: Compute the mean, mean square, variance and standard deviation for given random variables using PDF.

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Control Systems (204192)

Course Code: 204192 **Teaching Scheme:** Theory: 03 hrs/week Practical: 02 hrs/week		Examination Scheme: **In-Sem: 30 Marks** **End-Sem (Theory):70 Marks** **TW : 25 Marks**

Objectives:

- To Introduce elements of control system and their modeling using various Techniques.
- To get acquainted with the methods for analyzing the time response and Stability of System
- To Introduce and analyze the frequency response and Stability of System
- To Introduce concept of root locus, Bode plots, Nyquist plots.
- To Introduce State Variable Analysis method.
- To get acquainted with Concepts of PID controllers and IoT based Industrial Automation.

Outcomes: On completion of the course, learner will be able to –

CO1: Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.

CO2: Determine the (absolute) stability of a closed-loop control system.

CO3: Perform time domain analysis of control systems required for stability analysis.

CO4: Perform frequency domain analysis of control systems required for stability analysis.

CO5: Apply root-locus, Frequency Plots technique to analyze control systems.
CO6: Express and solve system equations in state variable form.

CO7: Differentiate between various digital controllers and understand the role of the controllers in Industrial automation.

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Principles of Communication Systems (204193)

Course Code: 204193 **Teaching Scheme:** Lectures: 3 Hrs/ Week Practical: 02 hrs/week		Examination Scheme: **In-Sem: 30 Marks** **End-Sem (Theory):70 Marks** Practical **: 50 Marks**

Objectives:

- To equip/ familiarize students with basic mathematical tools for time and frequency domain analysis of communication signal and systems.
- To acquaint the students with the fundamental principles of modulation process and different amplitude and angle modulation systems.
- To introduce the students with the concept of Sampling theorem and pulse modulation techniques PAM, PWM, PPM.
- To impart pre-requisites of digital communication systems and explore digital representation techniques like PCM, DPCM, DM and ADM.
- To highlight the issues in baseband digital transmission such as data representation, synchronization, multiplexing and ISI.

Outcomes: On completion of the course, learner will be able to -

CO1: To compute & compare the bandwidth and transmission power requirements by analyzing time and frequency domain spectra of signal required for modulation schemes under study.

CO2: Describe and analyze the techniques of generation, transmission and reception of Amplitude Modulation Systems.

CO3: Explain generation and detection of FM systems and compare with AM systems.

CO4: Exhibit the importance of Sampling Theorem and correlate with Pulse Modulation technique (PAM, PWM, and PPM).

CO5: Characterize the quantization process and elaborate digital representation techniques (PCM, DPCM, DM and ADM).

CO6: Illustrate waveform coding, multiplexing and synchronization techniques and articulate their importance in baseband digital transmission.

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Object Oriented Programming (204194)		
Credits: Th – 03, Pr -02		
Course Code:204194 **Teaching Scheme:** Lectures: 3Hrs/ Week Practical :2Hr/Week Total Teaching Hours :36		**Examination Scheme:** In-Sem: 30 Marks End-Sem(Theory): 70Marks Oral : 50 Marks

Objectives:

Make the students familiar with basic concepts and techniques of object oriented programming in C++

To acquaint the students with the fundamental principles of modulation process and different amplitude and angle modulation systems.

Develop an ability to write programs in C++ for problem solving.

Outcomes: On completion of the course, learner will be able to -

CO1: Describe the principles of object oriented programming.

CO2: Apply the concepts of data encapsulation, inheritance in C++.

CO3: Understand Operator overloading and friend functions in C++.

CO4: Apply the concepts of classes, methods inheritance and polymorphism to write programs C++.

CO5: Apply Templates, Namespaces and Exception Handling concepts to write programs in C++.

CO6: Describe and use of File handling in C++.

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EMPLOYABILITY SKILL DEVELOPMENT (204199)

Course code: 204199 **Teaching Scheme:** Lecture : 02 hr/week Practical : 02 hr/week		**Examination Scheme:** TW: 50 Marks

Course Objectives:

- Develop good communication skills – both oral as well as written.
- Encourage creative and critical thinking among students.
- Nurture collaborative behavior to work efficiently in groups

Course Outcomes: On completion of the course, learner will be able to -

CO1: Define personal and career goals using introspective skills and SWOC assessment. Outline and evaluate short-term and long-term goals.

CO2: Develop effective communication skills (listening, reading, writing, and speaking), self- management attributes, problem solving abilities and team working & building capabilities in order to fetch employment opportunities and further succeed in the workplace.

CO3: Be a part of a multi-cultural professional environment and work effectively by enhancing inter-personal relationships, conflict management and leadership skills.

CO4: Comprehend the importance of professional ethics, etiquettes & morals and demonstrate sensitivity towards it throughout certified career.

CO5: Develop practically deployable skill set involving critical thinking, effective presentations and leadership qualities to hone the opportunities of employability and excel in the professional environment.

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Project Based Learning (204200)

Course code: 204200 **Teaching Scheme:** Practical : 04hr/week		**Examination Scheme:** TW: 50 Marks

Course Objectives:

On completion of the course, learner will be able to -

- To emphasize projectbased learning activities that are long-term, interdisciplinary and student-centric.
- To inculcate independent and group learning by solving real world problem with the help of available resources.
- To be able to develop application based on the fundamentals of electronics and communication engineering by possibly the integration of previously acquired knowledge.
- To get practical experience in all steps in the life cycle of the development of electronic systems: specification, design, implementation, and testing.
- To be able to select and utilize appropriate hardware and software tools to design and analyze the proposed system.
- To provide every student the opportunity to get involved either individually or as a group so as to
  - develop team skills and learn professionalism.

Course Outcomes: On completion of the course, learner will be able to -

CO1: Identify the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aim and objectives.

CO2: Contribute to society through proposed solution by strictly following professional ethics and safety measures.

CO3: Propose a suitable solution based on the fundamentals of electronics and communication engineering by possibly the integration of previously acquired knowledge.

CO4: Analyze the results and arrive at valid conclusion.

CO5: Use of technology in proposed work and demonstrate learning in oral and written form.

CO6: Develop ability to work as an individual and as a team member.

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Department of ENTC

Course Outcomes

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Course Code	Subject:
304181	Digital Communication
304182	Digital Signal Processing
304183	Electromagnetics
304184	Microcontrollers
304185	Mechatronics
304193	Electronics System Design
304186	Power Electronics
304187	Information Theory, Coding and Communication Networks
304188	Business Management
304189	Advanced Processors
304190	System Programming and Operating Systems
304196	Employability Skills and Mini Project

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Digital Communication(304181)

Course Code:304181 **Teaching Scheme:** Lectures: 4 Hrs/ Week Total Teaching Hours :46		**Examination Scheme:** In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Objectives:

This course is at undergraduate level for 46 hours to make students to know basics of digital communication system with focus on following learning perspective.

- To understand the building blocks of digital communication system.
- To prepare mathematical background for communication signal analysis.
- To understand and analyze the signal flow in a digital communication system.
- To analyze error performance of a digital communication system in presence of noise and

other interferences.

- To understand concept of spread spectrum communication system.

Outcomes: After successfully completing the course student should be able to:

CO-1: Understand working of waveform coding techniques and analyse their performance.

CO-2: Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.

CO-3: Perform the time and frequency domain analysis of the signals in a digital communication system.

CO-4: Study of signal space representation.

CO-5: Design of digital communication system.

CO-6: Understand working of spread spectrum communication system and analyze its performance

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Digital Signal Processing(304182)

Course code: 304182 **Teaching Scheme:** Lecture : 04 hr/week Total Teaching Hours:40		Examination Scheme: In-Sem Assessment: Phase I:30 Marks End-Sem Assessment: Phase II:70 Marks

Course Objectives:

- To introduce students with transforms for analysis of discrete time signals and systems.
- To understand the digital signal processing, sampling and aliasing.
- To use and understand implementation of digital filters.

Course Outcomes:

On completion of the course, student will be able to:

CO-1: Analyze the discrete time signals and concept of sampling theorem in time domain.

CO-2: Analyze fourier transform in discrete domain and concepts of linear and circular convolution.

CO-3: Analyze the need of Z transform and relation between with different transforms.

CO-4: Design and implement the IIR filter for filtering different real world signals.

CO-5: Design and implement the FIR filter for filtering different real world signals.

CO-6: Develop different signal processing applications using DSP processor.

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Electromagnetics (304183)

Course Code:304183 **Teaching Scheme:** Lectures: 3Hrs/ Week Tutorial:1Hr/Week Total Teaching Hours :49		**Examination Scheme:** In Semester Assessment: 30 End Semester Examination: 70

Objectives:

1. To introduce the basic mathematical concepts related to electromagnetic vector fields.
2. To impart knowledge on the concepts of electrostatics, electric potential, energy density and their applications.
3. To impart knowledge on the concepts of magnetostatics, magnetic flux density,
4. To impart knowledge scalar and vector potential and its applications.
5. To impart knowledge on the concepts of Faraday's law, induced emf and Maxwell's equations
6. To impart knowledge on the concepts of Concepts of electromagnetic waves and Transmission lines.

Outcomes: After successfully completing the course student should be able to:

1. Understand the basic mathematical concepts related to electromagnetic vector fields.
2. Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.
3. Apply the principles of magnetostatics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density.
4. Understand the concepts related to Faraday's law, induced emf and Maxwell's equations.
5. Apply Maxwell's equations to solutions of problems relating to transmission lines
6. Apply Maxwell's equations to solutions of problems relating to uniform plane wave propagation.

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Microcontrollers (304184)

Course Code:304184 **Teaching Scheme:** Lectures: 3Hrs/ Week Total Teaching Hours :36		**Examination Scheme:** In Semester Assessment: 30 End Semester Examination: 70

Objectives:

1. To understand architecture and features of typical Microcontroller.
2. To understand need of microcontrollers in real life applications.
3. To learn interfacing of real world peripheral devices
4. To study various hardware and software tools for developing applications.

Outcomes: After successfully completing the course student should be able to:

CO-1: Learn importance of microcontroller in designing embedded application.

CO-2: Learn use of hardware and software tools.

CO-3: Develop interfacing to real world devices.

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Mechatronics (304185)

Course Code:304185 **Teaching Scheme:** Lectures: 3Hrs/ Week Total Teaching Hours :36		**Examination Scheme:** In Semester Assessment: 30 End Semester Examination: 70

Objectives:

1. To understand the concept and key elements of Mechatronics system, representation into block diagram
2. To understand principles of sensors their characteristics
3. To Understand of various data presentation and data logging systems
4. To Understand concept of actuator
5. To Understand various case studies of Mechatronics systems

Outcomes: After successfully completing the course student should be able to:

CO-1: Identification of key elements of mechatronics system and its representation in terms of block diagram

CO-2: Understanding basic principal of Sensors and Transducer.

CO-3: Able to prepare case study of the system given.

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Electronic System Design (304193)

Course code: 304193 **Teaching Scheme:** Lecture : 02 hr/week Practical : 02 hr/week		**Examination Scheme:** Oral : 50 marks

Course Objectives:

- Design working, reliable and electronic system to meet specifications.
- Inculcate circuit designing skills and ability and to use modern design tools.
- Enhance employability based on knowledge and understandings of electronic system design.
- To learn basics of database systems used in design / simulation software.
- To create an interest in the field of electronic design as a prospective career option.

Course Outcomes:

On completion of the course, student will be able to:

CO-1: Apply the fundamental concepts and working principles of electronics devices to design electronics systems

CO-2: Shall be able to interpret datasheets and thus select appropriate components and devices

CO-3: Select appropriate transducer and signal conditioning circuit to design prototype of Data Acquisition system.

CO-4: Design an electronic system/sub-system and validate its performance by simulating the same.

CO-5: Shall be able to use an EDA tool for circuit schematic and simulation.

CO-6: Create, manage the database and query handling using suitable tools.

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Power Electronics(304186)

Course code: 304186 **Teaching Scheme:** Lecture : 04 hr/week Total Teaching Hours:48		**Examination Scheme:** In-Sem Assessment: Phase I:30 Marks End-Sem Assessment: Phase II:70 Marks

Course Objectives:

- To introduce students to different power devices to study their construction, characteristics and turning on circuits.
- To give an exposure to students of working & analysis of controlled rectifiers for different loads, inverters, DC choppers, AC voltage controllers and resonant converters.
- To study the different motor drives, various power electronics applications like UPS, SMPS, etc. and some protection circuits.

