

## 2. Programme Outcomes (150)

Total 133

2.1. Definition and Validation of Course Outcomes and Programme Outcomes (25)  
Total 22.00

2.1.1. List the Course Outcomes (COs) and Programme Outcomes (POs) (2)  
Institute Marks 2.00

### **Programme Outcomes (POs):**

1. Gain an ability to apply the knowledge in mathematics, science, and engineering
2. Gain an ability to conduct experiments, analyse, and interpret results
3. Gain an ability to design a system, component, or process to meet desired needs within realistic constraints
4. Gain an ability to function effectively in multidisciplinary teams
5. Gain an ability to identify, formulate, and solve engineering problems
6. Gain an ability to understand professional, ethical, and social responsibilities
7. Gain an ability to communicate effectively
8. Gain an ability to understand the impact of engineering solutions in a global, economic, environment, and social context
9. Gain an ability to engage in lifelong learning
10. Gain knowledge of contemporary issues and possible solutions and alternatives
11. Gain an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
12. Gain an ability to effectively plan, organize, direct and control the available resources
13. Gain an ability to adapt to the situation and manage the change

### **Basic Sciences:**

<i>Sl. No</i>	<i>Course Code</i>	<i>Course Name</i>	<i>Course Objective</i>	<i>Course Outcomes</i>
1	EN010102	Engineering Physics	Acquire knowledge of physics of a problem and an overview of physical phenomena.	At the end of the course, students will be able to <ul style="list-style-type: none"><li>• Gain knowledge of physics of a problem and gain an overview of physical phenomena</li><li>• Explain the working and component details of different types of lasers and holography</li><li>• Explain the concepts of nanotechnology and super conductivity and to explain their application in the modern engineering world</li><li>• Explain crystallography and to classify engineering materials</li><li>• Explain engineering aspects of</li></ul>

				ultrasonics, spectroscopy and acoustics Explain fiber optics and its applications
2	EN010 103	<a href="#">Engineering</a> Chemistry & Environmental Studies	Learn scientific approach and to familiarize the applications of chemistry in the field of technology Aware of the major environmental issues for a sustainable development.	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>To impart a scientific approach and to familiarize the applications of chemistry in the field of technology</li> <li>Explain different types of pollution and to understand and plan about the major environmental issues for a sustainable development.</li> <li>Explain the theory and working of electrochemical energy systems and cells</li> <li>Explain the phenomenon of corrosion and its effect and ways of preventing corrosion</li> <li>Chemistry and industrial uses of engineering materials such as fibers, polymers, rubber and plastics</li> </ul>

### **Mathematics:**

<i>Sl. No</i>	<i>Course Code</i>	<i>Course Name</i>	<i>Course Objective</i>	<i>Course Outcomes</i>
1	EN010 101	<a href="#">Engineering Mathematics I</a>	Gain mathematical background for studying engineering subjects	At the end of the course, the students must be able to <ul style="list-style-type: none"> <li>solve linear homogeneous and non-homogeneous equations using elementary transformation and find eigen values and eigen vectors of a square matrix .</li> <li>Apply Taylor's series for a function of two variable</li> <li>Evaluate area and volume by multiple integral.</li> <li>Finding general solution of a linear differential equation.</li> <li>Transform the given function using Laplace transform.</li> </ul>
4	EN010 301A	Engineering Mathematics II	To apply standard methods and basic numerical techniques for solving problems and to know the importance of	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>Apply Vector differential calculus in the real engineering life</li> <li>Understand the basic theorems and methods of vector integral calculus and apply them in</li> </ul>

			learning theories in Mathematics.	real life <ul style="list-style-type: none"> <li>Apply the concepts of finite differences in the real engineering field</li> <li>Apply the concepts of difference calculus in the real engineering field</li> <li>Use Z- Transforms in the real time applications</li> </ul>
5	EN010 401	Engineering Mathematics III	Apply standard methods of mathematical & statistical analysis	At the end of the course, the students must be able to <ol style="list-style-type: none"> <li>solve linear and non-linear partial differential equations</li> <li>develop a function as Fourier series</li> <li>find Fourier transform and Fourier integral of a given function .</li> <li>compare theoretical and experimental frequencies using probability distributions .</li> <li>apply statistical test procedures in their respective areas and inferring the conclusion</li> </ol>
6	EN010 501A	Engineering Mathematics IV	Learn basic numerical techniques to solve problems and provide scientific techniques to decision making problems.	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>Apply the concepts of Complex variables for solving complex engineering problems</li> <li>Understand and apply the concepts of Complex Integration</li> <li>Apply numerical methods to solve algebraic and transcendental equations in the engineering context</li> <li>Apply numerical methods to solve ordinary differential equations in the engineering context</li> <li>Apply linear programming to solve engineering problems</li> </ul>

