



**Sinhgad Technical Education Society's  
Sinhgad Academy of Engineering, Kondhwa (Bk), Pune**

**Programme and course outcomes for all Programmes offered by the institution are stated and displayed on website and communicated to teachers and students.**

**Department of CivilEngineering**

<b>Class</b>	<b>Subject Code</b>	<b>Subject Name</b>	<b>Course outcomes</b>
<b>SE</b>	<b>201001</b>	<b>Building Technology and Architectural Planning</b>	<ol style="list-style-type: none"> <li>1. Identify types of building and basic requirements of building components.</li> <li>2. Make use of Architectural Principles and Building byelaws for building construction.</li> <li>3. Plan effectively various types of Residential Building forms according to their utility, functions with reference to National Building Code.</li> <li>4. Plan effectively various types of Public Buildings according to their utility functions with reference to National Building Code.</li> <li>5. Make use of Principles of Planning in Town Planning, Different Villages and Safety aspects.</li> <li>6. Understand different services and safety aspects</li> </ol>
<b>SE</b>	<b>201002</b>	<b>Mechanics of Structures</b>	<ol style="list-style-type: none"> <li>1. Understand concept of stress-strain and determine different types of stress, strain in determinate, indeterminate homogeneous and composite structures.</li> <li>2. Calculate shear force and bending moment in determinate beams for different loading conditions and illustrate shear force and bending moment diagram.</li> <li>3. Explain the concept of shear and bending stresses in beams and demonstrate shear and bending stress distribution diagram.</li> <li>4. Use theory of torsion to determine the stresses in circular shaft and understand concept of Principal stresses and strains.</li> <li>5. Analyze axially loaded and eccentrically loaded column.</li> <li>6. Determine the slopes and deflection of determinate beams and trusses.</li> </ol>

SE	201003	<b>Fluid Mechanics</b>	<ol style="list-style-type: none"> <li>1. Understand the use of Fluid Properties, concept of Fluid statics, basic equation of Hydrostatics, measurement of fluid pressure, buoyancy &amp; floatation and its application for solving practical problems.</li> <li>2. 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</li> <li>3. Understand the concept of Dimensional analysis using Buckingham's <math>\pi</math> theorem, Similarity &amp; Model Laws and boundary layer theory and apply it for solving practical problems of fluid flow.</li> <li>4. 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.</li> <li>5. 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.</li> <li>6. 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.</li> </ol>
SE	207001	<b>Engineering Mathematics III</b>	<ol style="list-style-type: none"> <li>1. Solve Higher order linear differential equations and its applications to modelling and analysing Civil engineering problems such as bending of beams, whirling of shafts and mass spring systems.</li> <li>2. Solve System of linear equations using direct &amp; iterative numerical techniques and develop solutions for ordinary differential equations using single step &amp; multistep methods applied to hydraulics, geotechnics and structural systems.</li> <li>3. Apply Statistical methods like correlation, regression and probability theory in data analysis and predictions in civil engineering.</li> <li>4. Perform Vector differentiation &amp; integration, analyze the vector fields and apply to fluid flow problems.</li> <li>5. Solve Partial differential equations such as wave equation, one and two dimensional heat flow equations.</li> </ol>

SE	207003	<b>Engineering Geology</b>	<ol style="list-style-type: none"> <li>1. 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.</li> <li>2. 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.</li> <li>3. Recognize effect of plate tectonics, structural geology and their significance and utility in civil engineering activities.</li> <li>4. 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.</li> <li>5. Assess the Importance of geological nature of the site, precautions and treatments to improve the site conditions for dams, reservoirs, and tunnels.</li> <li>6. Explain geological hazards and importance of ground water and uses of common building stones.</li> </ol>
SE	201008	<b>Geotechnical Engineering</b>	<ol style="list-style-type: none"> <li>1. Identify and classify the soil based on the index properties and its formation process</li> <li>2. Explain permeability and seepage analysis of soil by construction of flow net.</li> <li>3. Illustrate the effect of compaction on soil and understand the basics of stress distribution.</li> <li>4. Express shear strength of soil and its measurement under various drainage conditions.</li> <li>5. Evaluate the earth pressure due to backfill on retaining structures by using different theories.</li> <li>6. Analysis of stability of slopes for different types of soils.</li> </ol> <p><b>Course Contents</b></p>
SE	201009	<b>Surveying</b>	<ol style="list-style-type: none"> <li>1. Define and Explain basics of plane surveying and differentiate the instruments used for it.</li> <li>2. Express proficiency in handling surveying equipment and analyse the surveying data from these equipment.</li> <li>3. Describe different methods of surveying and find relative positions of points on the surface of earth.</li> <li>4. Execute curve setting for civil engineering projects such as roads, railways etc.</li> <li>5. Articulate advancements in surveying such as space based positioning systems</li> </ol>

			6. Differentiate map and aerial photographs, also interpret aerial photographs.
SE	201010	Concrete Technology	<ol style="list-style-type: none"> <li>1. Able to select the various ingredients of concrete and its suitable proportion to achieved desired strength.</li> <li>2. Able to check the properties of concrete in fresh and hardened state.</li> <li>3. Get acquainted to concreting equipments, techniques and different types of special concrete.</li> <li>4. Able to predict deteriorations in concrete and get acquainted to various repairing methods and techniques.</li> </ol>
SE	201011	Structural Analysis	<ol style="list-style-type: none"> <li>1. Understand the basic concept of static and kinematic indeterminacy and analysis of indeterminate beams.</li> <li>2. Analyze redundant trusses and able to perform approximate analysis of multi-story multi-bay frames.</li> <li>3. Implement application of the slope deflection method to beams and portal frames.</li> <li>4. Analyze beams and portal frames using moment distribution method.</li> <li>5. Determine response of beams and portal frames using structure approach of stiffness matrix method.</li> <li>6. Apply the concepts of plastic analysis in the analysis of steel structures.</li> </ol>
SE	201012	Project Management	<ol style="list-style-type: none"> <li>1. <b>Describe</b> project life cycle and the domains of Project Management.</li> <li>2. <b>Explain</b> networking methods and their applications in planning and management</li> <li>3. <b>Categorize</b> the materials as per their annual usage and also <b>Calculate</b> production rate of construction equipment</li> <li>4. <b>Demonstrates</b> resource allocation techniques and <b>apply</b> it for manpower planning.</li> <li>5. <b>Understand</b> economical terms and different laws associated with project management</li> <li>6. <b>Apply</b> the methods of project selection and <b>recommend</b> the best economical project.</li> </ol>
SE	201017	Project Based Learning	<ol style="list-style-type: none"> <li>1. Identify the community/ practical/ societal needs and convert the idea into a product/ process/ service.</li> <li>2. Analyse and design the physical/ mathematical/ ICT model in order to solve identified problem/project.</li> <li>3. Create, work in team and applying the solution in practical way to specific problem.</li> </ol>
TE	301001	Hydrology and water	Various components of hydrologic cycle that affect the movement of water in the earth

		<b>resource engineering.</b>	<p>Various Stream flow measurements technique</p> <p>The concepts of movement of ground water beneath the earth</p> <p>The basic requirements of irrigation and various irrigation techniques, requirements of the crops</p> <p>Basic components of reservoir planning works.</p> <p>Apply mathematics, science, and technology in the field of water resource Engineering</p>
<b>TE</b>	<b>301002</b>	<b>Infrastructure Engineering and Construction Techniques</b>	<p>To understand the meaning and scope of Infrastructure Engineering, basic concepts of Railway Engineering.</p> <p>To understand and study the various details of Railway Engineering.</p> <p>To understand and study the various Construction Techniques.</p> <p>Get acquainted Tunneling construction methods.</p> <p>To study the various types of Docks &amp; Harbors.</p> <p>To know and understand the various Construction Equipments.</p>
<b>TE</b>	<b>301003</b>	<b>Structural Design-I</b>	<p>Student should able to understand the Philosophy of limit state design &amp; To understand the design of various Tension members.</p> <p>Student should able to understand the design of various Compression members in steel Structure.</p> <p>Student should able to understand the design of various column bases in steel Structure</p> <p>Student should able to understand the design of Beam and beam to column.</p> <p>Student should able to understand the design of Welded plate girder in steel Structure</p> <p>Students are able to acquire the knowledge and skill of analyzing different Types of Trusses and design.</p>
<b>TE</b>	<b>301004</b>	<b>Structural Analysis-II</b>	<p>Graduates should understand analysis of beams and frames by slope and deflection method</p> <p>Graduates should understand analysis of beams and portal frames by moment distribution method</p> <p>Graduates should be able to learn fundamental concepts of flexibility method of analysis</p> <p>Graduates should learn about the fundamental</p>

			<p>concepts of stiffness method of analysis</p> <p>To learn Finite Difference Method &amp; Approximate methods of analysis of multi-storied</p> <p>Graduates should analysis Finite element method &amp; shape functions</p>
<b>TE</b>	<b>301005</b>	<b>Fluid Mechanics-II</b>	<p>Study the flow around the Streamlined Structure</p> <p>Understand the concept for open channel section and criteria for Economical section</p> <p>Design of hydraulic parameter of Open channel</p> <p>Design and understand the capacity of pump and its functioning</p> <p>Design and understand the capacity of Turbine and its functioning</p> <p>Understand concept and design energy dissipation of GVF and RVF</p>
<b>TE</b>	<b>301007</b>	<b>Advanced Surveying</b>	<p>Student should able to understand the concept of trigonometric leveling and shouldable to apply various corrections with handling the instrument.</p> <p>Student should able to use Nautical Sextant to measure angles on field.</p> <p>Student should able to understand concepts of Aerial photogrammetry and remote sensing and adjustment of geodetic quadrilateral.</p>
<b>TE</b>	<b>301008</b>	<b>Project Management and Engineering Economics</b>	<p>Enable them to formulate and analyze project management and engineering economics problems</p> <p>To enable them to plan and schedule the projects</p> <p>To aware about various resources available and to plan site while considering various parameters</p> <p>To explain them concept of project monitoring and</p>

			<p>controlling</p> <p>To learn the concepts of economics and enable them to use in projects.</p> <p>To describe project appraisal and various terminologies associated with it.</p>
<b>TE</b>	<b>301009</b>	<b>Foundation Engineering</b>	<p>Identify a suitable foundation system for a structure.</p> <p>Evaluate the importance of raft foundation and principles of design for buildings and tower structures.</p> <p>Analyse and design pile foundations.</p> <p>Examine and discuss various machine foundations</p> <p>Analyse and design Sheet piles and cofferdams.</p>
<b>TE</b>	<b>301010</b>	<b>Structural Design-II</b>	<p>Able to know about various design philosophy in RC structure</p> <p>Able to design the one way slab and will know about the design philosophy of rectangular RC section</p> <p>Able to design the two way slab and staircase</p> <p>Able to design the flexural member for flexure</p> <p>Able to design the flexural member for shear bond and torsion and will know about the redistribution of moments in RC beam</p> <p>Able to design short column and isolated footing</p>
<b>TE</b>	<b>301011</b>	<b>Environmental Engineering -I</b>	<p>Know about Noise Pollution, Air Pollution and Solid Waste Management.</p> <p>Know about Water supply scheme and quality and demand of water.</p> <p>Understand the principles of water treatment</p>