Course Outcomes:

On completion of the course, student will be able to:

CO-1: Design and implement a triggering /gate drive circuit for a power device.

CO-2: Perform & analyze different AC to DC power converters.

CO-3: Perform & analyze different DC to A C power converters.

CO-4: Perform & analyze DC-DC converters & AC Voltage Controller.

CO-5: Design & implement over voltage / over current protection circuit.

CO-6. Evaluate battery backup time & design a battery charger.

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Information Theory and Coding Techniques(304187)

Course Code:304187 **Teaching Scheme:** Lectures: 4 Hrs/ Week Total Teaching Hours :44		**Examination Scheme:** In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Objectives:

This course is at undergraduate level for 43 hours to make students to know different coding techniques also use of data communication and networking with focus on following learning perspective:

- To understand information theoretic behaviour of a communication system.
- To understand various source coding techniques for data compression
- To understand various channel coding techniques and their capability.
- To Build and understanding of fundamental concepts of data communication and networking.

Outcomes: After successfully completing the course student should be able to:

CO-1: Perform information theoretic analysis of communication system.

CO-2: Design a data compression scheme using suitable source coding technique.

CO-3: Design a channel coding scheme for a communication system.

CO-4: Design of different coding &decoding techniques.

CO-5: Understand and apply fundamental principles of data communication and networking.

CO-6: Apply flow and error control techniques in communication networks.

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304188 Business Management

Course code: 304188 **Teaching Scheme:** Lecture : 03 hr/week Total Teaching Hours:36		**Examination Scheme:** In-Sem Assessment: Phase I:30 Marks End-Sem Assessment: Phase II:70 Marks

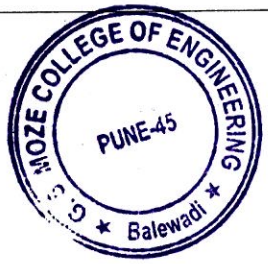
Course Objectives:

- To get awareness about various domains in Business Management.
- To understand concept of Quality Management, Financial Management and Project Management.
- To learn Human Resource Management, marketing management are the major tasks in Business
- To promote Entrepreneurship.

Course Outcomes:

On completion of the course, student will be able to:

1. Get overview of Management Science aspects useful in business.
2. Get motivation for Entrepreneurship
3. Get Quality Aspects for Systematically Running the Business
4. To Develop Project Management aspect and Entrepreneurship Skills.



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304189 Advanced Processors

Course code: 304189 **Teaching Scheme:** Lecture : 04 hr/week Total Teaching Hours:44		**Examination Scheme:** In-Sem Assessment: Phase I:30 Marks End-Sem Assessment: Phase II:70 Marks

Course Objectives:

- To understand need and application of ARM Microprocessors in embedded system.
- To study the architecture of ARM series microprocessor
- To understand architecture and features of typical ARM7& DSP Processors.
- To learn interfacing of real world input and output devices
- To learn embedded communication systems

Course Outcomes:

On completion of the course, student will be able to:

1. Describe the ARM microprocessor architectures and its feature.
2. Interface the advanced peripherals to ARM based microcontroller
3. Design embedded system with available resources.
4. Use of DSP Processors and resources for signal processing applications

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System Programming and Operating Systems (304190)

Course Code: 304190 **Teaching Scheme:** Lectures: 3Hrs/ Week Practical:2Hr/Week Total Teaching Hours :40		**Examination Scheme:** In Semester Assessment: 30 End Semester Examination: 70

Objectives: To understand fundamentals of system programming and operating systems.

1. To study and understand how the system programming and operating system abstractions can be implemented.
2. To develop comprehensive skills to design assembler, microprocessor, compiler and interpreter.
3. To understand the importance of application of linkers, loaders and Software tools in system programming
4. To Implement System Programming concepts and Operating systems components
5. To analyze memory allocation methods, input output devices and file system w. r. t. various operating system.
6. To study and implement various process scheduling techniques and dead lock avoidance schemes in operating system

Outcomes: After successfully completing the course student should be able to:

1. Demonstrate the knowledge of Systems Programming
2. Formulate the Problem and develop the solution for same.
3. Compare and analyze the different implementation approach of system programming abstractions.
4. Demonstrate the knowledge of Operating Systems
5. Formulate the Problem and develop the solution for same.
6. Compare and analyze the different implementation approach operating system abstractions. Interpret various OS functions used in Linux / Ubuntu

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Employability Skills and Mini Project (304196)

Course code: 304196 **Teaching Scheme:** **Lecture : 2 Hrs/Week** Practical: Hrs/Week		Examination Scheme: Oral Examination: 50 marks

Course Objectives:

- To undertake & execute a Mini Project through a group of students.
- To understand the 'Product Development Cycle' through Mini Project.
- To plan for various activities of the project and distribute the work amongst team members.
- To learn budget planning for the project.
- To inculcate electronic hardware implementation skills by
  a. Learning PCB artwork design using an appropriate EDA tool.
  b. Imbibing good soldering and effective trouble-shooting practices.
  c. Following correct grounding and shielding practices.
  d. Knowing the significance of aesthetics & ergonomics while designing electronic product.
- To develop student's abilities to transmit technical information clearly and test the same by delivery of Seminar based on the Mini Project.
- To understand the importance of document design by compiling Technical Report on the Mini Project work carried out.

Course Outcomes:

On completion of the course, student will be able to:

CO-1: Understand, plan and execute a Mini Project with team.

CO-2: Implement electronic hardware by learning PCB artwork design, soldering techniques, trouble shooting etc.

CO-3: Prepare a technical report based on the Mini project.

CO-4: Deliver technical seminar based on the Mini Project work carried out.

CO-5: Face Technical interviews.

CO-6: Participate in Technical Paper presentation.

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Department of ENTC

Course Outcomes

BE

Course Code	Subject:
404181	VLSI Design & Technology
404182	Computer Networks & Security
404183	Radiation & Microwave Techniques
404184	Elective I (Digital Image and Video Processing)
404185	Elective II (Electronics Product Design)
404189	Mobile Communication
404190	Broadband Communication Systems
404191	Elective III (Audio Video Engineering)
404192	Elective IV (Wireless Sensor Networks)

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VLSI Design & Technology(404181)

Course Code:E&TC181 **Teaching Scheme:** Lectures: 3 Hrs/ Week Total Teaching Hours:40		Examination Scheme: In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Objectives: This course is at undergraduate level for 40 hours to make students to know the VLSI design, develop HDL language , CMOS design and testability using engineering techniques with focus on following learning perspective

1. To study HDL based design approach
2. To understand PLD architectures with advanced features
3. To overview SoC issues and interconnect
4. To learn digital CMOS logic design
5. To nurture students with CMOS analog circuit designs
6. To realize importance of testability in logic circuits design

Outcomes: At the end of the course, the students should be able to

CO-1: Identify various system requirement and model digital circuit with HDL, simulate, synthesis and prototype in PLDs

CO-2 : Conceptualize the system through design of PLD architecture

CO-3: Analyze different factors of chip level issues and their interconnect

CO-4 : Design CMOS based digital circuits and understand the design rules

CO-5: Design analog CMOS circuits for specified applications

CO-6 : Need of testability and detect fault on circuit

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Computer Networks & Security (404182)

Course Code: 404182 **Teaching Scheme:** Lectures: 3Hrs/ Week Total Teaching Hours :36		**Examination Scheme:** In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Objectives:

1. Understand state-of-the-art in network protocols, architectures, and applications
2. To provide students with a theoretical and practical base in computer networks issues
3. Define the basic terminology of computer networks
4. Recognize the individual components of the big picture of computer networks
5. Outline the basic network configurations
6. List the layers of the TCP/IP and OSI model and describe the duties of each layer. Understand the transmission methods underlying LAN and WAN technologies

Outcomes: After successfully completing the course student should be able to:

1. Understand fundamental underlying principles of computer networking
2. Describe and analyze the hardware, software, components of a network and the interrelations.
3. Analyze the requirements for a given organizational structure and select the most appropriate Networking architecture and technologies;
4. Have a basic knowledge of the use of cryptography and network security;
5. Have a basic knowledge of installing and configuring networking applications.
6. Specify and identify deficiencies in existing protocols, and then go onto select new and better protocols.

Radiation & Microwave Techniques (404183)		
Course Code: 404183 **Teaching Scheme:** Lectures: 3Hrs/ Week Total Teaching Hours :36		**Examination Scheme:** In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Objectives:

This course is at undergraduate level for 44 hours to make students to know the arrangement of microwave test bench with focus on following learning perspective.

- To introduce fundamental theory of radiation and microwaves.
- To understand design principles of various radiating elements.
- To understand theory of passive and active components of microwave systems.
- To learn microwave measurement techniques.
- Carryout the microwave network analysis.
- To carry out the different microwave measurement methods.

Outcomes: After successfully completing the course student should be able to:

CO-1: Differentiate various performance parameters of radiating elements.

CO-2 Analyze various radiating elements and arrays.

CO-3 Apply the knowledge of waveguide fundamentals in design of transmission lines.

CO-4 Design and set up a system consisting of various passive microwave components.

CO-5 Analyze tube based and solid state active devices along with their applications.

CO-6 Measure various performance parameters of microwave components.

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Digital Image and Video Processing (404184)

Course code: 404184 **Teaching Scheme:** Lecture : 04 hr/week Practical :02 hr/week		**Examination Scheme:** In Semester Assessment: Phase I:30 End Semester Examination: Phase II:70

Course Objectives:

- To learn the fundamental concepts of Digital Image Processing.
- To study basic image processing operations.
- To understand image analysis algorithms.
- To understand image segmentation and restoration algorithms
- To understand image representation and description techniques.
- To expose students to current applications in the field of digital image processing.

Course Outcomes:

On completion of the course, student will be able to:

CO-1: Develop and implement algorithms for digital image processing.

CO-2: Examine various types of images, intensity transformations and spatial filtering.

CO-3: Develop Fourier transform for image processing in frequency domain.

CO-4: Evaluate the methodologies for image segmentation, restoration etc.

CO-5: Implement image process and analysis algorithms.

CO-6: Apply image processing algorithms for practical object recognition applications

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Electronic Product Design (404185)

Course Code: 404185 **Teaching Scheme:** Lectures: 3 Hrs/ Week Total Teaching Hours:36		Examination Scheme: In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Objectives: This course is at undergraduate level for 36 hours to make students to know the Electronic product design, with focus on following learning perspective

- To overview Electronic Product Design with different parameters
- To understand the stages of product (hardware/ software) design and development
- To learn the different considerations of analog, digital and mixed circuit design
- To be acquainted with methods of PCB design and different tools used for PCB design
- To understand the importance of testing in product design cycle
- To understand the processes and importance of documentation

Outcomes: After successfully completing the course students will be able to

CO-1 : Understand various stages of hardware, software and PCB design

CO-2 : Analyze the requirement of hardware design & test specifications

CO-3 : Requirement and importance of software design & test specifications

CO-4 : Need of PCB design in electronics

CO-5 : Importance of product debugging and testing

CO-6 : Special design considerations and importance of documentation

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Mobile Communication(404189)

Course Code: 404189 **Teaching Scheme:** Lectures: 3 Hrs/ Week Total Teaching Hours:36		Examination Scheme: In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Objectives:

This course is at undergraduate level for 44 hours to make students to know telecommunication traffic , the use of CDMA , cellular system and GSM with focus on following learning perspective.

- To learn and understand the basic principles of Telecommunication switching, traffic and networks.
- To learn and understand basic concepts of cellular system, wireless propagation and the techniques used to maximize the capacity of cellular network.
- To learn and understand architecture of GSM and CDMA system.
- To understand mobile management, voice signal processing and coding in GSM and CDMA system.

Outcomes: After successfully completing the course student should be able to:

CO-1: Explain and apply the concepts telecommunication switching, traffic and networks
CO-2: Analyze the telecommunication traffic.
CO-3: Analyze radio channel and cellular capacity.
CO-4: Comparative study of different generation of Mobile system like 1G,2G,3G
CO-5: Explain and apply concepts of GSM .
CO-6: Explain and apply concepts of CDMA system.