**Humanities:**

<i>Sl. No</i>	<i>Course Code</i>	<i>Course Name</i>	<i>Course Objective</i>	<i>Course Outcomes Expected</i>
1	EN010 302	Economics and	Sound knowledge of the fundamentals of Economics.	At the end of the course, students will be able to

		Communication Skills	Language Proficiency of the Engineering students. To enable them to express themselves fluently and appropriately in social and professional contexts To equip them with the components of different forms of writing	<ul style="list-style-type: none"> <li>• Explain the functioning of Reserve Bank, other types of banks, stock markets and mutual funds</li> <li>• Explain globalization, privatization and MNCs and its impact on the economy</li> <li>• Explain different types of taxation and deficit financing and its relevance on the economy</li> <li>• Explain the concepts and elements of national income, inflation mechanisms and international trade</li> <li>• Understand communication mechanisms, types and its importance</li> <li>• Acquire proficiency in communicative English such as Reading comprehension, Presentation Techniques, Group Discussion and Interview skills</li> <li>• Gain knowledge in technical writing skills such as vocabulary, suffix, prefix, writing e-mails, CV, technical reports etc</li> </ul>
2	EN 010 402 (ME)	Principles of Management	To develop an understanding of different functional areas of management. To understand the functions and duties an individual should perform in an organization.	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>• Understand the basic management concepts such as mission, vision, goal setting, evolution of management functions etc</li> <li>• Understand the concepts of personnel management and observe its functioning</li> <li>• Understand the basic concepts of production management and differentiate production</li> <li>• Understand the concepts of financial and cost management and learn its usage in industries</li> <li>• Learn sales and marketing concepts and understand its application in the modern business world</li> </ul>

**Professional Core:**

<i>Sl. No</i>	<i>Course Code</i>	<i>Course Name</i>	<i>Course Objectives</i>	<i>Course Outcomes</i>
1	EN010 104	<a href="#">Engineering Mechanics</a>	To develop analytical skills to formulate and solve engineering	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>• To develop analytical skills to</li> </ul>

			problems	<p>formulate and solve engineering problems related to statics, force systems, vectors, scalars and resolution of forces</p> <ul style="list-style-type: none"> <li>• Explain moment of inertia, centre of gravity, virtual work and their role in daily life</li> <li>• Explain the concepts and engineering application of friction, structural mechanics and support frames</li> <li>• Explain the concepts of kinematics and its application in daily life such as estimation of velocity and acceleration</li> <li>• Explain Newton's Laws of motion, kinetics and engineering applications in linear and circular motion</li> </ul>
2	EN010105	<a href="#">Engineering Graphics</a>	<p>Gain fundamental knowledge of engineering drawing</p> <p>Acquire drawing skills to students</p>	<p>At the end of the course, students will be able to</p> <ul style="list-style-type: none"> <li>• Acquire skill and knowledge about lettering, construction of scales and to understand the aspects of drawing different types of conics and curves</li> <li>• Understand the concepts of orthographic projection of points, lines and solids and to Imagine, realize and draw them after identifying the analogy in the real life</li> <li>• Grasp the development of surfaces and to imagine and draw them in orthographic and isometric projection</li> <li>• Explain and apply the concepts of perspective projection and intersection of surfaces</li> </ul>
3	EN010107	Basic Mechanical Engineering	Gain basic knowledge in mechanical engineering	<p>At the end of the course, students will be able to</p> <ul style="list-style-type: none"> <li>• Explain basic thermodynamics concepts, basic cycles and heat transfer concepts</li> <li>• Explain the mechanism and component details of IC Engines, Refrigeration and Air Conditioning</li> <li>• Explain the working of different types of power transmission elements</li> <li>• Explain the selection, working and components of different types of power plants</li> <li>• Describe the working of different types of general purpose machines and</li> </ul>