			<p>operations and processes (Aeration and sedimentation).</p> <p>Understand the principles of Coagulation, Flocculation and Filtration.</p> <p>Understand the mechanism of Disinfection and Water softening.</p> <p>Understand the Water distribution system and Rainwater harvesting.</p>
<b>BE</b>	<b>401001</b>	<b>Environmental Engineering II</b>	<p>Graduates should understand brick and block masonry construction.</p> <p>Graduates should be able to learn types, suitability and construction details of various flooring and roofing material.</p> <p>Graduates should be able to learn types, suitability and construction details of various flooring and roofing material.</p> <p>Graduates should learn about installation, specification and types of doors, windows arches and lintels.</p> <p>Graduates should gain knowledge of planning, design and construction of various vertical circulations.</p> <p>Graduates should demonstrate awareness of safety in construction. Should gain detail knowledge about various miscellaneous material.</p>
<b>BE</b>	<b>401002</b>		<p>To comprehend the concepts of road development, road alignment and preparation of highway project.</p> <p>To design cross section elements, sight distance, horizontal and vertical alignment. Study, analysis and design of curves and grades.</p> <p>To implement traffic studies, traffic regulations and control, and intersection design</p> <p>To be aware of pavement materials and their</p>



			<p>properties.</p> <p>To become familiar with Design flexible and rigid pavements.</p> <p>To Understand the principles of construction and maintenance of highways</p>
<b>BE</b>	<b>401 003</b>	<b>Structural Design and Drawing III</b>	<p>Application of different specification of IS-1343:2012 for prestressed concrete</p> <p>Able to differentiate between pretensioning and post tensioning systems</p> <p>Safely achieved by varying the sections that is proving thin slabs and avoiding beams.</p> <p>Understand and designing of soil retaining structures.</p> <p>Understand and design of liquid retaining structures.</p> <p>Able to analyse and design framed structures, Application of IS 1893 for earthquake resistant design of structures.</p>
<b>BE</b>	<b>401004</b>	<b>ARCHITECTURE AND TOWN PLANNING</b>	<p>Graduates should gain and understand basic concepts of town planning.</p> <p>Graduates should be able to understand landscape architecture.</p> <p>Graduates should be able to understand the concept of urban design, sustainable development and city development.</p> <p>Graduates should able to understand the planning agencies and traffic transportation system.</p> <p>Graduates should be able to understand smart city approach</p>
<b>BE</b>	<b>401004</b>	<b>Advanced Concrete Technology</b>	<p>To understand the basic concepts of Cement &amp; Concrete.</p>

			<p>To understand and study the various types of special Concrete.</p> <p>To understand and study the Mix design of special concrete.</p> <p>To study the basic concept of fibre reinforced concrete</p> <p>To study the various special fibre reinforced concrete.</p> <p>To know and understand the various properties of Ferrocement.</p>
<b>BE</b>	<b>401 005</b>	<b>Total Quality Management</b>	<p>To understand the concept of Quality</p> <p>To understand the Implication of Quality on Business</p> <p>To Implement Quality Implementation Programs</p> <p>To have exposure to challenges in Quality Improvement Programs</p>
<b>BE</b>	<b>401007</b>	<b>Dams and Hydraulics structure</b>	<p>Graduate should understand importance of dam, social issue, climatic effects and health monitoring of dams.</p> <p>Student should able to design, analyze gravity dam, spillways and design the same, operation of gates.</p> <p>Student should gain the field knowledge of spillway and operation of gates and design.</p> <p>Student should understand the necessarily of earthen dams and its design.</p> <p>Student should get knowledge with various hydraulic structures such as canals, river training works.</p>
<b>BE</b>	<b>401008</b>	<b>Quantity Surveying, Contracts and tenders</b>	<p>Student should able to understand the purpose of estimating and mode of measurements.</p>

			<p>Student should able to understand the methods of taking out quantities using IS 1200 rules.</p> <p>Student should able to understand the specifications and analysis of rates.</p> <p>Student should able to evaluate values of building.</p> <p>Student should able to understand and fill tenders.</p> <p>Student should able to understand the contracts and conditions of contracts.</p>
<b>BE</b>	<b>401 009</b>	<b>Air Pollution and Pollution</b>	<p>Introduction of major problems in indoor air pollution and control, regulations</p> <p>Familiar with regulations pertinent to air pollutions</p> <p>Describe general air pollution problems, meteorological definitions, air transport equations and pollution control matters and devices</p> <p>The contents involved the knowledge of causes of air pollution.</p> <p>The contents involved the knowledge of health related to air pollution.</p> <p>To develop skills relevant to control of air pollution.</p>
<b>BE</b>	<b>401 010</b>	<b>Construction Management</b>	<p>To apply business and management skills in positions within the construction industry.</p> <p>To apply technical skills and knowledge in mathematics, science, construction, and technology in support of planning, analyzing, and solving construction problems.</p> <p>To use industry resources including associations and organizations, professional publications, and governmental data to analyze, evaluate, and apply current trends within the industry.</p>

			<p>To manage a quality construction project from start to completion while maintaining budget, schedule, and safety requirements..</p> <p>To analyze, evaluate, and select computer applications for the purpose of efficient and effective project management.</p>
--	--	--	---

### Department of Computer Engineering

Class	Subject Code	Subject Name	Course outcomes
SE	210242	Discrete Mathematics	<p><b>CO1: Formulate</b> problems precisely, solve the problems, apply formal proof techniques, and explain the reasoning clearly.</p> <p><b>CO2: Apply</b> appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts.</p> <p><b>CO3: Design and analyze</b> real world engineering problems by applying set theory, propositional logic and to construct proofs using mathematical induction.</p> <p><b>CO4: Specify, manipulate and apply</b> equivalent relations; construct and use functions and apply these concepts to solve new problems.</p> <p><b>CO5: Calculate</b> numbers of possible outcomes using permutations and combinations; to model and analyze computational processes using combinatorics.</p> <p><b>CO6: Model and solve</b> computing problems using tree and graph and solve problems using appropriate algorithms.</p> <p><b>CO7: Analyze</b> the properties of binary operations, apply abstract algebra in coding theory and evaluate the algebraic structures.</p>
SE	210242:	Fundamentals of Data Structures	<p><b>CO1: Design</b> the algorithms to solve the programming problems, <b>identify</b> appropriate algorithmic strategy for specific application, and <b>analyze</b> the time and space complexity.</p> <p><b>CO2: Discriminate</b> the usage of various structures, <b>Design/Program/Implement</b> the</p>

			<p>appropriatedatastructures;usetheimplementationsofabstractdatatypesandIdentitytheappropriatedatastructureinapproachingtheproblemsolution.</p> <p><b>CO3: Demonstrate</b> use of sequential data structures- Array and Linked lists to store and processdata.</p> <p><b>CO4:</b> <b>Understand</b>thecomputationalefficiencyofthepincipalalgorithmsforsearchingandsortingandchoosethemostefficientonefortheapplication.</p> <p><b>CO5: Compareandcontrast</b>differentimplementationsofdatastructures(dynamicandstatic)</p> <p><b>CO6: Understand, Implement and apply</b> principles of data structures-stack and queue to solvecomputationalproblems.</p>
SE	210243	<b>ObjectOrientedProgramming(OOP)</b>	<p><b>CO1: Apply</b>constructs- sequence,selectionanditeration;classesandobjects,inheritance,useofpredefinedclassesfromlibraries whiledeveloping software.</p> <p><b>CO2: Design</b>object-orientedolutionsforsmallsystemsinvolvingmultipleobjects.</p> <p><b>CO3:</b> <b>Use</b>virtualandpurevirtualfunctionandcomplexprogramming situations.</p> <p><b>CO4:</b> <b>Apply</b>object-orientedsoftwareprinciplesinproblemsolving.</p> <p><b>CO5: Analyze</b>thestrengthsofobject-orientedprogramming.</p> <p><b>CO6: Develop</b>theapplicationusingobjectorientedprogramminglanguage(C++).</p>
SE	210244	<b>ComputerGraphics</b>	<p><b>CO1: Identify</b>thebasicterminologiesofComputerGraphicsandinterpretthematematicalfoundationoftheconceptsofcomputergraphics.</p> <p><b>CO2: Apply</b>mathematicstodevelopComputerprogramsforelementarygraphicoperations.</p> <p><b>CO3: Illustrate</b>theconceptsof windowingandclippingand<b>apply</b>variousalgorithmstofillandclippolygons.</p> <p><b>CO4: Understandandapply</b>thecoreconcepts ofcomputergraphics,includingtransformationintwo andthreedimensions,viewingandprojection.</p> <p><b>CO5: Understand</b>theconceptsofcolormodel</p>

			s, lighting, shading models and hidden surface elimination. <b>CO6: Create</b> effective programs using soft of curves, fractals, animation and gaming.
SE	210245	Digital Electronics and Logic Design	<b>CO1: Simplify</b> Boolean Expressions using K Map <b>CO2: Design and implement</b> combinational circuits <b>CO3: Design and implement</b> sequential circuits. <b>CO4: Develop</b> simple real-world application using ASM and PLD. <b>CO5: Differentiate and Choose</b> appropriate logic families IC packages as per the given design specifications. <b>CO6: Explain</b> organization and architecture of computer system
SE	207003	Engineering Mathematics III	CO1: Solve Linear differential equations, essential in modelling 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 of 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 solution of ordinary differential equations used in modern scientific computing.
SE	210252	Data Structures and Algorithms	CO1: <b>Identify and articulate</b> the complexity goals and benefits of a good hashing scheme for real-world applications. CO2: <b>Apply</b> non-linear data structures for solving problems of various domain. CO3: <b>Design and specify</b> the operations of a non-linear-based abstract data type and implement them in a high-level programming language. CO4: <b>Analyze</b> the algorithmic solutions for resource requirements and optimization CO5: <b>Use</b> efficient indexing methods and multiway search