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Broadband Communication Systems(404190)

Course code: 404190 **Teaching Scheme:** Lecture : 04hr/week Practical : 02 hr/week Total Teaching Hours:44		**Examination Scheme:** In Semester Assessment: Phase I:30 End Semester Examination: Phase II:70

Course Objectives:

- To understand the three primary components of a fiber-optic communication system.
- Identify the various optical sources and detectors.
- To understand the system design issues and the role of WDM components in advanced light wave systems.
- To understand the basics of orbital mechanics and the look angles from ground stations to the satellite.
- To apply their subject understanding in Link Design

Course Outcomes:

On completion of the course, student will be able to:

CO-1: Understand the basic elements of optical fiber transmission link, fiber modes configurations, different kind of losses, optical sources and detectors

CO-2: Carry out Link power budget and Rise Time Budget

CO-3: Learn the fiber optical network components and optical amplifiers.

CO-4: Understand the basic principle & terminologies of Satellite communication systems

CO-5: Explain the principles, concepts and operation of satellite communication systems

CO-6: Analyze the design requirements and the performance of satellite communication systems

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Audio Video Engineering (Elective-III)

Course Code: 404191 **Teaching Scheme:** Lectures: 3Hrs/ Week Total Teaching Hours :40		**Examination Scheme:** In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Objectives:

1. After learning AVE course, students will get benefit to learn and understand the working of real life video system .
2. Understand the different elements of video system plus the encoding/decoding techniques.
3. The learners will be groomed up to understand different channel allocations difference between various systems present in this world,
4. Various Systems' transmission and reception techniques.
5. Students will get insight on functioning of individual blocks, differen standards of compression and they will be acquainted with different types o analog, digital TV and HDTV systems.
6. The students will gate overview of fundamentals of Audio systems and basics Acoustics

Outcomes: After successfully completing the course student should be able to:

1. To study the analysis and synthesis of TV Pictures, Composite Video Signal, Receiver, Picture Tubes and Television Camera Tubes.
2. To study the various Colour Television systems .
3. Greater emphasis on television standards.
4. To study the advanced topics in Digital Television and High Definition Television.
5. To study audio recording systems such CD/DVD recording, Audio Standards,
6. To Study Acoustics principles. application

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404192 C Wireless Sensor Networks (Elective-IV)

Course Code: 404192 C **Teaching Scheme:** Lectures: 3Hrs/ Week Total Teaching Hours :36		**Examination Scheme:** In Semester Assessment: Phase I : 30 End Semester Examination: Phase II: 70

Objectives:

- To learn basic concepts of Wireless sensor networks
- To be familiar with architecture and protocols used in Wireless sensor networks
- To provide knowledge of deployment and security issued of Wireless sensor networks

Outcomes: After successfully completing the course student should be able to:

1)Explain various concepts and terminologies used in WSN

2) Describe importance and use of radio communication and link management in WSN

3) Explain various wireless standards and protocols associated with WSN

4) Recognise importance of localisaion and routing techniques used in WSN

5) Understand techniques of data aggregation and importance of security in WSN

6) Examine the issues involved in design and deployment of WSN

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Ph: 020-27390500 Website: www.gsmozecoe.org Email: gsmoze@yahoo.co.in
Founder President: Shri Rambhau Moze

Department of First Year Engineering

Course Outcomes

SUB CODE: 101011	Subject: Engineering Mechanics
CO 1	Students will acquire the knowledge of Basic Mathematics and Mechanics by understanding the concepts related to Resolution & Composition of various force systems
CO 2	Students will be able to solve the practical problems related to centroid, moment of inertia and also solve problems related to friction
CO 3	Students will be able to understand and apply the practical applications of equilibrium conditions for coplanar and non coplanar force systems.
CO 4	Students will be able to analyse the different structures such as trusses, frames, cables.
CO 5	Students will be able to calculate position, velocity and acceleration of particle using principles of kinematics
CO 6	Students will be able to correlate the concepts related to power; work and energy to solve practical problems.

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SUB CODE: 107009	Subject: Engineering Chemistry
CO 1	Apply the different methodologies for analysis of water and techniques involved in softening of water as commodity
CO 2	Select appropriate electro-technique and method of material analysis.
CO 3	Demonstrate the knowledge of advanced engineering materials for various engineering applications.
CO 4	Analyze fuel and suggest use of alternative fuels.
CO 5	Identify chemical compounds based on their structure.
CO 6	Explain causes of corrosion and methods for minimizing corrosion.

SUB CODE: 104010	Subject: Basic Electronics Engineering
CO 1	Explain the working of P-N junction diode and its circuits.
CO 2	Identify types of diodes and plot their characteristics and also can compare BJT with MOSFET
CO 3	Build and test analog circuits using OPAMP and digital circuits using universal/basic gates and flip flops

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CO 4	Use different electronics measuring instruments to measure various electrical parameters.
CO 5	Select sensors for specific applications
CO 6	Describe basic principles of communication systems.

SUB CODE: 107002	**Subject: Engineering Physics**
CO 1	Develop understanding of interference, diffraction and polarization; connect it to few engineering applications.
CO 2	Learn basics of lasers and optical fibers and their use in some applications
CO 3	Understand concepts and principles in quantum mechanics. Relate them to some applications.
CO 4	Understand theory of semiconductors and their applications in some semiconductor devices.
CO 5	Summarize basics of magnetism and superconductivity. Explore few of their technological applications
CO 6	Comprehend use of concepts of physics for Non Destructive Testing. Learn some properties of nanomaterials and their application.

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SUB CODE: 102012	Subject: Engineering Graphics
CO 1	Draw the fundamental engineering objects using basic rules and able to construct the simple geometries.
CO 2	Construct the various engineering curves using the drawing instruments.
CO 3	Apply the concept of orthographic projection of an object to draw several 2D views and its sectional views for visualizing the physical state of the object.
CO 4	Apply the visualization skill to draw a simple isometric projection from given orthographic views precisely using drawing equipment.
CO 5	Draw the development of lateral surfaces for cut section of geometrical solids.
CO 6	Draw fully-dimensioned 2D, 3D drawings using computer aided drafting tools.

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SUB CODE: 107001	Subject: Engineering Mathematics – I
CO 1	Mean value theorems and its generalizations leading to Taylors and Maclaurin's series useful in the analysis of engineering problems.
CO 2	The Fourier series representation and harmonic analysis for design and analysis of periodic continuous and discrete systems.
CO 3	To deal withderivative of functions of several variables that are essential in various branches of Engineering
CO 4	To apply the concept of Jacobian to find partial derivative of implicit function and functional dependence. Use of partial derivatives in estimating error and approximation and finding extreme values of the function.
CO 5	The essential tool of matrices and linear algebra in a comprehensive manner for analysis of system of linear equations, finding linear and orthogonal transformations, Eigen values and Eigen vectors applicable to engineering problems

SUB CODE: (107008)	Subject: Engineering Mathematics II
CO1	The effective mathematical tools for solutions of first order differential equations that model physical processes such as Newton's law of cooling, electrical circuit, rectilinear motion, mass spring systems, heat transfer etc.
CO2	Advanced integration techniques such as Reduction formulae, Beta functions, Gamma functions, Differentiation under integral sign and Error functions needed in evaluating multiple integrals and their applications.
CO3	To trace the curve for a given equation and measure arc length of various curves.

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CO4	the concepts of solid geometry using equations of sphere, cone and cylinder in a comprehensive manner.
CO5	Evaluation of multiple integrals and its application to find area bounded by curves, volume bounded by surfaces, Centre of gravity and Moment of inertia.

SUB CODE: 102003	**Systems in Mechanical Engineering**
CO 1	Describe and compare the conversion of energy from renewable and non-renewable energy sources
CO 2	Explain basic laws of thermodynamics, heat transfer and their applications
CO 3	List down the types of road vehicles and their specifications
CO 4	Illustrate various basic parts and transmission system of a road vehicle
CO 5	Discuss several manufacturing processes and identify the suitable process
CO 6	Explain various types of mechanism and its application

SUB CODE: 110005	**Programming and Problem Solving**
CO 1	Inculcate and apply various skills in problem solving.

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CO 2	Choose most appropriate programming constructs and features to solve the problems in diversified domains.
CO 3	Exhibit the programming skills for the problems those require the writing of well-documented programs including use of the logical constructs of language, Python.
CO 4	Demonstrate significant experience with the Python program development environment.

SUB CODE: 103004	**Subject: Basic Electrical Engineering**
CO 1	Differentiate between electrical and magnetic circuits and derive mathematical relation for self and mutual inductance along with coupling effect.
CO 2	Calculate series, parallel and composite capacitor as well as characteristics parameters of alternating quantity and phasor arithmetic
CO 3	Derive expression for impedance, current, power in series and parallel RLC circuit with AC supply along with phasor diagram.
CO 4	Relate phase and line electrical quantities in polyphase networks, demonstrate the operation of single phase transformer and calculate efficiency and regulation at different loading conditions
CO 5	Apply and analyze the resistive circuits using star-delta conversion KVL, KCL and different network theorems under DC supply.
CO 6	Evaluate work, power, energy relations and suggest various batteries for different applications, concept of charging and discharging and depth of charge.

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Department of First Year Engineering

PROGRAM OUTCOMES

Programme Outcomes describe what students are expected to know or be able to do by the time of graduation from the programme. The POs for Under Graduate Course in Electronics and Telecommunication Engineering are able to

1. Apply the knowledge of technical fundamentals, mathematics and applied science for solving the domain problems.
2. Identify, Analyse complex engineering problems and review the literature for the same.
3. Design the processes, implement the system for the welfare, safety, and environmental need of the society.
4. Perform experiment, and interpret results.
5. Use technical skills and tools for electronic system development.
6. Understand the importance of electronics and telecommunication in modern era.
7. Identify the needs of society for development, growth and human values.
8. Understand the legal, professional, ethical responsibilities.
9. Work effectively in diversified, multidisciplinary environment to achieve common goal.
10. Ability to communicate effectively and possess soft skills.
11. Engage themselves in continuous educational, professional and entrepreneurship development
12. Apply effectively electronics and telecommunication engineering and management skills and act as a team leader to solve industrial and social problem.

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Website: www.gsmozecoe.co.in Email: gsmoze@yahoo.co.in

Department of Information Technology

Program Outcomes

Students are expected to know and be able to–		
PO1	Engineering knowledge	An ability to apply knowledge of mathematics, computing, science, engineering and technology.
PO2	Problem analysis	An ability to define a problem and provide a systematic solution with the help of conducting experiments, analyzing the problem and interpreting the data.
PO3	Design / Development of Solutions	An ability to design, implement, and evaluate software or a software /hardware system, component, or process to meet desired needs within realistic constraints.
PO4	Conduct Investigation of Complex Problems	An ability to identify, formulate, and provide essay schematic solutions to complex engineering /Technology problems.
PO5	Modern Tool Usage	An ability to use the techniques, skills, and modern engineering technology tools, standard processes necessary for practice as a IT professional.
PO6	The Engineer and Society	An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computerbased systems with necessary constraints and assumptions.
PO7	Environment and Sustainability	An ability to analyze and provide solution for the local and global impact of information technology on individuals, organizations and society.
PO8	Ethics	An ability to understand professional, ethical, legal, security and social issues and responsibilities.
PO9	Individual and Team Work	An ability to function effectively as an individual or as a team member to accomplish a desired goal(s).
PO10	Communication Skills	An ability to engage in life-long learning and continuing professional development to cope up with fast changes in the technologies /tools with the help of electives, profession along animations and extracurricular activities.

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PO11	Project Management and Finance	An ability to communicate effectively in engineering community at large by means of effective presentations, report writing, paper publications, demonstrations.
PO12	Life-long Learning	An ability to understand engineering, management, financial aspects, performance, optimizations and time complexity necessary for professional practice.