				manufacturing processes
4	ME 010 303	Fluid Mechanics	Impart the basic concepts of fluid mechanics by providing exposure to diverse real engineering examples. Understand basic laws and equations used for analysis of static and dynamic fluids	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>• Explain the basic concepts of fluid mechanics by providing exposure to diverse real world engineering examples</li> <li>• Understand and apply momentum and energy equations to static and dynamic fluids</li> <li>• Understand and apply the knowledge of fluid flow through pipes and open channels</li> <li>• Understand the concepts of fluid kinematics and apply the same in real engineering world</li> <li>• Understand and apply the concepts of fluid boundary layer theory to solve engineering problems</li> </ul>
5	ME0 10 304	Metallurgy and Material Science	Learn physical concepts of atomic radius, atomic structure, chemical bonds, crystal structure, heat treatment etc. of metals with mechanical behaviour. To understand the causes of metal failure and deformation To determine properties of unknown materials and develop an awareness to apply this knowledge in material design	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>• Understand the concepts of atomic structure, crystal structure, chemical bonds, work hardening, heat treatment etc. of metals with mechanical behavior</li> <li>• Understand and apply the concepts of crystal imperfections and microstructure</li> <li>• Understand and apply the concepts of phase diagrams, heat treatment and metal forming</li> <li>• Understand the properties of ferrous and non ferrous alloys</li> <li>• Understand and apply the concepts of fracture, creep, fatigue, plasticity etc in the metallurgical context</li> </ul>
6	ME 010 305	Programming in C	Get advanced knowledge in programming in C language to solve engineering problems	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>• Understand the basic concepts of computer programming such as constants, variables, loops etc</li> <li>• Understand and apply the concepts of representing data through arrays</li> <li>• Understand the functions used in C language</li> <li>• Understand the use of pointers in C programming</li> </ul>

				<ul style="list-style-type: none"> <li>Understand and practice the use of different types of files in C programming</li> </ul>
7	ME 010 306	Strength of Materials and Structural Engineering	<p>To study internal effects produced and deformations of bodies caused by externally applied forces.</p> <p>To understand the stresses and strains in different materials and analyze strength characteristic of structural members.</p>	<p>At the end of the course, students will be able to</p> <ul style="list-style-type: none"> <li>Explain the internal effects and deformations of bodies caused by externally applied forces</li> <li>Understand the stresses and strains in different materials and analyze strength characteristic of structural members</li> <li>Understand stress, strain, Hooks Law, elastic constants, bending moment and shear force</li> <li>Study, analyze and calculate stresses on beams and deflection under linear and torsional effects</li> <li>Analyze combined stresses on beams and columns and to solve engineering problems</li> </ul>
8	ME 010 403	Hydraulic Machines	To impart knowledge regarding principles and operations of various hydraulic machines	<p>At the end of the course, students will be able to</p> <ul style="list-style-type: none"> <li>Understand the basic concepts of dynamic action of fluids and impact of jets</li> <li>Explain the classification, working, design calculations, application and selection of different types of hydraulic turbines</li> <li>Understand the basic concepts of pumping machinery and selection, operation and design of pumps</li> <li>Understand the concepts of dimensional analysis for the design of hydraulic pumps</li> <li>Explain and design the features of hydraulic systems such as positive displacement pumps, hydraulic accumulators, lifts, presses etc</li> </ul>
9	ME010 404	Manufacturing Process	Gain theoretical and practical knowledge in material casting processes and develops an understanding of the dependent and independent variables which control materials	<p>At the end of the course, students will be able to</p> <ul style="list-style-type: none"> <li>Gain theoretical and practical knowledge in material casting processes and understand the variables which control casting</li> <li>Explain the classification, working, design calculations, application</li> </ul>

			casting in a production processes	and selection of different types of welding processes <ul style="list-style-type: none"> <li>• Understand the basic concepts of rolling process and gain exposure to the current rolling applications</li> <li>• Understand the concepts of forging and explain the features of different types of forging, its components and applications</li> <li>• Explain and design the features of different types of punch and die forming systems and their components</li> </ul>
10	ME010405	Machine Drawing	To impart the fundamental concepts of machine drawing. Develop primary knowledge of working drawings	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>• Convert pictorial views of machine parts into orthographic drawings</li> <li>• Understand various systems of limits, fits and tolerances and apply the same in drawing screw threads, rivets, bolts etc</li> <li>• Visualize and draw dimensioned and sectional drawings of pipe joints and shaft couplings</li> <li>• Draw assembly drawings of IC Engine parts</li> <li>• Draw assembly drawings of valves and machine elements</li> </ul>
11	ME010502	Computer aided Design and Manufacture	Comprehensive concepts of the design aspects and its importance in computer assisted design and manufacture.	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>• Use basic concepts of CAD/CAM/CIM in the preparation of 2D and 3D graphics</li> <li>• Understand and apply the concepts of NC/ PLC and geometric modeling</li> <li>• Learn and practice part programming</li> <li>• Explain and apply the concepts of CAPP and FMS systems</li> <li>• Explain the basic concepts of robotics and application in engineering practice</li> </ul>
12	ME010503	Advanced Mechanics of Materials	Learn concepts of stress and strain analysis in a solid	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>• Explain and illustrate the basic concepts of elasticity equations and stress strain analysis in a solid</li> <li>• Apply the strain compatibility</li> </ul>