			<p>chtechniquetostoreand maintaindata.  CO6:Useappropriate moderntoolstounderstandandanalyzethefunctionalitiesconfinedtothesecondarystorage.</p>
SE	210253	Software Engineering	<p><b>CO1: Analyze</b> software requirements and formulate design solution for a software.  <b>CO2: Design</b> applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.  <b>CO3: Apply</b> 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.  <b>CO4: Model</b> and design User interface and component-level.  <b>CO5: Identify</b> and handle risk management and software configuration management.  <b>CO6: Utilize</b> knowledge of software testing approaches, approaches to verification and validation.  <b>CO7: Construct</b> 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.</p>
SE	210254	Microprocessor	<p><b>CO1: Exhibit</b> skill of assembly language programming for the application.  <b>CO2: Classify</b> Processor architectures.  <b>CO3: Illustrate</b> advanced features of 80386 Microprocessor.  <b>CO4: Compare and contrast</b> different processor modes.  <b>CO5: Use</b> interrupts mechanism in applications  <b>CO6: Differentiate</b> between Microprocessors and Microcontrollers.  <b>CO7: Identify and analyze</b> the tools and techniques used to design, implement, and debug microprocessor-based systems.</p>
SE	210255	Principles of Programming	<p>CO1: <b>Make use of</b> basic principles of programming languages.  CO2: <b>Develop</b> a program with Data representation and C</p>

		<b>ngLanguages</b>	<p>omputations.</p> <p>CO3:<b>Develop</b> programs using Object Oriented Programming language : Java.</p> <p>CO4:<b>Develop</b> application using inheritance, encapsulation, and polymorphism.</p> <p>CO5:<b>Demonstrate</b> Multithreading for robust application development.</p> <p>CO6:<b>Develop</b> a simple program using basic concepts of Functional and Logical programming paradigm.</p>
<b>TE</b>	310241	Theory of Computation	<p>CO1: Able to design deterministic Turing machine for all inputs all outputs</p> <p>CO2: Able to subdivide problem space based on input subdivision using constraints</p> <p>CO3: Able to apply linguistic theory</p>
<b>TE</b>	310242	Database Management Systems	<p>CO1: Design E-R Model for given requirements and convert the same into database tables.</p> <p>CO2: Use database techniques such as SQL &amp; PL/SQL.</p> <p>CO3: Use modern database techniques such as NOSQL.</p> <p>CO4: Explain transaction Management in relational database System.</p> <p>CO5: Describe different database architecture and analyses the use of appropriate architecture in real time environment.</p> <p>CO6: Students will be able to use advanced database Programming concepts Big Data – HADOOP</p>
<b>TE</b>	310243	Software Engineering and Project Management	<p>CO1: Decide on a process model for a developing a software project</p> <p>CO2: Classify software applications and Identify unique features of various domains</p> <p>CO3: Design test cases of a software system.</p> <p>CO4: Understand basics of IT Project management.</p> <p>CO5: Plan, schedule and execute a project considering the risk management.</p> <p>CO6: Apply quality attributes in software development life cycle.</p>



<b>TE</b>	310244	Information Systems and Engineering Economics	<p>CO1: Understand the need, usage and importance of an Information System to an organization.</p> <p>CO2: Understand the activities that are undertaken while managing, designing, planning, implementation, and deployment of computerized information system in an organization.</p> <p>CO3: 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</p> <p>CO4: Outline the past history, present position and expected performance of a company engaged in engineering practice or in the computer industry.</p> <p>CO5: Perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives.</p> <p>CO6: Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.</p>
<b>TE</b>	310245	Computer Networks	<p>CO1: Analyze the requirements for a given organizational structure to select the most appropriate networking architecture and technologies</p> <p>CO2: Demonstrate LAN and WAN protocol behavior using Modern Tools.</p> <p>CO3: Analyze data flow between peer to peer in an IP network using Application, Transport and Network Layer Protocols.</p> <p>CO4: Illustrate applications of Computer Network capabilities, selection and usage for various sectors of user community.</p> <p>CO5: Develop Client-Server architectures and prototypes by the means of correct standards and technology.</p>
<b>TE</b>	310250	Design and Analysis of Algorithms	<p>CO1: Formulate the problem</p> <p>CO2: Analyze the asymptotic performance of algorithms</p> <p>CO3: Decide and apply algorithmic strategies to solve given problem</p> <p>CO4: Find optimal solution by applying various methods</p>
	310251	Systems Programming and	<p>CO1: Analyze and synthesize system software • Use tools like LEX &amp; YACC.</p> <p>CO2: Implement operating system functions.</p>

		Operating System	
<b>TE</b>	310252	Embedded Systems and Internet of Things	CO1: Implement an architectural design for IoT for specified requirement CO2: Solve the given societal challenge using IoT CO3: Choose between available technologies and devices for stated IoT challenge
<b>TE</b>	310253	Software Modeling and Design	CO1: Analyze the problem statement (SRS) and choose proper design technique for designing web-based/ desktop application CO2: Design and analyze an application using UML modeling as fundamental tool CO3: Apply design patterns to understand reusability in OO design CO4: Decide and apply appropriate modern tool for designing and modeling CO5: Decide and apply appropriate modern testing tool for testing web-based/desktop application
<b>TE</b>	310254	Web Technology	CO1: analyze given assignment to select sustainable web development design methodology CO2: develop web based application using suitable client side and server side web technologies CO3: develop solution to complex problems using appropriate method, technologies, frameworks, web services and content management
<b>BE</b>	410241	High Performance Computing	CO1: Describe different parallel architectures, inter-connect networks, programming models CO2: Develop an efficient parallel algorithm to solve given problem CO3: Analyze and measure performance of modern parallel computing systems CO4: Build the logic to parallelize the programming task
<b>BE</b>	410242	Artificial Intelligence and Robotics	CO1 Identify and apply suitable Intelligent agents for various AI applications CO2: Design smart system using different informed search / uninformed search or heuristic approaches. CO3: Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem. CO4: Apply the suitable algorithms to solve

			AI problems
<b>BE</b>	410243	Data Analytics	CO1: Write case studies in Business Analytic and Intelligence using mathematical models CO2: Present a survey on applications for Business Analytic and Intelligence CO3: Provide problem solutions for multi-core or distributed, concurrent/Parallel environments
<b>BE</b>	410244(D)	Data Mining and Warehousing	CO1: Apply basic, intermediate and advanced techniques to mine the data CO2: Analyze the output generated by the process of data mining CO3: Explore the hidden patterns in the data CO4: Optimize the mining process by choosing best data mining technique
<b>BE</b>	410245(B)	Software Testing and Quality Assurance	CO1: Describe fundamental concepts in software testing such as manual testing, automation testing and software quality assurance. CO2: Design and develop project test plan, design test cases, test data, and conduct test operations CO3: Apply recent automation tool for various software testing for testing software CO4: Apply different approaches of quality management, assurance, and quality standard to software system CO5: Apply and analyze effectiveness Software Quality Tools
<b>BE</b>	410250	Machine Learning	CO1: Distinguish different learning based applications CO2: Apply different preprocessing methods to prepare training data set for machine learning. CO3: Design and implement supervised and unsupervised machine learning algorithm. CO4: Implement different learning models CO5: Learn Meta classifiers and deep learning concepts
<b>BE</b>	410251	Information and Cyber Security	CO1: Gauge the security protections and limitations provided by today's technology. CO2: Identify information security and cyber security threats. CO3: Analyze threats in order to protect or defend it in cyberspace from cyber-attacks. CO4: Build appropriate security solutions against cyber-attacks.

<b>BE</b>	410252(C)	Embedded and Real Time Operating Systems	CO1: Recognize and classify embedded and real-time systems CO2: Explain communication bus protocols used for embedded and real-time systems CO3: Classify and exemplify scheduling algorithms CO4: Apply software development process to a given RTOS application CO5: Design a given RTOS based application
<b>BE</b>	410253(C)	Cloud Computing	CO1: To install cloud computing environments. CO2: To develop any one type of cloud CO3: To explore future trends of cloud computing

### Department of Electronics & Telecommunication Engineering

<b>Class</b>	<b>Subject Code</b>	<b>Subject Name</b>	<b>Course outcomes</b>
<b>SE</b>	207005	Engineering Mathematics - III	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 electro-magnetic fields & wave theory. CO5: Analyze Complex functions, Conformal mappings, Contour integration applicable to electrostatics, digital filters, signal and image processing.
<b>SE</b>	204181	Electronic Circuits	CO1: Assimilate the physics, characteristics and parameters of MOSFET towards its application as amplifier. CO2: Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators,

			<p>for given specifications.</p> <p>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.</p> <p>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.</p>
<b>SE</b>	204182	Digital Circuits	<p>CO1: Identify and prevent various hazards and timing problems in a digital design.</p> <p>CO2: Use the basic logic gates and various reduction techniques of digital logic circuit.</p> <p>CO3: Analyze, design and implement combinational logic circuits.</p> <p>CO4: Analyze, design and implement sequential circuits.</p> <p>CO5: Differentiate between Mealy and Moore machines. CO6: Analyze digital system design using PLD.</p>
<b>SE</b>	204183	Electrical Circuits	<p>CO1: Analyze the simple DC and AC circuit with circuit simplification techniques.</p> <p>CO2: Formulate and analyze driven and source free RL and RC circuits.</p> <p>CO3: Formulate &amp; determine network parameters for given network and analyze the given network using Laplace Transform to find the network transfer function.</p> <p>CO4: Explain construction, working and applications of DC Machines / Single Phase &amp; Three Phase AC Motors.</p> <p>CO5: Explain construction, working and applications of special purpose motors &amp; understand motors used in electrical vehicles.</p> <p>CO6: Analyze and select a suitable motor for different applications.</p>
<b>SE</b>	204184	Data Structures	<p>CO1: Solve mathematical problems using C programming language.</p> <p>CO2: Implement sorting and searching algorithms and calculate their complexity.</p> <p>CO3: Develop applications of stack and queue using array.</p> <p>CO4: Demonstrate applicability of Linked List.</p> <p>CO5: Demonstrate applicability of nonlinear</p>

			<p>data structures - Binary Tree with respect to its time complexity.</p> <p>CO6: Apply the knowledge of graph for solving the problems of spanning tree and shortest path algorithm</p>
<b>SE</b>	204191	Signals & Systems	<p>CO1: Identify, classify basic signals and perform operations on signals.</p> <p>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.</p> <p>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.</p> <p>CO5: Define and Describe the probability, random variables and random signals. Compute the probability of a given event, model, compute the CDF and PDF.</p> <p>CO6: Compute the mean, mean square, variance and standard deviation for given random variables using PDF.</p>
<b>SE</b>	204192	Control Systems	<p>CO1: Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.</p> <p>CO2: Determine the (absolute) stability of a closed-loop control system.</p> <p>CO3: Perform time domain analysis of control systems required for stability analysis.</p> <p>CO4: Perform frequency domain analysis of control systems required for stability analysis.</p> <p>CO5: Apply root-locus, Frequency Plots technique to analyze control systems.</p> <p>CO6: Express and solve system equations in state variable form.</p> <p>CO7: Differentiate between various digital controllers and understand the role of the controllers in Industrial automation</p>
<b>SE SE</b>	204193	Principles of Communication Systems	<p>CO1: To compute &amp; compare the bandwidth and transmission power requirements by analyzing time and frequency domain spectra of signal required for modulation schemes under study.</p> <p>CO2: Describe and analyze the techniques</p>