Program Specific Outcomes(PSO)

A graduate ofthe Information Technology Program will demonstrate -	
PSO1	An ability to apply the theoretical concepts and practical knowledge of Information Technology in analysis, design, development and management of information processing systems and applicationsin theinterdisciplinary domain.
PSO2	An ability to analyze a problem, and identify and define the computing infrastructure and operations requirements appropriate to its solution. IT graduates should be able to work on large-scale computing systems.
PSO3	An understanding of professional, business and business processes, ethical, legal,security and social issues and responsibilities.
PSO4	Practice communication and decision-making skills through the use of appropriate technology and beready for professionalresponsibilities.

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Course Outcomes

SE 2019 PAT	
Course Code	**Subject: Sem-III**
214441	**Discrete Mathematics** **CO1:** Formulate and apply formal proof techniques and solve the problems with logical reasoning. **CO2:** Analyze and evaluate the combinatorial problems by using probability theory. **CO3:** Apply the concepts of graph theory to devise mathematical models. **CO4:** Analyze types of relations and functions to provide solution to computational problems. **CO5:** Identify techniques of number theory and its application. **CO6:** Identify fundamental algebraic structures.
214442	**Logic Design & Computer Organization** **CO1:** Perform basic binary arithmetic & simplify logic expressions. **CO2:** Grasp the operations of logic ICs and Implement combinational logic functions using ICs. **CO3:** Comprehend the operations of basic memory cell types and Implement sequential logic functions using ICs. **CO4:** Elucidate the functions & organization of various blocks of CPU. **CO5:** Understand CPU instruction characteristics, enhancement features of CPU. **CO6:** Describe an assortment of memory types (with their characteristics) used in computer systems and basic principle of interfacing input, output devices.

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214443	**Data Structure & Algorithms** **CO1:** Perform basic analysis of algorithms with respect to time and space complexity. **CO2:** Select appropriate searching and/or sorting techniques in the application development. **CO3:** Implement abstract data type (ADT) and data structures for given application. **CO4:** Design algorithms based on techniques like brute -force, divide and conquer, greedy, etc. **CO5:** Apply implement learned algorithm design techniques and data structures to solve problems. **CO6:** Design different hashing functions and use files organizations.

214444	**Object-Oriented Programming** **CO1:** Differentiate various programming paradigms. **CO2**: Identify classes, objects, methods, and handle object creation, initialization, and Destruction to model real-world problems. **CO3**: Identify relationship among objects using inheritance and polymorphism principles. **CO4:** Handle different types of exceptions and perform generic programming. **CO5:** Use of files for persistent data storage for real world application. **CO6:** Apply appropriate design patterns to provide object-oriented solutions.
214445	**Basics of Computer Network** **CO1:** Understand and explain the concepts of communication theory and compare functions of OSI and TCP/IP model. **CO2:** Analyze data link layer services, error detection and correction, linear block codes, cyclic Codes, framing and flow control protocols. **CO3:** Compare different access techniques, channelization and IEEE standards. **CO4:** Apply the skills of subnetting, supernetting and routing mechanisms. **CO5:** Differentiate IPv4 and IPv6. **CO6:** Illustrate services and protocols used at transport layer.
Course Code	**Subject: Sem-IV**

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207003	**Engineering Mathematics III** Students will able to **CO1:** Solve Linear differential equations, essential in modeling and design of computer-based systems. **CO2:** Apply concept of Fourier transform and Z-transform and its applications to continuous and discrete systems and image processing. **CO3:** Apply Statistical methods like correlation and regression analysis and probability theory for data analysis and predictions in machine learning. **CO4:** Solve Algebraic and Transcendental equations and System of linear equations using numerical techniques. **CO5:** Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing.
214451	**Processor Architecture** **CO1:** Apprehend architecture and memory organization of PIC 18 microcontroller. **CO2**: Implement embedded C programming for PIC 18. **CO3:** Use concepts of timers and interrupts of PIC 18. **CO4:** Demonstrate real life applications using PIC 18. **CO5:** Analyze architectural details of ARM processor.

214452	**Database Management System** **CO1:** Apply fundamental elements of database management systems. **CO2:** Design ER-models to represent simple database application scenarios. **CO3:** Formulate SQL queries on data for relational databases. **CO4:** Improve the database design by normalization & to incorporate query processing. **CO5:** Apply ACID properties for transaction management and concurrency control.

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	CO6: Analyze various database architectures and technologies.
214453	**Computer Graphics** **CO1:** Apply mathematical and logical aspects for developing elementary graphics operations like scan conversion of points, lines, circle, and apply it for problem solving. **CO2:** Employ techniques of geometrical transforms to produce, position and manipulate Objects in 2 dimensional and 3-dimensional space respectively. **CO3:** Describe mapping from a world coordinates to device coordinates, clipping, and projections in order to produce 3D images on 2D output device. **CO4:** Apply concepts of rendering, shading, animation, curves and fractals using computer graphics tools in design, development and testing of 2D, 3D modeling applications. **CO5:** Perceive the concepts of virtual reality.
214454	**Software Engineering** **CO1:** Classify various software application domains. **CO2:** Analyze software requirements by using various modeling techniques. **CO3:** Translate the requirement models into design models. **CO4:** Apply planning and estimation to any project. **CO5:** Use quality attributes and testing principles in software development life cycle. **CO6:** Discuss recent trends in Software engineering by using CASE and agile tools.

TE 2019 PAT	
Course Code	**Subject: Sem-V**

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314441	**Theory of Computation** **CO1:** Construct finite automata and its variants to solve computing problems. **CO2:** Write regular expressionsfor the regular languages and finite automata. **CO3:** Identify types of grammar, design and simplify Context Free Grammar. **CO4:** Construct Pushdown Automata machine for the Context Free Language. **CO5:** Design and analyze Turing machines for formal languages. **CO6:** Understand decidable and undecidable problems, analyze complexity classes.
314442	**Operating Systems** **CO1:** Explain the role of Modern Operating Systems. **CO2:** Apply the concepts of process and thread scheduling. **CO3:** Illustrate the concept of process synchronization, mutual exclusion and the deadlock. **CO4:** Implement the concepts of various memory management techniques. **CO5:** Make use of concept of I/O management and File system. **CO6:** Understand Importance of System software.
314443	**Machine Learning** **CO1:** Apply basic concepts of machine learning and different types of machine learning algorithms. **CO2**: Differentiate various regression techniques and evaluate their performance. **CO3**: Compare different types of classification models and their relevant application. **CO4**: Illustrate the tree-based and probabilistic machine learning algorithms. **CO5**: Identify different unsupervised learning algorithms for the related real-worldproblems. **CO6**: Apply fundamental concepts of ANN.

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314444	**Human Computer Interaction** **CO1:** Explain importance of HCIstudy and principles of user-centered design (UCD) approach. **CO2**: Develop understanding of human factors in HCI design. **CO3:** Develop understanding of models, paradigms, and context of interactions. **CO4:** Design effective user-interfacesfollowing a structured and organized UCD process. **CO5:** Evaluate usability of a user-interface design. **CO6:** Apply cognitive modelsfor predicting human-computer-interactions.

314445(A)	**Elective -I : Design and Analysis of Algorithm** **CO1:** Calculate computational complexity using asymptotic notations for various algorithms. **CO2:** Apply Divide & Conquer as well as Greedy approach to design algorithms. **CO3:** Understand and analyze optimization problems using dynamic programming. **CO4:** Illustrate different problems using Backtracking. **CO5:** Compare different methods of Branch and Bound strategy. **CO6:** Classify P, NP, NP-complete, NP-Hard problems.
314445(B)	**Elective -I : Advanced Database Management System** **CO1:** Differentiate relational and object-oriented databases. **CO2:** Illustrateparallel &distributed database architectures. **CO3:** Apply concepts of NoSQL Databases. **CO4:** Explain concepts ofdata warehouse and OLAP technologies. **CO5:** Apply data mining algorithms and various software tools. **CO6:** Comprehend emerging and enhanced data models for advanced applications.

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314445(C)	**Elective I : Design Thinking** **CO1:** Identify need and features of design thinking. **CO2:** Identify the opportunities and challenges for design thinking innovation. **CO3:** Learn the process of design thinking using various tools. **CO4:** Summarize and learn the various prototyping techniques. **CO5:** Enlist the activities carried out in Test and reflect phase of design thinking. **CO6**: Interpret the design thinking disruptive innovations through case studies.
314445(D)	**Elective I : Internet of Things** **CO1:** Discussfundamentals, architecture and framework of IoT. **CO2:** Select suitable sensors and actuators for real time scenarios. **CO3:** Justify the significance of protocol for wireless communication and IoT challenges **CO4:** Understand the Python programming for development of IoT applications. **CO5:** Understand the cloud interfacing technologies. **CO6:** Design and Implement realtime IoT applications.

Course Code	Subject: Sem-VI
314451	**Computer Network and Security** **CO1:** Explain Responsibilities,services offered and protocol used at application layer of network **CO2:** Apply concepts of wireless network and different wireless standards. **CO3:** Recognize the Adhoc Network's MAC layer, routing protocol and Sensor network architecture. **CO4:**Implement the principal concepts of network security and Understand network security threats, security services, and countermeasures **CO5:** Apply basic cryptographic techniques in application development. **CO6:** Gain a good comprehension of the landscape of cyber security Vulnerabilities & describe typical threats to modern digital systems.

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314452	**Data Science and Big Data Analytics** **CO1:** Understand Big Data primitives. **CO2:** Learn and apply different mathematical models for Big Data. **CO3:** Demonstrate Big Data learning skills by developing industry or research applications. **CO4:** Analyze and apply each learning model comes from a different algorithmic approach and it will perform differently under different datasets. **CO5:** Understand, apply and analyze needs, challenges and techniques for big data visualization. **CO6:** Learn different programming platformsfor big data analytics.
314453	**Web Application Development** **CO1:** Develop Static and Dynamic website using technologies like HTML, CSS, Bootstrap. **CO2:** Demonstrate the use of web scripting languages. **CO3:** Develop web application with Front End & Back End Technologies. **CO4:** Develop mobile website using JQuery Mobile. **CO5:** Deploy web application on cloud using AWS.
314454 (A)	**Elective II (Artificial Intelligence)** **CO1:** Apply the fundamental concepts of Artificial Intelligence **CO2:** Choose appropriate search strategies for any AI problem **CO3**: Illustrate knowledge reasoning and knowledge representation methods (for solving real world problems) **CO4:** Analyze the suitable techniques of NLP to develop AI applications **CO5:** Correlate the appropriate methods of Game Theory to design AI applications **CO6:** Understand the concept of deep learning and AI applications

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314454 (B)	**Elective-II (Cyber Security)** **CO1:** Develop basic understanding of cybersecurity. **CO2:** Differentiate among different types of cyber threats and cyber-crimes. **CO3**: Illustrate cyberforensic techniques to identify the criminal activities. **CO4:** Apply forensic analysistoolsto recover important evidence foridentifying computercrime **CO5:** Distinguish and classify the forms of cybercriminal activity and the technological and social engineering' methods used to undertake such crimes **CO6:** Evaluate the effectiveness of cyber-security, cyber-laws and other countermeasures againstcybercrime
314454 (C)	**Elective-II- (Cloud Computing)** **CO1:** Articulate the main concepts, key technologies and fundamentals of cloud computing. **CO2:** Understand cloud enabling technologies and virtualization. **CO3:** Analyze various cloud programming models and apply them to solve problems on the cloud. **CO4:** Explain data storage and major security issues in the cloud. **CO5:** Understand trends in ubiquitous cloud and internet of things. **CO6:** Explore future trends of cloud computing.
314454 (D)	**Elective –II (Software Modeling and Design)** **CO1:** Understand basics of object oriented methodologies and Unified Modeling Language (UML). **CO2:** Apply analysis process, use case modeling, domain/class modeling **CO3:** Design and apply interaction and behavior modeling on a given system. **CO4:** Comprehend OO design process and business, access and view layer class design. **CO5:** Recognize the software design principles and patternsto be applied on system. **CO6:** Illustrate architectural design principles and guidelines in the varioustype of applicationdevelopment.

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314455	**Internship** **CO1:** Develop professional competence through industry internship. **CO2:** Apply academic knowledge in a personal and professional environment **CO3:** Build the professional network and expose students to future employees. **CO4:** Apply professional and societal ethics in their day-to-day life. **CO5:** Become a responsible professional having social, economic and administrative considerations. **CO6:** Make own career goals and personal aspirations.