			<p>of generation, transmission and reception of Amplitude Modulation Systems.</p> <p>CO3: Explain generation and detection of FM systems and compare with AM systems.</p> <p>CO4: Exhibit the importance of Sampling Theorem and correlate with Pulse Modulation technique (PAM, PWM, and PPM).</p> <p>CO5: Characterize the quantization process and elaborate digital representation techniques (PCM, DPCM, DM and ADM).</p> <p>CO6: Illustrate waveform coding, multiplexing and synchronization techniques and articulate their importance in baseband digital transmission</p>
<b>SE</b>	204194	Object Oriented Programming	<p>CO1: Describe the principles of object oriented programming.</p> <p>CO2: Apply the concepts of data encapsulation, inheritance in C++.</p> <p>CO3: Understand Operator overloading and friend functions in C++.</p> <p>CO4: Apply the concepts of classes, methods inheritance and polymorphism to write programs C++.</p> <p>CO5: Apply Templates, Namespaces and Exception Handling concepts to write programs in C++.</p> <p>CO6: Describe and use of File handling in C++</p>
<b>TE</b>	304181	Digital Communication	<ul style="list-style-type: none"> <li>• To understand the building blocks of digital communication system.</li> <li>• To prepare mathematical background for communication signal analysis.</li> <li>• To understand and analyze the signal flow in a digital communication system</li> <li>• To analyze error performance of a digital communication system in presence of noise and other interferences.</li> <li>• To understand concept of spread spectrum communication system.</li> </ul>
<b>TE</b>	304182	Digital Signal Processing	<ol style="list-style-type: none"> <li>1) Analyze the discrete time signals and system using different transform domain techniques.</li> <li>2) Design and implement LTI filters for filtering different real world signals.</li> <li>3) Develop different signal processing applications using DSP processor</li> </ol>
<b>TE</b>	304183	Electromagnetics	<ol style="list-style-type: none"> <li>1) Understand the basic mathematical concepts related to electromagnetic vector fields.</li> </ol>

			<p>2) Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.</p> <p>3) Apply the principles of magnetostatics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density.</p> <p>4) Understand the concepts related to Faraday's law, induced emf and Maxwell's equations.</p> <p>5) Apply Maxwell's equations to solutions of problems relating to transmission lines and uniform plane wave propagation.</p>
<b>TE</b>	304184	Microcontrollers	<p>1) Learn importance of microcontroller in designing embedded application.</p> <p>2) Learn use of hardware and software tools.</p> <p>3) Develop interfacing to real world devices</p>
<b>TE</b>	304185	Mechatronics	<p>1 Identification of key elements of mechatronics system and its representation in terms of block diagram</p> <p>2 Understanding basic principal of Sensors and Transducer.</p> <p>3. Able to prepare case study of the system given.</p>
<b>TE</b>	304186	Power Electronics	<p>1) Design &amp; implement a triggering / gate drive circuit for a power device</p> <p>2) Understand, perform &amp; analyze different controlled converters.</p> <p>3) Evaluate battery backup time &amp; design a battery charger.</p> <p>4) Design &amp; implement over voltage / over current protection circuit.</p>
<b>TE</b>	304187	Information Theory Coding Techniques and Communication Networks	<p>1) Perform information theoretic analysis of communication system.</p> <p>2) Design a data compression scheme using suitable source coding technique.</p> <p>3) Design a channel coding scheme for a communication system.</p> <p>4) Understand and apply fundamental principles of data communication and networking.</p> <p>5) Apply flow and error control techniques in communication networks.</p>
<b>TE</b>	304188	Business Management	<p>1) Get overview of Management Science aspects useful in business.</p> <p>2) Get motivation for Entrepreneurship</p> <p>3) Get Quality Aspects for Systematically</p>



			Running the Business 4) To Develop Project Management aspect and Entrepreneurship Skills.
<b>TE</b>	304189	Advanced Processors	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.
<b>TE</b>	304190	System Programming and Operating System	1) Demonstrate the knowledge of Systems Programming and Operating Systems 2) Formulate the Problem and develop the solution for same. 3) Compare and analyse the different implementation approach of system programming operating system abstractions. 4) Interpret various OS functions used in Linux / Ubuntu
<b>BE</b>	404181	VLSI Design & Technology	1. Write effective HDL coding for digital design. 2. Apply knowledge of real time issues in digital design. 3. Model digital circuit with HDL, simulate, synthesis and prototype in PLDs. 4. Design CMOS circuits for specified applications. 5. Analyze various issues and constraints in design of an ASIC 6. Apply knowledge of testability in design and build self test circuit.
<b>BE</b>	404182	Computer Networks & Security	1. Understand fundamental underlying principles of computer networking 2. Describe and analyze the hardware, software, components of a network and their 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 installing and configuring networking applications. 5. Specify and identify deficiencies in existing protocols, and then go onto select new and better protocols. 6. Have a basic knowledge of the use of cryptography and network security.
<b>BE</b>	404183	Radiation	1. Differentiate various performance parameters of radiating elements.

		and Microwave Techniques	<ol style="list-style-type: none"> <li>2. Analyze various radiating elements and arrays.</li> <li>3. Apply the knowledge of waveguide fundamentals in design of transmission lines.</li> <li>4. Design and set up a system consisting of various passive microwave components.</li> <li>5. Analyze tube based and solid state active devices along with their applications.</li> <li>6. Measure various performance parameters of microwave components.</li> </ol>
<b>BE</b>	404184	Digital Image and Video Processing (Elective-I)	<ol style="list-style-type: none"> <li>1. Develop and implement basic mathematical operations on digital images.</li> <li>2. Analyze and solve image enhancement and image restoration problems.</li> <li>3. Identify and design image processing techniques for object segmentation and recognition.</li> <li>4. Represent objects and region of the image with appropriate method.</li> <li>5. Apply 2-D data compression techniques for digital images.</li> <li>6. Explore video signal representation and different algorithm for video processing</li> </ol>
<b>BE</b>	404185	Electronic Product Design (Elective-II)	<ul style="list-style-type: none"> <li>• Understand various stages of hardware, software and PCB design.</li> <li>• Importance of product test &amp; test specifications.</li> <li>• Special design considerations and importance of documentation.</li> </ul>
<b>BE</b>	404185	Artificial Intelligence (Elective II)	<ol style="list-style-type: none"> <li>1. Design and implement key components of intelligent agents and expert systems.</li> <li>2. To apply knowledge representation techniques and problem solving strategies to common AI applications.</li> <li>3. Apply and integrate various artificial intelligence techniques in intelligent system development as well as understand the importance of maintaining intelligent systems.</li> <li>4. Build rule-based and other knowledge-intensive problem solvers.</li> </ol>
<b>BE</b>	404189	Mobile Communication	<ol style="list-style-type: none"> <li>1. Apply the concepts of switching technique and traffic engineering to design multistage networks.</li> <li>2. Explore the architecture of GSM.</li> <li>3. Differentiate thoroughly the generations of mobile technologies.</li> </ol>

<b>BE</b>	404190	Broadband Communication Systems	<ol style="list-style-type: none"> <li>1. Perform Link power budget and Rise Time Budget by proper selection of components and check its viability.</li> <li>2. Perform Satellite Link design for Up Link and Down Link.</li> </ol>
<b>BE</b>	404191	Machine Learning (Elective III)	<ol style="list-style-type: none"> <li>1. To compare and contrast pros and cons of various machine learning techniques and to get an in sight of when to apply a particular machine learning approach.</li> <li>2. To mathematically analyze various machine learning approaches and paradigms.</li> <li>3. To implement convolution neural networks in recognition applications.</li> </ol>
<b>BE</b>	404191	Audio Video Engineering (Elective III)	<ol style="list-style-type: none"> <li>1. Apply the fundamentals of Analog Television and Colour Television standards.</li> <li>2. Explain the fundamentals of Digital Television, DTV standards and parameters.</li> <li>3. Study and understand various HDTV standards and Digital TV broadcasting systems and acquainted with different types of analog, digital TV and HDTV systems.</li> <li>4. Understand acoustic fundamentals and various acoustic systems.</li> </ol>
<b>BE</b>	404192	ROBOTICS (Elective-IV)	<ol style="list-style-type: none"> <li>1. Familiar with the history, concept development and key components of robotics technologies.</li> <li>2. Implement basic mathematics manipulations of spatial coordinate representation and transformation.</li> <li>3. Solve basic robot forward and inverse kinematic problems</li> <li>4. Understand and able to solve basic robotic dynamics, path planning and control problems</li> </ol>

### Department of Engineering Science

<b>Class</b>	<b>Subject Code</b>	<b>Subject Name</b>	<b>Course outcomes</b>
<b>FE</b>	<b>107002</b>	<b>Engineering Physics</b>	<p><b>CO1:</b> Develop understanding of interference, diffraction and polarization; connect it to few engineering applications.</p> <p><b>CO2:</b> Learn basics of lasers and optical fibers and their use in some applications.</p> <p><b>CO3:</b> Understand concepts and principles in quantum mechanics. Relate them to some applications.</p>

			<p><b>CO4:</b> Understand theory of semiconductors and their applications in some semiconductor devices.</p> <p><b>CO5:</b> Summarize basics of magnetism and superconductivity. Explore few of their technological applications.</p> <p><b>CO6:</b> Comprehend use of concepts of physics for Non Destructive Testing. Learn some properties of nonmaterial's and their application</p>
<b>FE</b>	107001	Engineering Mathematics-I	<p><b>CO1:</b> Mean value theorems and its generalizations leading to Taylors and Maclaurin's series useful in the analysis of engineering problems.</p> <p><b>CO2:</b> the Fourier series representation and harmonic analysis for design and analysis of periodic continuous and discrete systems.</p> <p><b>CO3:</b> to deal with derivative of functions of several variables that are essential in various branches of Engineering.</p> <p><b>CO4:</b> 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.</p> <p><b>CO5:</b> 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</p>
<b>FE</b>	107009	Engineering Chemistry	<p><b>CO1:</b> Apply the different methodologies for analysis of water and techniques involved in softening of water as commodity.</p> <p><b>CO2:</b> Select appropriate electro-technique and method of material analysis.</p> <p><b>CO3:</b> Demonstrate the knowledge of advanced engineering materials for various engineering applications.</p> <p><b>CO4:</b> Analyze fuel and suggest use of alternative fuels.</p> <p><b>CO5:</b> Identify chemical compounds based on their structure.</p> <p><b>CO6:</b> Explain causes of corrosion and methods for minimizing corrosion.</p>
<b>FE</b>	101011	Systems in Mechanical Engineering	<p><b>CO1:</b> Describe and compare the conversion of energy from renewable and non-renewable energy sources</p> <p><b>CO2:</b> Explain basic laws of thermodynamics, heat transfer and their applications</p> <p><b>CO3:</b> List down the types of road vehicles and their specifications</p> <p><b>CO4:</b> Illustrate various basic parts and transmission</p>

			<p>system of a road vehicle</p> <p><b>CO5:</b> Discuss several manufacturing processes and identify the suitable process</p> <p><b>CO6:</b> Explain various types of mechanism and its application</p>
<b>FE</b>	103004	Basic Electrical Engineering	<p><b>CO1:</b> Differentiate between electrical and magnetic circuits and derive mathematical relation for self and mutual inductance along with coupling effect.</p> <p><b>CO2:</b> Calculate series, parallel and composite capacitor as well as characteristics parameters of alternating quantity and phasor arithmetic</p> <p><b>CO3:</b> Derive expression for impedance, current, power in series and parallel RLC circuit with AC supply along with phasor diagram.</p> <p><b>CO4:</b> 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</p> <p><b>CO5:</b> Apply and analyze the resistive circuits using star-delta conversion KVL, KCL and different network theorems under DC supply.</p> <p><b>CO6:</b> Evaluate work, power, energy relations and suggest various batteries for different applications, concept of charging and discharging and depth of charge.</p>
<b>FE</b>	104010	Basic Electronics Engineering	<p><b>CO1:</b> Explain the working of P-N junction diode and its circuits.</p> <p><b>CO2:</b> Identify types of diodes and plot their characteristics and also can compare BJT with MOSFET.</p> <p><b>CO3:</b> Build and test analog circuits using OPAMP and digital circuits using universal/basic gates and flip flops.</p> <p><b>CO4:</b> Use different electronics measuring instruments to measure various electrical parameters.</p> <p><b>CO5:</b> Select sensors for specific applications.</p>
<b>FE</b>	110005	Programming and Problem Solving	<p><b>CO1:</b> Inculcate and apply various skills in problem solving.</p> <p><b>CO2:</b> Choose most appropriate programming constructs and features to solve the problems in diversified domains.</p> <p><b>CO3:</b> Exhibit the programming skills for the problems those require the writing of well-documented programs including use of the logical constructs of language, Python.</p> <p><b>CO4:</b> Demonstrate significant experience with the Python program development environment</p>

<b>FE</b>	101011	Engineering Mechanics	<p><b>CO1:</b> Determine resultant of various force systems  <b>CO2:</b> Determine centroid, moment of inertia and solve problems related to friction  <b>CO3:</b> Determine reactions of beams, calculate forces in cables using principles of equilibrium  <b>CO4:</b> Solve trusses, frames for finding member forces and apply principles of equilibrium to forces in space  <b>CO5:</b> Calculate position, velocity and acceleration of particle using principles of kinematics  <b>CO6:</b> Calculate position, velocity and acceleration of particle using principles of kinetics and Work, Power, Energy</p>
<b>FE</b>	107008	Engineering Mathematics-II	<p><b>CO1:</b> 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.  <b>CO2:</b> 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.  <b>CO3:</b> to trace the curve for a given equation and measure arc length of various curves.  <b>CO4:</b> the concepts of solid geometry using equations of sphere, cone and cylinder in a comprehensive manner.  <b>CO5:</b> evaluation of multiple integrals and its application to find area bounded by curves, volume bounded by surfaces, Centre of gravity and Moment of inertia.</p>
<b>FE</b>	102012	Engineering Graphics	<p><b>CO1:</b> Draw the fundamental engineering objects using basic rules and able to construct the simple geometries. <b>CO2:</b> Construct the various engineering curves using the drawing instruments. <b>CO3:</b> 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. <b>CO4:</b> Apply the visualization skill to draw a simple isometric projection from given orthographic views precisely using drawing equipment. <b>CO5:</b> Draw the development of lateral surfaces for cut section of geometrical solids. <b>CO6:</b> Draw fully-dimensioned 2D, 3D drawings using computer aided drafting tools.</p>

**Department of Information Technology**

<b>Class</b>	<b>Subject Code</b>	<b>Subject Name</b>	<b>Course outcomes</b>
SE	214441	<b>Discrete Mathematics</b>	<ol style="list-style-type: none"> <li>1. To gain sound knowledge to formulate and solve problems with sets and propositions.</li> <li>2. To understand and solve counting problems by applying elementary counting techniques to solve problems of discrete probability.</li> <li>3. To understand Graph and Tree terminologies and models to be applied in real life problems.</li> <li>4. To recognize types of relation, formulate and solve problems with relations and functions.</li> <li>5. To understand basics of number theory and its applications.</li> <li>6. To understand the various types' algebraic structures and its applications.</li> </ol>
SE	214442	<b>Logic Design &amp; Computer Organization</b>	<ol style="list-style-type: none"> <li>1. To make undergraduates, aware of different levels of abstraction of computer systems from hardware perspective.</li> <li>2. To make undergraduates, understand the functions, characteristics of various components of Computer&amp; in particular processor &amp; memory.</li> </ol>
SE	214443	<b>Data Structure &amp; Algorithms</b>	<ol style="list-style-type: none"> <li>1. To study data structures and their implementations and applications.</li> <li>2. To learn different searching and sorting techniques.</li> <li>3. To study some advanced data structures such as trees, graphs and tables.</li> <li>4. To learn different file organizations.</li> <li>5. To learn algorithm development and analysis of algorithms.</li> </ol>
SE	214444	<b>Object-Oriented Programming</b>	<ol style="list-style-type: none"> <li>1. Apply concepts of object-oriented paradigm.</li> <li>2. Design and implement models for real life problems by using object-oriented programming.</li> <li>3. Develop object-oriented programming skills.</li> </ol>
SE	214445	<b>Basics of Computer Network</b>	<ol style="list-style-type: none"> <li>1. To understand the fundamentals of communication system.</li> <li>2. To understand the basics of internetworking.</li> <li>3. To understand services and protocols used at Physical, Data Link, Network, Transport Layer.</li> </ol>
SE	207003	<b>Engineering Mathematics III</b>	<ol style="list-style-type: none"> <li>1. To make the students familiarize with concepts and techniques in Linear differential equations, Fourier transform&amp;Z-transform, Statistical methods, Probability theory and Numerical methods.2. The</li> </ol>

			aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance thinking power, useful in their disciplines.
<b>SE</b>	<b>214451</b>	<b>Processor Architecture</b>	<ol style="list-style-type: none"> <li>1. To study architectural details of PIC 18 microcontroller.</li> <li>2. To study applications of PIC through various interfacing devices.</li> </ol>
<b>SE</b>	<b>214452</b>	<b>Database Management System</b>	<ol style="list-style-type: none"> <li>1. The objective of the course is to present an introduction to database management system as a subject in its own right.</li> <li>2. To understand the fundamental concepts of Relational Database management system.</li> <li>3. To present SQL and procedural interfaces to SQL comprehensively.</li> <li>4. To provide a strong formal foundation in Relational Database Concepts, database concepts, technology and practice &amp; to introduce the concepts of Query Processing.</li> <li>5. To introduce the concepts of Transaction Processing and to present the issues and techniques relating to concurrency and recovery in multi-user database environments.</li> <li>6. To introduce the recent trends in database technology.</li> </ol>
<b>SE</b>	<b>214453</b>	<b>Computer Graphics</b>	<ol style="list-style-type: none"> <li>1. Understand the foundations of computer graphics: hardware systems, math basis, light and color.</li> <li>2. Understand the complexities of modeling realistic objects through modeling complex scenes using a high-level scene description language.</li> <li>3. Become acquainted with some advanced topics in computer graphics. The student should gain an expanded vocabulary for discussing issues relevant to computer graphics (including both the underlying mathematics and the actual programming).</li> <li>4. The student should gain an appreciation and understanding of the hardware and software utilized in constructing computer graphics applications.</li> <li>5. The student should gain a comprehension of windows, clipping and view-ports in relation to images displayed on screen.</li> <li>6. The student should gain an understanding of geometric, mathematical and algorithmic concepts necessary for programming computer graphics.</li> </ol>
<b>SE</b>	<b>214454</b>	<b>Software Engineering</b>	<ol style="list-style-type: none"> <li>1. To learn the principles of Software Engineering.</li> <li>2. To learn and understand methods of capturing, specifying, visualizing and analyzing software requirements.</li> <li>3. To know design principles to software project</li> </ol>



			<p>development.</p> <ol style="list-style-type: none"> <li>To learn basics of IT project management.</li> <li>To understand software quality attributes and testing principles.</li> <li>To introduce formal methods and recent trends in Software Engineering.</li> </ol>
<b>TE</b>	<b>314441</b>	<b>Theory of Computation</b>	<ol style="list-style-type: none"> <li>To know the applicability of the model of computation to different problems.</li> <li>To understand in detail the relationship among formal languages, formal grammars and automata.</li> <li>To learn the design of Finite Automata, Pushdown Automata and Turing Machine for processing of formal languages.</li> <li>To study the theory of computability and complexity for algorithm design.</li> </ol>
<b>TE</b>	<b>314442</b>	<b>Operating Systems</b>	<ol style="list-style-type: none"> <li>To introduce basic concepts and functions of modern operating systems.</li> <li>To understand the concept of process, thread management and scheduling.</li> <li>To learn the concept of concurrency control.</li> <li>To study various Memory Management techniques.</li> <li>To know the concept of I/O and File management.</li> <li>To learn concept of system software.</li> </ol>
<b>TE</b>	<b>314443</b>	<b>Machine Learning</b>	<ol style="list-style-type: none"> <li>To understand the basic concepts of machine learning and apply them for the various problems.</li> <li>To learn various machine learning types and use it for the various machine learning tasks.</li> <li>To optimize the machine learning model and generalize it.</li> </ol>
<b>TE</b>	<b>314444</b>	<b>Human Computer Interaction</b>	<ol style="list-style-type: none"> <li>To introduce to the field of human-computer-interaction study.</li> <li>To gain an understanding of the human part of human-computer-interactions.</li> <li>To learn to do design and evaluate effective human-computer-interactions.</li> <li>To study HCI models and theories.</li> <li>To understand HCI design processes.</li> <li>To apply HCI to real life use cases.</li> </ol>