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Course Code	**Subject: Sem-VII**

414441	**Information Storage and Retrieval** **CO1.** Understand the concept of Information retrieval and to apply clustering in information retrieval. **CO2.** Use an indexing approach for retrieval of text and multimedia data. **CO3.** Evaluate performance of information retrieval systems. **CO4.** Apply the concepts of multimedia and distributed information retrieval. **CO5.** Use appropriate tools in analyzing the web information **CO6.** Simulate the working of a search engine and recommender system.
414442	**Software Project Management.** **CO1.** Apply the practices and methods for successful Software Project Management **CO2.** Create Design and Evaluate Project **CO3.** Analyze Project Schedule and calculate Risk Management with help of tools. **CO4.** Demonstrate different tools used for Project Tracking, Monitoring & Control. **CO5.** Identify Staff Selection Process and the issues related to Staff Management. **CO6.** Discuss and use modern tools for Software Project Management.
414443	**Deep Learning** **CO1.** Understand the theoretical foundations, algorithms, and methodologies of Deep Learning. **CO2.** Apply the concepts of Convolution Neural Networks and use of

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	popular CNN architectures. **CO3.** Compare Feed Forward Neural Network and Recurrent Neural Network and learn modeling the time dimension using RNN and LSTM. **CO4.** Elaborate unsupervised deep learning algorithms like Autoencoders. **CO5.** Explore Representation Learning and Transfer Learning techniques using variants of CNN architecture. **CO6.** Evaluate the performance of deep learning algorithms and to provide solution for various real-world applications.
414444	**Elective – III (Mobile Computing)** **CO1.** understand the basic concepts of mobile computing, MAC and different multiplexing technics. **CO2.** understand Protocols, Connection Establishment, Frequency Allocation, Routing of mobile telecommunication system like GSM, GPRS, UMTS. **CO3.** understand the Generations of Mobile Communication Technologies **CO4.** learn mobile IP , Adhoc – Network, Reactive Routing protocols, Multicast Routing. **CO5.** obtaining knowledge of transport layer protocol TCP, File System, and different application layer protocols. **CO6.** gain knowledge about different mobile platforms, operating Systems, Software Development Kit, Security Issues.
414444	**Elective – III (High Performance Computing)** **CO1.** Understand concepts of parallel computing, its application areas and parallel computing platforms **CO2.** Apply different Parallel programming paradigm and Decomposition Techniques. **CO3.** Correlate various communication calls. **CO4.** Analyze and Measure different Performance Metrics. **CO5.** Perform CUDA Programming. **CO6.** Build the logic to develop parallel algorithms for high performance computing.
414444	**Elective – III (Multimedia Technology)** **CO1.** Understand basic building block and applications of Multimedia. **CO2.** Solve and analyze different algorithms for text and image compression. **CO3.** Classify different audio and video file formats of Multimedia. **CO4.** Apply open-source authoring tools of animation. **CO5.** List various devices used in virtual reality and its use in daily life. **CO6.** Recognize emerging trends in Multimedia.
414444	**Elective – III (Smart Computing)** **CO1.** Demonstrate the knowledge of design of smart computing and its

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	applications. **CO2.** Describe different generations of mobile and mobile computing projects **CO3.** Demonstrate the knowledge of design of Ubicomp and its applications. **CO4.** Explain smart devices and services used Ubicomp. **CO5.** Implement interfacing of various sensors, actuators to the development boards **CO6.** Compare various IoT communication technologies and smart computing applications.
414445	**Elective – IV (Bioinformatics)** **CO1.** Integrate biological concepts with information technologies to study the biological system. **CO2.** Study Gene structure, various biological database, and methods to manage the different types of biological data. **CO3.** Describe principles and algorithms of pairwise and multiple alignments. **CO4.** Study various bioinformatics tools and Algorithm. **CO5.** Understand modeling and simulation in bioinformatics, drug discovery process. and Protein Structure. **CO6.** To Gain awareness in field of System Biology and Human Disease.
414445	**Elective – IV (Introduction to DevOps)** **CO1.** Understand the fundamental concepts of DevOps **CO2.** Link the background of DevOps with other technologies **CO3.** Comprehend the concept of continuous integration and continuous delivery **CO4.** Compare various stages of continuous deployment and test strategies **CO5.** Justify the importance of monitoring system and reliability engineering **CO6.** Use the latest tools in DevOps
414445	**Elective – IV (Computer Vision)** **CO1.** Implement fundamental image processing techniques required for computer vision. **CO2.** Apply feature extraction techniques. **CO3.** Apply Hough Transform for line, circle, and ellipse detections. **CO4.** Understand three-dimensional analysis techniques. **CO5.** Develop skills to develop applications using computer vision techniques.

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414445	**Elective – IV (Wireless Communication)** **CO1:** Articulate the fundamental concept of cellular system. **CO2:** Analyse the fundamentals of cellular systems. **CO3:** Illustrate multiple access technique for effective utilization of spectrum. **CO4:** Design and analyse the WAP Programming Model in networking environment. **CO5:** Learn and understand security issues, challenges and tools in wireless communication. **CO6:** Explore the emerging trends and applications in wireless communication.
414446	**Lab Practice III** **CO1.** Understand the concept of Information retrieval and to apply clustering in information retrieval. **CO2.** Use appropriate indexing approach for retrieval of text and multimedia data. Evaluate performance of information retrieval systems. **CO3.** Apply appropriate tools in analyzing the web information. **CO4.** Map the concepts of the subject on recent developments in the Information retrieval field.
414447	**Lab Practice IV** **CO1.** Learn and Use various Deep Learning tools and packages. **CO2.** Build and train a deep Neural Network models for use in various applications. **CO3.** Apply Deep Learning techniques like CNN, RNN Auto encoders to solve real word Problems. **CO4.** Evaluate the performance of the model build using Deep Learning.
414448	**Project Stage I** **CO1.** To apply knowledge of mathematics, science, and engineering to formulate the Problem statement. **CO2.** To design and conduct experiments, as well as to analyze and interpret data. **CO3.** Understand the professional and ethical responsibility. **CO4.** To communicate effectively. **CO5.** Get broad education which is necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context. **CO6.** Recognition of the need for, and an ability to engage in life-long learning. **CO7.** To use the techniques, skills, and modern engineering tools necessary for engineering practices. **CO8.** To design a system, component, or process to meet desired needs

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	within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

414449A	**Audit Course 7** **Copyrights and Patents** **CO1.** Understand the concepts of Intellectual Property Rights. **CO2.** Understand the knowledge about Copyrights and Trademark. **CO3.** Understand the knowledge how to protect trade secrets.
414449B	**Audit Course 7** **Stress Management By Yoga** **CO1.** Understand the reasons for Stress. **CO2.** Understand the role of Yoga. **CO3.** Develop healthy mind in a healthy body. **CO4.** Develop overall efficiency.
414449C	**Audit Course 7** **English for Research Paper Writing** **CO1.** Understand that how to improve writing skills and level of readability. **CO2.** Identify and categorize about what to write in each section. **CO3.** Ensure the good quality of paper at very first-time submission.
	SEMESTER – VIII
414450	**Distributed Systems** **CO1.** Demonstrate the core concepts of distributed systems. **CO2.** Understand the concept of middleware of distributed systems. **CO3.** Understand Inter-process communication methods and analyze different coordination algorithms. **CO4.** Comprehend the importance of replication to achieve fault tolerance in distributed systems. **CO5.** Analyze the design and functioning of existing distributed file systems, distributed multimedia, and distributed web-based systems. **CO6.** Understand various Recent Trends in distributed systems.

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414451	**Elective-V (Software Defined Network)** **CO1.** Acquire fundamental knowledge of SDN exploring the need, characteristics, and architecture of SDN and methods of API's in SDN. **CO2.** Recognize Open Flow protocols and its forwarding, pipeline model and use cases of SDN controller. **CO3.** Demonstrate virtualization and Cloud computing services of SDN. **CO4.** Comprehend IT Infrastructure and understand the data center in SDN. **CO5.** Analyse various security issues and challenges in SDN. **CO6.** Comprehend SDN application areas and future.
414451	**Elective- V (Social Computing)** **CO1.** Understand basics of Social Media Analytics **CO2.** Correlate Network Measures for Social Media Data **CO3.** Visualize mining in social media data **CO4.** Discuss the Social Similarities **CO5.** Interpret social media behaviour **CO6.** Apply Social Media Computations for Google+
414451	**Elective V (Natural Language Processing)** **CO1.** Understand and analyze the natural language text and model. **CO2.** Analyze the natural language syntactically. **CO3.** Analyze and study natural language logically. **CO4**. Process the natural language text based on relations and knowledge. **CO5.** Evaluate the natural language text using models and apply modeling techniques for automatic document separation and text mining. **CO6.** Apply information retrieval techniques.

414451	**Elective-V (Soft Computing)** **CO1.** Learn soft computing techniques and their roles in problem solving. **CO2.** Understand and Analyze various Artificial neural network techniques **CO3.** Understand and define the fuzzy systems for problem solving. **CO4.** Understand and apply the concepts of genetic algorithms for problem solving. **CO5.** Identify and select a suitable Soft Computing method to solve the problem **CO6.** Identify and understand the role of soft computing models in various applications

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414451	**Elective V (Game Engineering)** **CO1.** Describe fundamentals of game engineering and the social- ethical issues in game development. **CO2.** Develop creative and critical thinking skills for designing compelling games. **CO3.** Apply game mechanics to make game more enjoyable. **CO4.** Analyze Games over Networks and Peer Effects. **CO5.** Demonstrate an understanding of various tools that are used in game development. **CO6.** Apply mathematical and game programming knowledge and skills to solve development tasks.
414452	**ElectiveVI (Ethical Hacking and Security)** **CO1.** Identify Ethical hacking processes and become acquainted with Penetration testing. **CO2.** Recognize Foot printing techniques and apply in real time applications **CO3.** Build knowledge about Meta sploit tool with Kali Linux **CO4.** Differentiate Privilege Escalation in Windows and Linux **CO5.** Construct Secure Web Applications to understand Hacking Techniques. **CO6.** Recognize Wifi Hacking and Security techniques.
414452	**Elective-VI (Augmented and Virtual Reality)** **CO1.** Analyze how Virtual Reality systems work. **CO2.** Understand the representation of Virtual world. **CO3.** Describe the importance of motion and tracking in VR systems. **CO4.** Analyze how AR systems work and list the applications of AR. **CO5.** Identify the working of various AR components and AR devices. **CO6.** Make use of computer vision concepts for AR.
414452	**Elective VI (Business Analytics and Intelligence)** **CO1.** Apply conceptual knowledge on how Business Intelligence is used in decision making process **CO2.** Use modelling concepts in Business Intelligence **CO3.** Understand and apply the concepts of business reports and analytics with the help of visualization for business performance management **CO4.** Comprehend the model-based decision making using prescriptive analytics **CO5.** Analyze the role of analytics and intelligence in Business **CO6.** Comprehend different Business Intelligence trends and its future impacts

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414452	**Elective-VI (Blockchain Technology)** **CO1.** Understand the concept of cryptography and decentralization. **CO2.** Acquire fundamental knowledge of blockchain with issues associated with it. **CO3.** Acquire knowledge of Ethereum blockchain platform. **CO4.** Understand hyper ledger fabric platform. **CO5.** Acquire the knowledge regarding working of tokenization. **CO6.** Describe the applications and risk involved
414453	**Startup and Entrepreneurship** 1. able to understand key concepts and framework of innovation and start-up ecosystem. 2. gain knowledge of how to develop start up ecosystem, its key components and how to influence and manage dynamics between them and increase the productivity of ecosystem. 3. understand the role of different stakeholders in ecosystem in building and supporting growth of start-ups. 4. have insight into global trend in start-up ecosystem and product development. 5. mapping different start-up ecosystems and developing performance indicators.
414454	**Lab Practice – V** 1. Demonstrate knowledge of the core concepts and techniques in distributed systems. 2. Learn how to apply principles of state-of-the-Art Distributed systems in practical application. 3. Design, build and test application programs on distributed systems
414455	**Lab Practice VI (Ethical Hacking and Security)** **CO1.** Perform internal and external vulnerability analysis on web application and network. **CO2.** Comprehend the hacker's mindset while conducting reconnaissance and system hacking. **CO3.** Implement industry standard security protocols to prevent cyber-attacks. **CO4.** Carry-out the same tactics, techniques, and procedures as actual hackers.