<b>TE</b>	<b>314445(B)</b>	<b>Advanced Database Management System</b>	<ol style="list-style-type: none"> <li>1. To understand the fundamental concepts of Relational and Object-oriented databases.</li> <li>2. To learn and understand various Parallel and Distributed Database Architectures and Applications.</li> <li>3. To understand and apply the basic concepts, categories and tools of No SQL Database.</li> <li>4. To learn and understand Data warehouse and OLAP Architectures and Applications.</li> <li>5. To learn data mining architecture, algorithms, software tools and applications.</li> <li>6. To learn enhanced data models for advanced database applications.</li> </ol>
<b>TE</b>	<b>314451</b>	<b>Computer Network and Security</b>	<ol style="list-style-type: none"> <li>1. The application layer services, responsibilities and protocol.</li> <li>2. Fathom wireless network and different wireless standards</li> <li>3. Differences in different wireless networks and to learn different mechanism used at layers of wireless network.</li> <li>4. The concept of network security.</li> <li>5. Basic cryptographic techniques in application development.</li> <li>6. Cyber security vulnerabilities &amp; study typical threats to modern digital systems.</li> </ol>
<b>TE</b>	<b>314452</b>	<b>Data Science and Big Data Analytics</b>	<ol style="list-style-type: none"> <li>1. To introduce basic need of Big Data and Data science to handle huge amount of data.</li> <li>2. To understand the basic mathematics behind the Big data.</li> <li>3. To understand the different Big data processing technologies.</li> <li>4. To understand and apply the Analytical concept of Big data using Python.</li> <li>5. To visualize the Big Data using different tools.</li> <li>6. To understand the application and impact of Big Data.</li> </ol>
<b>TE</b>	<b>314453</b>	<b>Web Application Development</b>	<ol style="list-style-type: none"> <li>1. To familiarize students with Web Programming basic concepts</li> <li>2. To learn and understand Web scripting languages.</li> <li>3. To explore the Front end&amp; Back end web programming skills.</li> <li>4. To understand and learn Mobile web development.</li> <li>5. To understand and learn Web application deployment.</li> </ol>
<b>TE</b>	<b>314454(C)</b>	<b>Cloud Computing</b>	<ol style="list-style-type: none"> <li>1. To provide students with the fundamentals and essentials of cloud computing</li> <li>2. To learn basics of virtualization and its importance</li> </ol>

			<ol style="list-style-type: none"> <li>3. To provide students a sound foundation of the cloud computing so that they are able to start using and adopting cloud computing services and tools in their real life scenarios</li> <li>4. To enable students exploring some important cloud computing driven commercial systems and applications</li> <li>5. To understand cloud storage technologies and relevant file systems</li> <li>6. To be exposed to Ubiquitous Cloud and Internet of Things</li> </ol>
<b>TE</b>	<b>314455:</b>	<b>Internship</b>	<ol style="list-style-type: none"> <li>1. To encourage and provide opportunities for students to get professional/personal experience through internships.</li> <li>2. To learn and apply the technical knowledge gained from academics /classroom learning in real life/industrial situations.</li> <li>3. To get familiar with various tools and technologies used in industries and their applications.</li> <li>4. To enable students to develop professional skills and expand their professional network with the development of employer-valued skills like teamwork, communication.</li> <li>5. To apply the experience gained from industrial internship to the academic course completion project.</li> <li>6. To nurture professional and societal ethics in students</li> <li>7. Understand the social, economic and administrative considerations that influence the working environment of industrial organizations</li> </ol>
<b>BE</b>	<b>414453</b>	<b>Information and Cyber Security</b>	<ol style="list-style-type: none"> <li>1. Understand computer, network and information security.</li> <li>2. To study operating system security and malwares.</li> <li>3. To study security issues in internet protocols.</li> <li>4. To study network defence tools.</li> <li>5. To learn forensics and investigation techniques.</li> </ol>
<b>BE</b>	<b>414454</b>	<b>Machine Learning and Applications</b>	<ol style="list-style-type: none"> <li>1. Understanding Human learning aspects.</li> <li>2. Understanding primitives and methods in learning process by computer.</li> <li>3. Understanding nature of problems solved with Machine Learning.</li> </ol>
<b>BE</b>	<b>414455</b>	<b>Software Design and Modeling</b>	<ol style="list-style-type: none"> <li>1. To teach the student the fundamental aspects of different object oriented methodologies and unified approach along with Unified Modeling Language (UML), in terms of “how to use” it for the purpose of specifying and developing software.</li> <li>2. Explore and analyze use case modeling, domain/class modeling.</li> </ol>

			<ol style="list-style-type: none"> <li>3. To teach the student Interaction and behaviour modeling.</li> <li>4. Aware students with design process in software development.</li> <li>5. Orient students with the software design principles and patterns.</li> <li>6. Enable students to learn the architectural design guidelines in various type of application development.</li> </ol>
<b>BE</b>	<b>414456E</b>	<b>Business Analytics and Intelligence</b>	<ol style="list-style-type: none"> <li>1. Apply conceptual knowledge on how business intelligence is used within organizations.</li> <li>2. Evaluate organization's abilities to create and mobilize corporate knowledge.</li> <li>3. Select software tools for knowledge management systems in business organizations</li> <li>4. Suggest design systems to provide business intelligence.</li> </ol>
<b>BE</b>	<b>414457C</b>	<b>Software Testing and Quality Assurance</b>	<ol style="list-style-type: none"> <li>1. Learn to apply the testing strategies and methodologies in projects.</li> <li>2. To understand test management strategies and tools for testing.</li> <li>3. A keen awareness on the open problems in software testing and maintenance.</li> <li>4. To explain quality assurance and various tools used in quality management.</li> <li>5. To learn in detail about various quality assurance models.</li> <li>6. To understand the audit and assessment procedures to achieve quality.</li> </ol>
<b>BE</b>	<b>414462</b>	<b>Distributed Computing System</b>	<ol style="list-style-type: none"> <li>1. To understand the fundamentals and knowledge of the architectures of distributed systems.</li> <li>2. To gain knowledge of working components and fault tolerance of distributed systems</li> <li>3. To make students aware about security issues and protection mechanism for distributed environment.</li> </ol>
<b>BE</b>	<b>414463</b>	<b>Ubiquitous Computing</b>	<ol style="list-style-type: none"> <li>1. To describe ubiquitous computing, its properties applications and architectural design.</li> <li>2. To explain various smart devices and services used in ubiquitous computing.</li> <li>3. To teach the role of sensors and actuators in designing real time applications using Ubicomp.</li> <li>4. To explore the concept of human computer interaction in the context of Ubicomp.</li> <li>5. To explain Ubicomp privacy and challenges to privacy.</li> <li>6. To describe Ubicomp network with design issues and Ubicomp management.</li> </ol>

<b>BE</b>	<b>414464B</b>	<b>Information Storage and Retrieval</b>	<ol style="list-style-type: none"> <li>1. To understand information retrieval process.</li> <li>2. To understand concepts of clustering and how it is related to Information retrieval.</li> <li>3. To deal Storage, Organization &amp; Access to Information Items.</li> <li>4. To evaluate the performance of IR system and understand user interfaces for searching.</li> <li>5. To understand information sharing on semantic web.</li> <li>6. To understand the various applications of Information Retrieval giving emphasis to multimedia and distributed IR, web Search.</li> </ol>
<b>BE</b>	<b>414464D</b>	<b>Social Media Analytics</b>	<ol style="list-style-type: none"> <li>1. To understand foundations of Social Media Analytics.</li> <li>2. To Visualize and understand the data mining aspects in social networks.</li> <li>3. To solve mining problems by different algorithms.</li> <li>4. To understand network measures for social data.</li> <li>5. To understand behavioral part of web applications for Analysis.</li> <li>6. To analyze the data available on any social media applications.</li> </ol>

### **Department of Mechanical Engineering**

<b>FE</b>	<b>102003</b>	<b>Systems in Mechanical Engineering</b>	<ol style="list-style-type: none"> <li>1. Describe and compare the conversion of energy from renewable and non-renewable energy sources.</li> <li>2 Explain basic laws of thermodynamics, heat transfer and their applications.</li> <li>3 List down the types of road vehicles and their specifications.</li> <li>4 Illustrate various basic parts and transmission system of a road vehicle.</li> <li>5 Discuss several manufacturing processes and identify the suitable process.</li> <li>6 Explain various types of mechanisms and its applications.</li> </ol>
<b>FE</b>	<b>102012</b>	<b>Engineering Graphics</b>	<ol style="list-style-type: none"> <li>1 Draw the fundamental engineering objects using basic rules and able to construct the simple geometries.</li> <li>2 Construct the various engineering curves using the drawing instruments.</li> <li>3 Apply the concept of orthographic projections of an object to draw several</li> </ol>

			<p>2D views and its sectional views for visualizing the physical state of object.</p> <p>4 Apply the visualization skill to draw a simple isometric projection from given orthographic views precisely using drawing equipment.</p> <p>5 Draw the development of lateral surfaces for cut section of geometrical solids.</p> <p>6 Draw fully dimensioned 2D, 3D drawings using computer aided drafting tools.</p>
<b>SE</b>	<b>202041</b>	<b>Solid Mechanics</b>	<p>1 DEFINE various types of stresses and strain developed on determinate and indeterminate members.</p> <p>2 DRAW Shear force and bending moment diagram for various types of transverse loading and support.</p> <p>3 COMPUTE the slope &amp; deflection, bending stresses and shear stresses on a beam.</p> <p>4 CALCULATE torsional shear stress in shaft and buckling on the column.</p> <p>5 APPLY the concept of principal stresses and theories of failure to determine stresses on a 2-D element.</p> <p>6 UTILIZE the concepts of SFD &amp; BMD, torsion and principal stresses to solve combined loading application based problems.</p>
<b>SE</b>	<b>202042</b>	<b>Solid Modelling and Drafting</b>	<p>1 UNDERSTAND basic concepts of CAD system, need and scope in Product Lifecycle Management</p> <p>2 UTILIZE knowledge of curves and surfacing features and methods to create complex solid geometry</p> <p>3 CONSTRUCT solid models, assemblies using various modeling techniques &amp; PERFORM mass property analysis, including creating and using a coordinate system</p> <p>4 APPLY geometric transformations to simple 2D geometries</p> <p>5 USE CAD model data for various CAD based engineering applications viz. production drawings, 3D printing, FEA, CFD, MBD, CAE, CAM, etc.</p> <p>6 USE PMI &amp; MBD approach for communication</p>
<b>SE</b>	<b>202043</b>	<b>Engineering Thermodynamics</b>	<p>1 DESCRIBE the basics of thermodynamics with heat and work interactions.</p> <p>2 APPLY laws of thermodynamics to steady flow and non-flow processes.</p> <p>3 APPLY entropy, available and non available energy for an Open and Closed System,</p> <p>4 DETERMINE the properties of steam and their effect on performance of vapour power cycle.</p>

			<p>5 ANALYSE the fuel combustion process and products of combustion.</p> <p>6 SELECT various instrumentations required for safe and efficient operation of steam generator.</p>
<b>SE</b>	<b>202044</b>	<b>Engineering Materials and Metallurgy</b>	<p>1 COMPARE crystal structures and ASSESS different lattice parameters</p> <p>2 CORRELATE crystal structures and imperfections in crystals with mechanical behaviour of materials.</p> <p>3 DIFFERENTIATE and DETERMINE mechanical properties using destructive and non-destructive testing of materials.</p> <p>4 IDENTIFY &amp; ESTIMATE different parameters of the system viz., phases, variables, component, grains, grain boundary, and degree of freedom. etc.</p> <p>5 ANALYSE effect of alloying element &amp; heat treatment on properties of ferrous &amp; nonferrous alloy.</p> <p>6 SELECT appropriate materials for various applications.</p>
<b>SE</b>	<b>203156</b>	<b>Electrical and Electronics Engineering</b>	<p>1 APPLY programming concepts to UNDERSTAND role of Microprocessor and Microcontroller in embedded systems</p> <p>2 DEVELOP interfacing of different types of sensors and other hardware devices with Atmega328 based Arduino Board</p> <p>3 UNDERSTAND the operation of DC motor, its speed control methods and braking</p> <p>4 DISTINGUISH between types of three phase induction motor and its characteristic features</p> <p>5 EXPLAIN about emerging technology of Electric Vehicle (EV) and its modular subsystems</p> <p>6 CHOOSE energy storage devices and electrical drives for EVs</p>
<b>SE</b>	<b>202045</b>	<b>Geometric dimensioning and tolerancing lab</b>	<p>1 SELECT appropriate IS and ASME standards for drawing</p> <p>2 READ &amp; ANALYSE variety of industrial drawings</p> <p>3 APPLY geometric and dimensional tolerance, surface finish symbols in drawing</p> <p>4 EVALUATE dimensional tolerance based on type of fit, etc.</p> <p>5 SELECT an appropriate manufacturing process using DFM, DFA, etc.</p>
<b>SE</b>	<b>207002</b>	<b>Engineering Mathematics III</b>	<p>1 SOLVE higher order linear differential equations and its applications to model and analyze mass spring</p> <p>2 APPLY Integral transform techniques such as Laplace transform and Fourier</p>

			<p>transform to solve differential equations involved in vibration theory, heat transfer and related mechanical engineering applications.</p> <p>3 APPLY Statistical methods like correlation, regression in analyzing and interpreting experimental data applicable to reliability engineering and probability theory in testing and quality control.</p> <p>4 PERFORM Vector differentiation &amp; integration, analyze the vector fields and APPLY to fluid flow problems.</p> <p>5 SOLVE Partial differential equations such as wave equation, one and two dimensional heat flow equations.</p>
SE	202047	<b>Kinematics of machinery</b>	<p>1 APPLY kinematic analysis to simple mechanisms</p> <p>2 ANALYZE velocity and acceleration in mechanisms by vector and graphical method</p> <p>3 SYNTHESIZE a four bar mechanism with analytical and graphical methods</p> <p>4 APPLY fundamentals of gear theory as a prerequisite for gear design</p> <p>5 CONSTRUCT cam profile for given follower motion</p>
SE	202048	<b>Applied Thermodynamics</b>	<p>1 DETERMINE COP of refrigeration system and ANALYZE psychrometric processes.</p> <p>2 DISCUSS basics of engine terminology, air standard, fuel air and actual cycles.</p> <p>3 IDENTIFY factors affecting the combustion performance of SI and CI engines.</p> <p>4 DETERMINE performance parameters of IC Engines and emission control.</p> <p>5 EXPLAIN working of various IC Engine systems and use of alternative fuels.</p> <p>6 CALCULATE performance of single and multi stage reciprocating compressors and DISCUSS rotary positive displacement compressors</p>
SE	202049	<b>Fluid Mechanics</b>	<p>1 DETERMINE various properties of fluid</p> <p>2 APPLY the laws of fluid statics and concepts of buoyancy</p> <p>3 IDENTIFY types of fluid flow and terms associated in fluid kinematics</p> <p>4 APPLY principles of fluid dynamics to laminar flow</p> <p>5 ESTIMATE friction and minor losses in internal flows and DETERMINE boundary layer formation over an external surface</p> <p>6 CONSTRUCT mathematical correlation considering dimensionless parameters, also ABLE to predict the performance of prototype using model laws</p>



<b>SE</b>	<b>202050</b>	<b>Manufacturing Processes</b>	<p>1 SELECT appropriate moulding, core making and melting practice and estimate pouring time, solidification rate and DESIGN riser size and location for sand casting process</p> <p>2 UNDERSTAND mechanism of metal forming techniques and CALCULATE load required for flat rolling</p> <p>3 DEMONSTRATE press working operations and APPLY the basic principles to DESIGN dies and tools for forming and shearing operations</p> <p>4 CLASSIFY and EXPLAIN different welding processes and EVALUATE welding characteristics</p> <p>5 DIFFERENTIATE thermoplastics and thermosetting and EXPLAIN polymer processing techniques</p> <p>6 UNDERSTAND the principle of manufacturing of fibre-reinforce composites and metal matrix composites</p>
<b>TE</b>	<b>302041</b>	<b>Numerical and statistical methods</b>	<p>1 Solve system of equations using direct and iterative numerical methods.</p> <p>2 Estimate solutions for differential equations using numerical techniques.</p> <p>3 Develop solution for engineering applications with numerical integration.</p> <p>4 Design and create a model using a curve fitting and regression analysis.</p> <p>5 Apply statistical Technique for quantitative data analysis.</p> <p>6 Demonstrate the data, using the concepts of probability and linear algebra</p>
<b>TE</b>	<b>302042</b>	<b>Heat and Mass Transfer</b>	<p>1 Analyze &amp; apply the modes of heat transfer equations for one dimensional thermal system</p> <p>2 Design a thermal system considering fins, thermal insulation and &amp; Transient heat conduction.</p> <p>3 Evaluate the heat transfer rate in natural and forced convection &amp; validate with experimentation results.</p> <p>4 Interpret heat transfer by radiation between objects with simple geometries, for black and grey surfaces.</p> <p>5 Ability to analyse the rate of mass transfer using Fick's Law of Diffusion and understands mass diffusion in different coordinate systems.</p> <p>6 Design &amp; analysis of heat transfer equipment's and investigation of its performance.</p>
<b>TE</b>	<b>302043</b>	<b>Design of Machine</b>	<p>1 Design and analyse the cotter and knuckle Joints, levers and components subjected to eccentric loading.</p>

		<b>Elements</b>	<p>2 Design shafts, keys and couplings under static loading conditions</p> <p>3 Analyse different stresses in power screws and APPLY those in the procedure to design screw jack.</p> <p>4 Evaluate dimensions of machine components under fluctuating loads.</p> <p>5 Evaluate &amp; interpret the stress developed on the different type of welded and threaded joints.</p> <p>6 Apply the design and development procedure for different types of springs.</p>
<b>TE</b>	<b>302044</b>	<b>Mechatronics</b>	<p>1 Define key elements of mechatronics, principle of sensor and its characteristics.</p> <p>2 Utilize concept of signal processing and MAKE use of interfacing systems such as ADC, DAC, Digital I/O.</p> <p>3 Determine the transfer function by using block diagram reduction technique.</p> <p>4 Evaluate Poles and Zero, frequency domain parameter for mathematical modelling for mechanical system.</p> <p>5 Apply the concept of different controller modes to an industrial application</p> <p>6 Develop the ladder programming for industrial application.</p>
<b>TE</b>	<b>302045-A</b>	<b>Advanced forming and joining processes</b>	<p>1 Analyse the effect of friction in metal forming deep drawing and identification of surface defects and their remedies in deep drawing operations</p> <p>2 Assess the parameters for special forming operation and select appropriate special forming operation for particular applications</p> <p>3 Analyse the effect of HAZ on microstructure and mechanical properties of materials</p> <p>4 Classify various solid state welding process and select suitable welding processes for particular applications</p> <p>5 Classify various advanced welding process and select suitable welding processes for particular applications.</p> <p>6 Interpret the principles of sustainable manufacturing and its role in manufacturing industry</p>
<b>TE</b>	<b>302045-B</b>	<b>Machining Science and Technology</b>	<p>1 Define metal cutting principles and mechanics of metal cutting and tool life.</p> <p>2 Describe features of gear and thread manufacturing processes.</p> <p>3 Select appropriate grinding wheel and demonstrate the various surface finishing processes</p> <p>4 Select appropriate jigs/fixtures and to draw the process plan for a given component.</p> <p>5 Select &amp; evaluate various parameters of</p>

			<p>process planning.</p> <p>6 Generate CNC program for Turning / Milling processes and generate tool path using CAM software.</p>
<b>TE</b>	<b>302046</b>	<b>Digital Manufacturing Laboratory</b>	<p>1 Develop a component using conventional machines, CNC machines and Additive Manufacturing Techniques.</p> <p>2 Analyse cutting tool parameters for machining given job.</p> <p>3 Demonstrate simulation of manufacturing process using Digital Manufacturing Tools.</p> <p>4 Select and design jigs and Fixtures for a given component.</p> <p>5 Demonstrate different parameters for CNC retrofitting and reconditioning.</p>
<b>TE</b>	<b>302047</b>	<b>Skill Development</b>	<p>1 Apply &amp; demonstrate procedure of assembly &amp; disassembly of various machines.</p> <p>2 Design &amp; develop a working/model of machine parts or any new product.</p> <p>3 Evaluate fault with diagnosis on the machines, machine tools and home appliances.</p> <p>4 Identify &amp; demonstrate the various activities performed in an industry such as maintenance, design of components, material selection</p>
<b>TE</b>	<b>302049</b>	<b>Artificial Intelligence and Machine Learning</b>	<p>1 Demonstrate fundamentals of artificial intelligence and machine learning</p> <p>2 Apply feature extraction and selection techniques</p> <p>3 Apply machine learning algorithms for classification and regression problems</p> <p>4 Devise and develop a machine learning model using various steps</p> <p>5 Explain concepts of reinforced and deep learning</p> <p>6 Simulate machine learning model in mechanical engineering problems</p>
<b>TE</b>	<b>302050</b>	<b>Computer aided Engineering</b>	<p>1 Define the use of CAE tools and describe the significance of shape functions in finite element formulations</p> <p>2 Apply the various meshing techniques for better evaluation of approximate results</p> <p>3 Apply material properties and boundary condition to solve 1-D and 2-D element stiffness matrices to obtain nodal or elemental solution</p> <p>4 Analyze and apply various numerical methods for different types of analysis</p> <p>5 Evaluate and solve non-linear and dynamic analysis problems by analyzing the results obtained from analytical and computational method</p> <p>6 Generate the results in the form of contour plot by</p>