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414455	**Lab Practice VI (Augmented and Virtual Reality)**
414455	**Lab Practice VI (Business Analytics and Intelligence)** **CO1.** Compare and analyze different analytical tools used by businesses **CO2.** Understand the application of critical notion of KPI using real time case studies **CO3.** Design and implement the analytical models using suitable tools **CO4.** Create visualizations using suitable tools
414455	**Lab Practice VI (Blockchain Technology)** 1.To implement small blockchain experimentations. 2. Identify Consensus mechanism for Blockchain Application.
414456	**Project-II** 1. To apply engineering and mathematical knowledge to investigate / select proper technology / Algorithm suitable to solve the problem in hand. 2. To apply knowledge of statistics for analysis of results and express conclusion and justification for the same. 3. To design and conduct experiments, as well as to analyze and interpret data or develop prototype model of the application. 4. To communicate effectively. 5. Get broad education which is necessary to understand the impact of engineering solutions in a global, economic, environmental, ethically and societal context. 6. Recognition of the need for, and an ability to engage in life-long learning.
414457A	**Audit Course8** **Functional Programming in Haskell** **CO1.** Understand the correctness of programs. **CO2.** Make use of higher-order functions. **CO3.** Make use of the data encapsulation and parametric polymorphism for functional programming. **CO4.** Understand the importance of the 'type checking' of values/functions to develop programs relatively faster.
414457B	**Audit Course 8 Cyber Laws And Use Of Social Media** **CO1.**Understand the importance of IT Act. **CO2.**Understand the significance of cyber laws and its practices. **CO3.**Identify and Analyze software vulnerabilities and security solutions to reduce the risk of exploitation. **CO4.** To study various privacy and security concerns of Online social media.

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414457C	**Audit Course 8 Constitution Of India** **CO1.** Understand the Principles of the Indian Constitution. **CO2.** Understand and identify the growth of the demand for civil rights in India. **CO3.** Understand the organizations of governance. **CO4.** Understand the role and functions of local administration.

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"EMPOWERMENT THROUGH TECHNOLOGICAL EXCELLENCE"

GENBA SOPANRAO MOZE TRUST'S

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Department of Information Technology

Program Outcomes

Students are expected to know and be able to–		
PO1	Engineering knowledge	An ability to apply knowledge of mathematics, computing, science, engineering and technology.
PO2	Problem analysis	An ability to define a problem and provide a systematic solution with the help of conducting experiments, analyzing the problem and interpreting the data.
PO3	Design / Development of Solutions	An ability to design, implement, and evaluate software or a software /hardware system, component, or process to meet desired needs within realistic constraints.
PO4	Conduct Investigation of Complex Problems	An ability to identify, formulate, and provide essay schematic solutions to complex engineering /Technology problems.
PO5	Modern Tool Usage	An ability to use the techniques, skills, and modern engineering technology tools, standard processes necessary for practice as a IT professional.
PO6	The Engineer and Society	An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computerbased systems with necessary constraints and assumptions.
PO7	Environment and Sustainability	An ability to analyze and provide solution for the local and global impact of information technology on individuals, organizations and society.
PO8	Ethics	An ability to understand professional, ethical, legal, security and social issues and responsibilities.
PO9	Individual and Team Work	An ability to function effectively as an individual or as a team member to accomplish a desired goal(s).
PO10	Communication Skills	An ability to engage in life-long learning and continuing professional development to cope up with fast changes in the technologies /tools with the help of electives, profession along animations and extracurricular activities.

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PO11	Project Management and Finance	An ability to communicate effectively in engineering community at large by means of effective presentations, report writing, paper publications, demonstrations.
PO12	Life-long Learning	An ability to understand engineering, management, financial aspects, performance, optimizations and time complexity necessary for professional practice.

Program Specific Outcomes(PSO)

A graduate ofthe Information Technology Program will demonstrate -	
PSO1	Computing profession, and will be engaged in learning, understanding and applying new ideas and technologies
PSO2	Ability to design and implement software products by applying SDLC

Course Outcomes

SE 2015 PAT	
Course Code	**Subject: Sem-III**
214441	**DISCRETE STRUCTURES** 1. Use set, relation and function to formulate a problem and solve it 2. Use graph theory and trees to formulate the problems and solve them 3. Use mathematical propositions and proof techniques to check the truthfulness of a real life situation.
214442	**COMPUTER ORGANIZATION &ARCHITECTURE** 1. Solve problems based on computer arithmetic. 2. Explain processor structure & its functions. 3. Obtain knowledge about micro-programming of a processor. 4. Understand concepts related to memory & IO organization. 5. Acquire knowledge about instruction level parallelism & parallel organization of multiprocessors & multi core systems.

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214443	**DIGITAL ELECTRONICS AND LOGIC DESIGN** 1. Spectacle an awareness and apply knowledge of number systems, codes, Boolean algebra and use necessary A.C, D.C Loading characteristics as well as functioning while designing with logic gates. 2. Use logic function representation for simplification with K-Maps and analyze as well as design Combinational logic circuits using SSI & MSI chips. 3. Analyze Sequential circuits like Flip-Flops (Truth Table, Excitation table), their conversion & design the applications. 4. Identify the Digital Circuits, Input/Outputs to replace by FPGA 5. Use VHDL programming technique with different modeling styles for any digital circuits.

214444	**FUNDAMENTAL OF DATA STRUCTURES** 1. Apply appropriate constructs of C language, coding standards for application development. 2. Use dynamic memory allocation concepts and file handling in various application developments. 3. Perform basic analysis of algorithms with respect to time and space complexity 4. Select appropriate searching and/or sorting techniques in the application development 5. Select and use appropriate data structures for problem solving and programming 6. Use algorithmic foundations for solving problems and programming
214445	**PROBLEM SOLVING AND OBJECT ORIENTED PROGRAMMING** 1. Develop algorithms for solving problems by using modular programming concepts 2. Abstract data and entities from the problem domain, build object models and design software solutions using object-oriented principles and strategies 3. Discover, explore and apply tools and best practices in object-oriented programming. 4. Develop programs that appropriately utilize key object-oriented concepts

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214446	**DIGITAL LABORATORY** 1. Spectacle an awareness and apply knowledge and concepts and methods of digital system design techniques as hands-on experiments with the use of necessary A.C, D.C Loading characteristics. 2. Use logic function representation for simplification with K-Maps and analyze as well as design Combinational logic circuits using SSI & MSI chips. 3. Analyze Sequential circuits like Flip-Flops (Truth Table, Excitation table) & design the applications like Asynchronous and Synchronous Counters. 4. Design Sequential Logic circuits: Sequence generators, MOD counters with registers/Counters using synchronous /asynchronous counters. 5. Understand the need of skills, techniques and learn state-of-the-art engineering tools through hands-on experimentation on the Xilinx tools for design as well as the basics of VHDL. 6. Understand and implement the design Steps, main programming technique with different modeling styles for any digital circuits with VHDL Programming.
214447	**PROGRAMMING LABORATORY** 1. Apply appropriate constructs of C language, coding standards for application development. 2. Use dynamic memory allocation concepts and file handling in various application developments. 3. Perform basic analysis of algorithms with respect to time and space complexity 4. Select appropriate searching and/or sorting techniques in the application development 5. Select and use appropriate data structures for problem solving and programming 6. Use algorithmic foundations for solving problems and programming
214448	**OBJECT ORIENTED PROGRAMMING LABORATORY** 1. Develop and implement algorithms for solving simple problems using modular programming concept. 2. Abstract data and entities from the problem domain, build object models and design software solutions using object-oriented principles and strategies. 3. Discover, explore and apply tools and best practices in object-oriented programming. 4. Develop programs that appropriately utilize key object-oriented concepts 5. Create a data base using files

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214449	**COMMUNICATION SKILLS** 1. Provides an ability to understand, analyze and interpret the essentiality of grammar and its proper usage. 2. Build the students' vocabulary by means of communication via web, direct Communication and indirect communication. 3. Improves Students' Pronunciation skills and understanding between various phonetic sounds during communication. 4. Understanding the various rules and means of written communication. 5. Effective communication with active listening, facing problems while communication and how to overcome it.
Course Code	**Subject: Sem-IV**
207003	**ENGINEERING MATHEMATICS – III** 1. Linear differential equations of higher order applicable to Control systems, Computer vision, and Robotics. 2. Transform techniques such as Fourier transform, Z-transform and applications to Image processing. 3. Statistical methods such as correlation, regression analysis and probability theory to analyze data and to make predictions applicable to machine intelligence. 4. Vector calculus necessary to analyze and design complex electrical and electronic devices as appropriate to Computer engineering. 5. Complex functions, conformal mappings and contour integration applicable to Image processing, Digital filters and Computer graphics.Students will able to
214450	**COMPUTER GRAPHICS** 1. Apply mathematics and logic to develop Computer programs for elementary graphic operations 2. Develop scientific and strategic approach to solve complex problems in the domain of Computer Graphics 3. Develop the competency to understand the concepts related to Computer Vision and Virtual reality 4. Apply the logic to develop animation and gaming programs

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214451	**PROCESSOR ARCHITECTURE AND INTERFACING** 1. Learn architectural details of 80386 microprocessor 2. Understand memory management and multitasking of 80386 microprocessor 3. Understand architecture and memory organization of 8051microcontroller 4. Explain timers and interrupts of 8051 microcontroller and its interfacing with I/O devices
214452	**DATA STRUCTURES AND FILES** 1. Analyze algorithms and to determine algorithm correctness and time efficiency class. 2. Understand different advanced abstract data type (ADT) and data structures and their implementations. 3. Understand different algorithm design techniques (brute -force, divide and conquer, greedy, etc.) and their implementation 4. Apply and implement learned algorithm design techniques and data structures to solve problems.
214453	**FOUNDATIONS OF COMMUNICATION AND COMPUTER NETWORK** 1. Understand data/signal transmission over communication media 2. Recognize usage of various modulation techniques in communication 3. Analyze various spread spectrum and multiplexing techniques 4. Use concepts of data communication to solve various related problems 5. Understand error correction and detection techniques. 6. Acquaint with transmission media and their standards
214454	**PROCESSOR INTERFACING LABORATORY** 1. Learn and apply concepts related to assembly language programming 2. Write and execute assembly language program to perform array addition, code conversion, block transfer, sorting and string operations 3. Learn and apply interfacing of real world input and output devices to 8051 microcontroller

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214455	**DATA STRUCTURE AND FILES LABORATORY** 1. Apply and implement algorithm to illustrate use of linear data structures such as stack, queue 2. Apply and implement algorithms to create/represent and traverse non-linear data structures such as trees, graphs etc 3. Apply and implement algorithms to create and manipulate database using different file organizations 4. Learn and apply the concept of hashing in database creation and manipulation
214456	**COMPUTER GRAPHICS LABORATORY** 1. Apply and implement line drawing and circle drawing algorithms to draw specific shape given in the problem 2. Apply and implement polygon filling algorithm for a given polygon 3. Apply and implement 2-D and 3-D transformation algorithms for given input shape 4. Apply and implement polygon clipping algorithm for given input polygon 5. Apply and implement fractal generation algorithm for a given input 6. Apply and implement animation concepts for generating simple animation without using any animation tool

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Course Code	**Subject: Sem-V**
314441	**Theory of Computation** 1. To construct finite state machines to solve problems in computing. 2. To write mathematical expressions for the formal languages 3. To apply well defined rules for syntax verification. 4. To construct and analyze Push Down, Post and Turing Machine for formal languages. 5. To express the understanding of the decidability and decidability problems. 6. To express the understanding of computational complexity.
314442	**DATABASE MANAGEMENT SYSTEMS** 1. To define basic functions of DBMS & RDBMS. 2. To analyze database models & entity relationship models. 3. To design and implement a database schema for a given problem-domain. 4. To populate and query a database using SQL DML/DDL commands. 5. To Programming in PL/SQL including stored procedures, stored

	functions, cursors and packages. 6. To appreciate the impact of analytics and big data on the information industry and the external ecosystem for analytical and data services.
314443	**SOFTWARE ENGINEERING AND PROJECT MANAGEMENT** 1. To identify unique features of various software application domains and classify software applications. 2. To choose and apply appropriate lifecycle model of software development. 3. To describe principles of agile development, discuss the SCRUM process and distinguish agile process model from other process models. 4. To analyze software requirements by applying various modeling techniques. 5. To list and classify CASE tools and discuss recent trends and research in software engineering. 6. To understand IT project management through life cycle of the project and future trends in IT Project Management.
314444	**OPERATING SYSTEM** 1. Fundamental understanding of the role of Operating Systems. 2. To understand the concept of a process and thread. 3. To apply the cons of process/thread scheduling. 4. To apply the concept of process synchronization, mutual exclusion and the deadlock. 5. To realize the concept of I/O management and File system. 6. To understand the various memory management techniques.

314445	**HUMAN-COMPUTER INTERACTION** 1. To explain importance of HCI study and principles of user-centred design (UCD) approach. 2. To develop understanding of human factors in HCI design. 3. To develop understanding of models, paradigms and context of interactions. 4. To design effective user-interfaces following a structured and organized UCD process. 5. To evaluate usability of a user-interface design. 6. To apply cognitive models for predicting human-computer-interactions.

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314446	**SOFTWARE LABORATORY – I** 1. To install and configure database systems. 2. To analyze database models & entity relationship models. 3. To design and implement a database schema for a given problem-domain 4. To understand the relational and document type database systems. 5. To populate and query a database using SQL DML/DDL commands. 6. To populate and query a database using MongoDB commands
314447	**SOFTWARE LABORATORY – II** 1. To understand the basics of Linux commands and program the shell of Linux. 2. To develop various system programs for the functioning of operating system. 3. To implement basic building blocks like processes, threads under the Linux. 4. To develop various system programs for the functioning of OS concepts in user space like concurrency control and file handling in Linux. 5. To design and implement Linux Kernel Source Code. 6. To develop the system program for the functioning of OS concepts in kernel space like embedding the system call in any Linux kernel.
314448	**SOFTWARE LABORATORY – III** 1. To identify the needs of users through requirement gathering. 2. To apply the concepts of Software Engineering process models for project development. 3. To apply the concepts of HCI for user-friendly project development. 4. To deploy website on live webserver and access through URL. 5. To understand, explore and apply various web technologies. 6. To develop team building for efficient project development.

Course Code	Subject: Sem-VI
314450	**COMPUTER NETWORK TECHNOLOGY** 1. To know Responsibilities, services offered and protocol used at each layer of network. 2. To understand different addressing techniques used in network. 3. To know the difference between different types of network. 4. To know the different wireless technologies and IEEE standards. 5. To use and apply the standards and protocols learned, for application development. 6. To understand and explore recent trends in network domain.

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314451	**SYSTEMS PROGRAMMING** 1. To learn independently modern software development tools and creates novel solutions for language processing applications. 2. To design and implement assemblers and macro processors. 3. To use tool LEX for generation of Lexical Analyzer. 4. To use YACC tool for generation of syntax analyzer. 5. To generate output for all the phases of compiler. 6. To apply code optimization in the compilation process.
314452	**DESIGN AND ANALYSIS OF ALGORITHMS** 1. To calculate computational complexity using asymptotic notations for various algorithms. 2. To apply Divide & Conquer as well as Greedy approach to design algorithms. 3. To practice principle of optimality. 4. To illustrate different problems using Backtracking. 5. To compare different methods of Branch and Bound strategy. 6. To explore the concept of P, NP, NP-complete, NP-Hard and parallel algorithms.
314453	**CLOUD COMPUTING** 1. To understand the need of Cloud based solutions. 2. To understand Security Mechanisms and issues in various Cloud Applications 3. To explore effective techniques to program Cloud Systems. 4. To understand current challenges and trade-offs in Cloud Computing. 5. To find challenges in cloud computing and delve into it to effective solutions. 6. To understand emerging trends in cloud computing.
314454	**DATA SCIENCE AND BIG DATA ANALYTICS** 1. To understand Big Data primitives. 2. To learn and apply different mathematical models for Big Data. 3. To demonstrate their Big Data learning skills by developing industry or research applications. 4. To analyze each learning model come from a different algorithmic approach and it will perform differently under different datasets. 5. To understand needs, challenges and techniques for big data visualization. 6. To learn different programming platforms for big data analytics.

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314455	**SOFTWARE LABORATORY – IV** 1. To implement small size network and its use of various networking commands. 2. To understand and use various networking and simulations tools. 3. To configure various client/server environments to use application layer protocols 4. To understand the protocol design at various layers. 5. To explore use of protocols in various wired and wireless applications. 6. To develop applications on emerging trends.
314456	**SOFTWARE LABORATORY – V** 1. To design and implement two pass assembler for hypothetical machine instructions. 2. To design and implement different phases of compiler (Lexical Analyzer, Parser, Intermediate code generation) 3. To use the compile generation tools such as "Lex" and "YACC". 4. To apply algorithmic strategies for solving various problems. 5. To compare various algorithmic strategies. 6. To analyze the solution using recurrence relation.
314455	**SOFTWARE LABORATORY – VI** 1. To apply Big data primitives and fundamentals for application development. 2. To explore different Big data processing techniques with use cases. 3. To apply the Analytical concept of Big data using R/Python. 4. To visualize the Big Data using Tableau. 5. To design algorithms and techniques for Big data analytics. 6. To design Big data analytic application for emerging trends.
314458	**PROJECT BASED SEMINAR** 1. To Gather, organize, summarize and interpret technical literature with the purpose of formulating a project proposal. 2. To write a technical report summarizing state-of-the-art on an identified topic. 3. Present the study using graphics and multimedia presentations. 4. Define intended future work based on the technical review. 5. To explore and enhance the use of various presentation tools and techniques. 6. To understand scientific approach for literature survey and paper writing.

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Course Code	**Subject: Sem-I**

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414453	**Information and Cyber Security** 1. Use basic cryptographic techniques in application development. 2. Apply methods for authentication, access control, intrusion detection and prevention. 3. To apply the scientific method to digital forensics and perform forensic investigations. 4. To develop computer forensics awareness. 5. Ability to use computer forensics tools.
414454	**Machine Learning and Applications** 1. Model the learning primitives. 2. Build the learning model. 3. Tackle real world problems in the domain of Data Mining and Big Data Analytics, Information Retrieval, Computer vision, Linguistics and Bioinformatics.
414455	**Software Design and Modeling**
	1. Understand object oriented methodologies, basics of Unified Modeling Language (UML). 2. Understand analysis process, use case modeling, domain/class modeling 3. Understand interaction and behavior modeling. 4. Understand design process and business, access and view layer class design 5. Get started on study of GRASP principles and GoF design patterns. 6. Get started on study of architectural design principles and guidelines in the various type of application development.
414456A: Elective-I	**Wireless Communications**

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	1. Understand the basics of propagation of radio signals. 2. Understand the basic concepts of basic Cellular System and the design requirements. 3. Have an understanding of the basic principles behind radio resource management techniques such as power control, channel allocation and handoffs. 4. Gain insights into various mobile radio propagation models and how the diversity can be exploited to improve performance. 5. Gain knowledge and awareness of the technologies for how to effectively share spectrum through multiple access techniques i.e. TDMA, CDMA, FDMA etc. 6. Have in-depth understanding of the design consideration and architecture for different Wireless Systems like GSM, CDMA, GPRS etc. 7. Understanding of the emerging trends in Wireless communication like WiFi, WiMAX, Software Defined Radio (SDR) and related issues and challenges.
414456B: Elective-I	**Natural Language Processing**
	1. Understand automatic processing of human languages using computers. 2. Understand various applications of natural language processing.

414456C: Elective-I	**Usability Engineering**

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	1. Justify the theory and practice of usability evaluation approaches, methods and techniques. 2. Compare and evaluate strengths and weaknesses of various approaches, methods and techniques for evaluating usability. 3. Design and implement a usability test plan, based on modelling or requirements specification. 4. Choose appropriate approaches, methods and techniques to evaluate the usability of a specified interactive system.
414456D: Elective-I	**Multicore and Concurrent Systems**
	1. Know types of parallel machine and to know multicore and concurrent systems in detail. 2. Know the ways to measure the performance of multicore systems. 3. Understand need of multicore and concurrent system programming. 4. Know the different approaches for multicore and concurrent programming. 5. Use and apply the approaches learned, for application development. 6. Understand and explore recent trends in multicore and concurrent system programming.
414456E: Elective-I	**Business Analytics and Intelligence**
	1. Comprehend the Information Systems and development approaches of Intelligent Systems. 2. Evaluate and rethink business processes using information systems. 3. Propose the Framework for business intelligence. 4. Get acquainted with the Theories, techniques, and considerations for capturing organizational intelligence. 5. Align business intelligence with business strategy. 6. Apply the techniques for implementing business intelligence systems.

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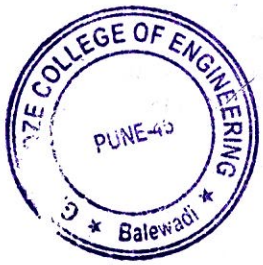
414457A: Elective-II	**Software Defined Networks**
	1. Acquire fundamental knowledge of SDN exploring the need, characteristics, and architecture of SDN. 2. Recognize OpenFlow protocols and its forwarding, pipeline model. 3. Understand different methodologies for sustainable SDN. 4. Comprehend IT Infrastructure for SDN. 5. Acquiring knowledge of OpenFlow protocols, visualization.
414457B: Elective-II	**Soft Computing**
	1. Tackle problems of interdisciplinary nature. 2. Find an alternate solution, which may offer more adaptability, resilience and optimization. 3. Gain knowledge of soft computing domain which opens up a whole new career option. 4. Tackle real world research problems.
414457C: Elective-II	**Software Testing and Quality Assurance**
	1. Test the software by applying testing techniques to deliver a product free from bugs. 2. Investigate the scenario and to select the proper testing technique. 3. Explore the test automation concepts and tools and estimation of cost, schedule based on standard metrics. 4. Understand how to detect, classify, prevent and remove defects. 5. Choose appropriate quality assurance models and develop quality. 6. Ability to conduct formal inspections, record and evaluate results of inspections.



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414457D: Elective-II	**Compiler Construction**
	1. Understand the structure of compilers. 2. Understand the basic and advanced techniques used in compiler construction.
	3. Understand the basic data structures used in compiler construction such as abstract syntax. 4. Cognitive skills (thinking and analysis)- Design and implement a compiler using a software engineering approach. 5. Communication skills (personal and academic). 6. Practical and subject specific skills (Transferable Skills) - Use generators (e.g. Lex and Yacc).
414457E: Elective-II	**Gamification**
	1. Write programs to solve problems using gamification and open source tools. 2. Apply gamification for Mobile and Web Applications. 3. Solve problems for multi-core or distributed, concurrent/Parallel environments
414458:	**Computer Laboratory VII**
	1. The students will be able to implement and port controlled and secured access to software systems and networks. 2. The students will be able to build learning software in various domains.
414459:	**Computer Laboratory VIII**

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	1. Draw, discuss different UML 2.0 diagrams, their concepts, notation, advanced notation, forward and reverse engineering aspects. 2. Identify different software artifacts used to develop analysis and design model from requirements. 3. Develop use case model. 4. Develop, implement analysis model and design model. 5. Develop, implement Interaction and behavior Model. 6. Implement an appropriate design pattern to solve a design problem.
414460:	**Project Phase-I**
	1. To show preparedness to study independently in chosen domain of Information Technology and programming languages and apply their acquired knowledge to variety of real time problem scenarios. 2. To function effectively as a team to accomplish a desired goal. 3. An understanding of professional, ethical, legal, security and social issues and responsibilities related to Information Technology Project.