			the use of CAE tools
<b>TE</b>	<b>302051</b>	<b>Design of Transmission systems</b>	<p>1 Apply the principle of Spur &amp; Helical gear design for industrial application and prepare a manufacturing drawing with the concepts of G D &amp; T</p> <p>2 Explain and design Bevel &amp; Worm gear considering design parameters as per design standards</p> <p>3 Select &amp; design Rolling and Sliding Contact Bearings from manufacturer's catalogue for a typical application considering suitable design parameters</p> <p>4 Define and design various types of Clutches, Brakes, used in automobile</p> <p>5 Apply various concept to design Machine Tool Gear box, for different applications</p> <p>6 Elaborate various modes of operation, degree of hybridization and allied terms associated with hybrid electric vehicles.</p>
<b>TE</b>	<b>302052-A</b>	<b>Composite Materials</b>	<p>1 Define &amp; compare composites with traditional materials.</p> <p>2 Identify &amp; estimate different parameters of the Polymer Matrix Composite</p> <p>3 Categorize and apply Metal Matrix Process from possessions landscape</p> <p>4 Determine volume/weight fraction and strength of Composites</p> <p>5 Select appropriate testing and inspection method for composite materials</p> <p>6 Select composites materials for various applications</p>
<b>TE</b>	<b>302052-B</b>	<b>Surface Engineering</b>	<p>1 Define the basic's principle &amp; mechanism of surface degradation.</p> <p>2 Analyze &amp; select correct corrosion prevention techniques for a different service condition</p> <p>3 Demonstrate the role of surface engineering of materials to modify/improve the surface properties.</p> <p>4 Select the suitable surface heat treatments to improve the surface properties</p> <p>5 Apply the surface modification technique to modify surface properties</p> <p>6 Analyze &amp; evaluate various surface coating defects using various testing/characterization method</p>
<b>TE</b>	<b>302053</b>	<b>Measurement Laboratory</b>	<p>1 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</p>

			<p>uncertainty in measurement.</p> <p>2 Analyze strain measurement parameters by taking modulus of elasticity in consideration to acknowledge its usage in failure detection and force variations</p> <p>3 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..</p> <p>4 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.</p> <p>5 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</p> <p>6 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</p>
<b>TE</b>	<b>302054</b>	<b>Fluid power and control laboratory</b>	<p>1 Define working principle of components used in hydraulic and pneumatic systems.</p> <p>2 Identify &amp; explain various applications of hydraulic and pneumatic systems.</p> <p>3 Select an appropriate component required for hydraulic and pneumatic systems using manufactures' catalogues.</p> <p>4 Simulate &amp; analyze various hydraulic and pneumatic systems for industrial/mobile applications</p> <p>5 Design a hydraulic and pneumatic system for the industrial applications</p> <p>6 Design &amp; demonstrate various IOT, PLC based controlling system using hydraulics and pneumatics</p>
<b>TE</b>	<b>302055</b>	<b>Internship/ Mini project</b>	<p>1 Demonstrate professional competence through industry internship.</p> <p>2 Apply knowledge gained through internships to complete academic activities in a professional manner.</p> <p>3 Choose appropriate technology and tools to solve given problem.</p> <p>4 Demonstrate abilities of a responsible professional and use ethical practices in day to day life.</p>

			<p>5 Develop network and social circle, and developing relationships with industry people</p> <p>6 Analyze various career opportunities and decide career goals</p>
<b>TE</b>	<b>302055</b>	<b>Internship/ Mini project</b>	<p>1 Explain plan and execute a Mini Project with team.</p> <p>2 Implement hardware/software/analytical/numerical techniques, etc.</p> <p>3 Develop a technical report based on the Mini project.</p> <p>4 Deliver technical seminar based on the Mini Project work carried out.</p>
<b>BE</b>	<b>402041</b>	<b>Hydraulics and pneumatics</b>	<p>1 Students should be able to understand basic working principle of hydraulic &amp; pneumatic systems.</p> <p>2 Students should be able to select appropriate pump required for hydraulic Power transmission.</p> <p>3 Students should be able to understand working of hydraulic actuators and select appropriate hydraulic actuators required for hydraulic system.</p> <p>4 Students should be able to understand industrial circuits of hydraulic and pneumatic system.</p> <p>5 Students should be able to understand operation of different components of pneumatic system.</p> <p>6 Students should be able to design hydraulic and pneumatic circuit for industrial applications.</p>
<b>BE</b>	<b>402042</b>	<b>CAD/CAM Automation</b>	<p>1 Students will be able to understand transformations and its formulation for geometric entities.</p> <p>2 Students will be able to represent curves in parametric and non parametric form.</p> <p>3 Student will able to calculate the deflection and stresses induced in the body due to applied force using FEA techniques.</p> <p>4 Student will be able to generate a part programs for milling and lathe operations.</p> <p>5 Students will able to understand Rapid prototyping systems.</p> <p>6 Student will be able to know about basic components of robots and automation.</p>
<b>BE</b>	<b>402043</b>	<b>Dynamics of Machinery</b>	<p>1 The students should able to understand static balancing, dynamic balancing and balancing of inline, v engine.</p> <p>2 The students should able to understand the basic terminology of wavelength, amplitude frequency and resonance.</p> <p>3 The students should able to understand concepts of single DOF with free undamped/ damped and</p>

			<p>forced Vibration.</p> <p>4 The students should be able to understand concepts of Two DOF systems with free undamped Vibration.</p> <p>5 The students should be able to understand concepts of working of accelerometer, microphone and FFT analyser instrument.</p> <p>6 The students should be able to understand concepts latest trends in vibration and noise control.</p>
<b>BE</b>	<b>402044 A</b>	<b>Finite Element Analysis</b>	<p>1 Student should be acquainted Basic Procedure of FEA</p> <p>2 Student should be have with fundamental knowledge of Strength of Materials, Applied Mechanics</p> <p>3 Student should have knowledge of Numerical Method adopted for FEA solution</p> <p>4 Student should know fundamentals of Element Matrix Formulation by classical, energy methods</p> <p>5 Student should be acquainted with solution of strength of material problems using FEA tools</p> <p>6 Student should have fundamental knowledge of real-life application of FEA tools in various domains such as Stress analysis, thermal analysis</p>
<b>BE</b>	<b>402044 C</b>	<b>Heating, Ventilation, Air conditioning and Refrigeration Engineering</b>	<p>1 Determine the performance parameters of trans-critical &amp; ejector refrigeration systems</p> <p>2 Estimate thermal performance of compressor, evaporator, condenser and cooling tower.</p> <p>3 Describe refrigerant piping design, capacity &amp; safety controls and balancing of vapour compressor system.</p> <p>4 Explain importance of indoor and outdoor design conditions, IAQ, ventilation and air distribution system.</p> <p>5 Estimate heat transmission through building walls using CLTD and decrement factor &amp; time lag methods with energy-efficient and cost-effective measures for building envelope.</p> <p>6 Explain working of types of desiccant, evaporative, thermal storage, radiant cooling, clean room and heat pump air-conditioning systems.</p>
<b>BE</b>	<b>402045 A</b>	<b>Automobile Engineering</b>	<p>1 Students should have basic understanding of various layouts of power transmission and overview of frame and chassis construction</p> <p>2 Students will have knowledge about different systems used in automobiles like clutch,</p>

			<p>transmission system, steering, brakes, suspension systems, Vehicle safety:, etc. should be able to carry out vehicle performance calculations.</p> <p>3 Students should understand Principles and construction of battery, Electrical system and accessories Types of vehicle maintenance, servicing/overhauling</p>
<b>BE</b>	<b>402045 C</b>	<b>Energy Audit and Management</b>	<p>1 Compare energy scenario of India and World</p> <p>2 Carry out Energy Audit of the Residence / Institute/ Organization</p> <p>3 Evaluate the project using financial techniques</p> <p>4 Identify and evaluate energy conservation opportunities in Thermal Utilities</p> <p>5 Identify and evaluate energy conservation opportunities in Electrical Utilities</p> <p>6 Identify the feasibility of Cogeneration and WHR. Use a CFD tool effectively for practical problems and research</p>
<b>BE</b>	<b>402046</b>	<b>Project work I</b>	<p>1 Students should be able to demonstrate basic knowledge of design and fabrication of models, machines and prototypes based on new ideas, robot and machines based on advanced systems.</p> <p>2 Students should able to design the project and develop experimental set up</p> <p>3 Student should be able to find out real life application of the project</p>
<b>BE</b>	<b>402047</b>	<b>Energy Engineering</b>	<p>1 Describe the power generation scenario, the layout components of thermal power plant and analyze the improved Rankin cycle, Cogeneration cycle</p> <p>2 Analyze the steam condensers, recognize the an environmental impacts of thermal power plant and method to control the same</p> <p>3 Recognize the layout, component details of hydroelectric power plant and nuclear power plant</p> <p>4 Realize the details of diesel power plant, gas power plant and analyze gas turbine power cycle</p> <p>5 Emphasize the fundamentals of non-conventional power plants</p> <p>6 Describe the different power plant electrical instruments and basic principles of economics of power generation</p>
<b>BE</b>	<b>402048</b>	<b>Mechanical system design</b>	<p>1 Student should be able to design assemblies of mechanical systems such as machine tool gear box, material handling systems, pressure vessels, and I.C. engine</p> <p>2 Student should be able to optimize the components based on cost, weight and strength criteria</p>



			3 Student should be able to understand the concepts and importance of value engineering, aesthetics, ergonomics in product design.
<b>BE</b>	<b>402050 A</b>	<b>Advanced manufacturing processes</b>	<p>1 To analyze and identify applications of special forming processes</p> <p>2 To analyze and identify applications of advanced joining processes</p> <p>3 To understand and analyze the basic mechanisms of hybrid non-conventional machining techniques</p> <p>4 To understand various applications and methods of micro and nano fabrication techniques</p> <p>5 To understand advanced Additive Manufacturing (AM) technology for innovations in product development</p> <p>6 To understand various material characterization techniques.</p>
<b>BE</b>	<b>402050 B</b>	<b>Solar and Wind Energy</b>	<p>1 Student should be able to understand practical applications of solar energy thermal system.</p> <p>2 Student should be able to implement procedure to design solar food drier for domestic purpose referring existing system</p> <p>3 Student should be able to implement procedure to design parabolic dish solar cooker for domestic purpose referring existing system</p> <p>4 Student should be able to apply basic principle to design solar photo voltaic system for domestic purpose referring existing system</p> <p>5 Student should be able to understand design consideration of wind energy conversion system.</p> <p>6 Student should be able to apply basic principle to design miniature wind mill for domestic purpose referring existing system</p>
<b>BE</b>	<b>402051</b>	<b>Project Work</b>	<p>1 Students should able present the experimental or simulated data in the form of graphs, charts and interpret the results.</p> <p>2 Students should relate the project for society applications and effect of model/project on the environment</p> <p>3 Student should be able to present the project using modern presentation techniques.</p> <p>4 To understand the methodology of writing a project report/technical report.</p> <p>Students should publish their project work in project competitions ,research Journals</p>