414461:	**Audit Course-V**
414461A:	**Audit Course-V Emotional Intelligence**
	1) Expand your knowledge of emotional patterns in yourself and others. 2) Discover how you can manage your emotions, and positively influence yourself and others. 3) Build more effective relationships with people at work and at home. 4) Positively influence and motivate colleagues, team members, and managers. 5) Increase your leadership effectiveness by creating an atmosphere that engages others. 6) Apply EI behaviours and supports high performance

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414461B:	**Audit Course-V Green Computing**
	1) Understand the concept of green IT and relate it to sustainable development. 2) Apply the green computing practices to save energy. 3) Discuss how the choice of hardware and software can facilitate a more sustainable operation. 4) Use methods and tools to measure energy consumption
414461C:	**Audit Course-V Critical Thinking**
	1) If students whole-heartedly participate in the course, they can expect to be smarter, stronger and more confident thinkers. 2) They can embark on a life-long journey of "self-directed learning".
414461D:	**Audit Course-V Statistical Learning Model using**
	1) Students will be familiar with concepts related to "data science", "analytics", "machine learning", etc. These are important topics, and will enable students to embark on highly rewarding careers. 2) Students will capable of learning "big data" concepts on their own

414462:	**Distributed Computing System**

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	1. Understand the principles and desired properties of distributed systems based on different application areas. 2. Understand and apply the basic theoretical concepts and algorithms of distributed systems in problem solving. 3. Recognize the inherent difficulties that arise due to distributed-ness of computing resources. 4. Identify the challenges in developing distributed applications
414463:	**Ubiquitous Computing**
	1. Demonstrate the knowledge of design of Ubicomp and its applications. 2. Explain smart devices and services used Ubicomp. 3. Describe the significance of actuators and controllers in real time application design. 4. Use the concept of HCI to understand the design of automation applications. 5. Classify Ubicomp privacy and explain the challenges associated with Ubicomp privacy. 6. Get the knowledge of ubiquitous and service oriented networks along with Ubicomp management.
414464A:	**Elective III** **Internet of Things (IoT)**
	1. Explain what is internet of things. 2. Explain architecture and design of IoT. 3. Describe the objects connected in IoT. 4. Understand the underlying Technologies. 5. Understand the platforms in IoT. 6. Understand cloud interface to IoT.
414464A:	**Elective III** **Internet of Things Laboratory**

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	1. To understand IoT platforms such as Raspberry-Pi/Beagle board/Arduino. 2. To understand operating systems for platforms such as Raspberry Pi/Beagle board/Arduino. 3. To communicate with objects using IoT platforms such as Raspberry Pi/Beagle board/Arduino. 4. To interface cloud environment for IoT application. 5. To implement IoT related protocols such as MQTT / CoAP etc. 6. To implement the web interface for IoT

414464B:	**Elective III** **Information Storage and Retrieval**
	1. Understand the concept of Information retrieval. 2. Deal with storage and retrieval process of text and multimedia data. 3. Evaluate performance of any information retrieval system. 4. Design user interfaces. 5. Understand importance of recommender system. 6. Understand concept of multimedia and distributed information retrieval.
414464B:	**Information Storage and Retrieval Laboratory**
	1. Understand the concept, data structure and preprocessing algorithms of Information retrieval. 2. Deal with storage and retrieval process of text and multimedia data. 3. Evaluate performance of any information retrieval system. 4. Design user interfaces. 5. Understand importance of recommender system (Take decision on design parameters of recommender system). 6. Understand concept of multimedia and distributed information retrieval. 7. Map the concepts of the subject on recent developments in the Information retrieval field.
414464C:	**Elective III** **Multimedia Techniques**

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	1. To create own file formats for specific application. 2. To do some projects based on current trends in multimedia. 3. To use open sources for authoring tool for animation and presentations. 4. Understand some research areas of current multimedia techniques.
414464C:	**Multimedia Techniques Laboratory**
	1. To create own file formats for specific application. 2. To do some projects based on current trends in multimedia. 3. To use open sources for authoring tool for animation and presentations
414464D:	**Elective III** **Internet and Web Programming**

	1. Demonstrate static website using basic tools. 2. Develop client side programming skills. 3. Develop server side programming skills. 4. Understand web services and handle content management tools. 5. Develop mobile website using mobile web development tools. 6. Understand aspects of web security and cyber ethics.
414464D:	**Internet and Web Programming Laboratory**
	1. Use fundamental skills to develop and maintain website and web application. 2. Apply scripting skills for Server side and Client-side Programming. 3. Develop web services to transfer data and add interactive components to website. 4. Combine multiple web technologies to create advanced web components.
414464E:	**Elective III Computational Optimization**

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	1. Learn and implement various optimization techniques. 2. Learn model real-world problems in optimization framework. 3. Apply various optimization models to solve optimization problems in computer-science & IT Engineering.
414464E:	**Computational Optimization Laboratory**
	1. Understand Transportation problem. 2. Learn different measures in shortest path algorithms. 3. Understand and learn Queuing Model.
414465A:	**Elective IV** **Rural Technologies and Community Development**
	1. Understand rural development model. 2. Learn different measures in rural development and its impact on overall economy. 3. Understand and learn importance of technologies in rural and community development. 4. Understand challenges and opportunities in rural development.
414465B:	**Elective IV** **Parallel Computing**
	1. Understand fundamentals in parallel computing. 2. Understand and learn importance of technologies including different hardware structures used in parallel computing. 3. Understand challenges and opportunities in parallel computing

414464C:	**Elective IV** **Computer Vision**
	1. Implement fundamental image processing techniques required for computer vision. 2. Implement boundary tracking techniques. 3. Apply Hough Transform for line, circle, and ellipse detections. 4. Implement motion related techniques. 5. Develop skills to develop applications using computer vision techniques.

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414464D:	**Elective IV** **Social Media Analytics**
	1. Understand the basics of Social Media Analytics. 2. Explain the significance of Data mining in Social media. 3. Demonstrate the algorithms used for text mining. 4. Apply network measures for social media data. 5. Explain Behavior Analytics techniques used for social media data. 6. Apply social media analytics for Face book and Twitter kind of applications.
414465E:	**Elective IV** **Open Elective**
414466	**COMPUTER LABORATORY-IX**
	1. Demonstrate knowledge of the core concepts and techniques in distributed systems. 2. Learn how to apply principles of state-of-the-Art Distributed systems in practical application. 3. Design, build and test application programs on distributed systems.
414467:	**COMPUTER LABORATORY-X**
	1. Set up the Android environment and explain the Evolution of cellular networks. 2. Develop the User Interfaces using pre-built Android UI components. 3. Create applications for performing CURD SQLite database operations using Android. 4. Create the smart android applications using the data captured through sensors. 5. Implement the authentication protocols between two mobile devices for providing. Security.

	6. Analyze the data collected through android sensors using any machine learning algorithm.
414468:	**Project Work**
	1. Learn teamwork. 2. Be well aware about Implementation phase. 3. Get exposure of various types of testing methods and tools. 4. Understand the importance of documentation.
414461:	**Audit Course-VI**
414469A:	Audit Course-VI IoT Applications in Engineering Field.
	By the end of the course, students should be able to 1. Expand your knowledge of Internet of Things. 2. Discover how you can use IoT in your Engineering applications. 3. Build more effective hands on with IoT elements. 4. Expand the practical knowledge of using IoT components like sensors, processors. 5. Expand the understanding of using different protocols.
414469B:	Audit Course-VI Entrepreneurship
	1. Expand your knowledge of Entrepreneurship & Startups. 2. Discover how you can use Entrepreneur Qualities. 3. Expand the practical knowledge of Finance, Legal-Patents, Intellectual Property, and Business Associations. 4. Expand the understanding of Deliverables & Achieving Target.
414469C:	Audit Course-VI Cognitive computing

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	1. Understand and discuss what cognitive computing is, and how it differs from traditional approaches. 2. Plan and use the primary tools associated with cognitive computing. 3. Plan and execute a project that leverages cognitive computing. 4. Understand and discuss the business implications of cognitive computing.
414469D:	Audit Course-VI AI and Robotics 1. The goal of this course is to familiarize the students with the basic concepts of robotics, artificial intelligence and intelligent machines. 2. It will help students to understand and apply principles, methodology and techniques of intelligent systems to robotics.

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Balewadi, Pune - 411045.

Department of Artificial Intelligence and Machine Learning

Academic Year 2023-24

Bachelor of Artificial Intelligence(AI) & Machine Learning(ML)

Program Educational Objectives (PEO)

PEO1	**Possess strong fundamental concepts in mathematics, science, engineering and Technology to address technological challenges.**
PEO2	**Possess knowledge and skills in the field of AI & ML for analyzing, designing and implementing complex engineering problems of any domain with innovative approaches.**
PEO3	**Possess an attitude and aptitude for research, entrepreneurship and higher studies in the field of Artificial Intelligence & Machine Learning**
PEO4	**Have commitment to ethical practices, societal contributions through communities and life-long learning.**
PEO5	**Possess better communication, presentation, time management and teamwork skills leading to responsible & competent professionals and will be able to address challenges in the field of AI & ML at global level.**

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Department of Artificial Intelligence and Machine Learning

Academic Year 2023-24

Program Outcomes

Students are expected to know and be able to–

PO1	Engineering knowledge	An ability to apply knowledge of mathematics, computing, science, engineering and technology.
PO2	Problem analysis	An ability to define a problem and provide a systematic solution with the help of conducting experiments, analyzing the problem and interpreting the data.
PO3	Design / Development of Solutions	An ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints.
PO4	Conduct Investigations of Complex Problems	An ability to identify, formulates, and provides systematic solutions to complex engineering/Technology problems.
PO5	Modern Tool Usage	An ability to use the techniques, skills, and modern engineering technology tools, standard processes necessary for practice as a IT professional.
PO6	The Engineer and Society	An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer- based systems with necessary constraints and assumptions.
PO7	Environment and Sustainability	An ability to analyze and provide solution for the local and global impact of information technology on individuals, organizations and society.
PO8	Ethics	An ability to understand professional, ethical, legal, security and social issues and responsibilities.
PO9	Individual and Team Work	An ability to function effectively as an individual or as a team member to accomplish a desired goal(s).
PO10	Communication Skills	An ability to engage in life-long learning and continuing professional development to cope up with fast changes in the technologies/tools with the help of electives, professional organizations and extra-curricular activities.
PO11	Project Management and Finance	An ability to communicate effectively in engineering community at large by means of effective presentations, report writing, paper publications, demonstrations.
PO12	Life-long Learning	An ability to understand engineering, management, financial aspects, performance, optimizations and time complexity necessary for professional practice.

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Program Outcomes: -

1. **Engineering Knowledge:** An ability to apply knowledge of computing, mathematics, science and engineering fundamentals in understanding complex mechanical systems.
2. **Problem Analysis:** An ability to identify and analyzed the complex engineering problems and provide solutions by using principles of engineering science, mathematics and computational / numerical methods.
3. **Design/ Development of solutions:** An ability to design solutions for thermal, hydraulic & machining systems and design components and processes that meet the specified needs with appropriate consideration for safety, societal and environmental aspects.
4. **Conduct investigation of complex problems:** An ability to investigate solutions of complex problems by conducting experiments, simulating, computing and analyzing data to provide valid findings and conclusions.
5. **Modern tool usage:**An ability to use modern engineering tools and technologies necessary for obtaining quick, economical and accurate solutions of engineering problems and understanding their limitations.
6. **The engineer and society:** An ability to analyze the local and global impact of mechanical systems on individuals, organizations and society.
7. **Environment and sustainability:** An ability to understand the environmental issues and provide the solutions for sustainable development of the system.
8. **Ethics:**An ability to understand professional and ethical responsibility through soft skill development.
9. **Individual and team work:** An ability to function effectively as an individual or as a team member to accomplish the goal.
10. **Communication:** An ability to communicate effectively at technical and management levels using both written and oral communication.
11. **Project management and finance:** An ability to apply technical and management skills to develop one's own work as a member and leader in a team to manage projects and in multidisciplinary environments.
12. **Lifelong learning:** Recognize the need of industry and develop ability to keep up-to-date with contemporary technologies through lifelong learning.

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Program Specific Outcomes:

1. An ability to apply the principle to fabrication, test and documentation of mechanical system and process
2. To develop ability to design, development, implementation of more advanced mechanical systems or process
3. Be prepared to work professionally in either thermal or mechanical system areas.

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