				<p>conditions in 2D</p> <ul style="list-style-type: none"> <li>• Apply the strain compatibility conditions in polar coordinates</li> <li>• Illustrate and apply energy methods and related theorems in the real life</li> <li>• Apply advanced theories in the evaluation of torsion of non circular shafts</li> </ul>
13	ME 010 504	Kinematics of Machinery	To understand the basic components and layout of linkages in the assembly of a system / machine. To understand the principles involved in assembly the displacement, velocity and acceleration at any point in a link of a mechanism	<p>At the end of the course, students will be able to</p> <ul style="list-style-type: none"> <li>• Classify, analyze and apply different types of mechanisms for transmitting force and power</li> <li>• Analyze the displacement, velocity and acceleration of links and mechanisms</li> <li>• Synthesize different types of links and mechanisms</li> <li>• Select, draw and analyze different type of cams used in mechanical engineering</li> <li>• Classify and analyze different types of gears and gear trains</li> </ul>
14	ME 010 505	IC Engines and Combustion	To impart the basic concepts of IC Engine and Combustion	<p>At the end of the course, students will be able to</p> <ul style="list-style-type: none"> <li>• Classify and analyze different types of two stroke and four stroke IC engines, fuels and components</li> <li>• Explain the working of different types of carburetion and fuel injection systems</li> <li>• Explain the thermodynamics of combustion and cooling systems</li> <li>• Analyze the combustion of SI and CI engines and use the knowledge for designing and selecting IC engines</li> <li>• Explain IC engine testing methods and effect of pollution</li> </ul>
15	ME 010 506	Thermodynamics	Impart the basic concepts of Thermodynamics	<p>At the end of the course, students will be able to</p> <ul style="list-style-type: none"> <li>• Explain and illustrate the basic concepts of thermodynamics</li> <li>• To apply steady flow energy equation in a real engineering problem</li> <li>• To apply second law of thermodynamics for constructing a temperature scale</li> <li>• Apply the combined first &amp; second laws for calculating enthalpy and</li> </ul>

				entropy <ul style="list-style-type: none"> <li>Apply the concept of thermodynamic properties to the mixture of gases</li> </ul>
16	ME 010 601	Mechanics of Machines	To understand the method of static force analysis and dynamic force analysis of mechanisms	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>Conduct static force analysis of machine links</li> <li>Explain the principles of speed governors and do the necessary calculations</li> <li>Explain the working and device gyroscopes</li> <li>Explain the working and device flywheels</li> <li>Explain the working and device brakes, clutches and dynamometers</li> </ul>
17	ME 010 602	Heat and Mass Transfer	Foundation and basic knowledge of the subject required for innovative work and advanced studies	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>Explain basic concepts of conduction and use it to solve engineering problems</li> <li>Use the idea of convection to calculate the number of tubes required in a heat exchanger</li> <li>Explain the concept of radiation applicable to solar panels</li> <li>Explain the phenomenon of boiling heat transfer</li> <li>Solve two dimensional heat flows</li> </ul>
18	ME 010 603	Thermal Systems and Applications	Get basic concepts of different types of engines To develop an idea about various thermal systems	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>Calculate the thermodynamic properties of wet, dry and super heated steam</li> <li>Select and device steam nozzles and steam turbines</li> <li>Explain the working of gas turbine power plants and its components</li> <li>Learn how to use solar energy and maintain solar power plants</li> <li>Layout, device and operate different types of thermal power plants</li> </ul>
19	ME 010 604	Metrology and Machine Tools	Understand and appreciate the importance of basic principles of traditional material removal processes	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>Explain the importance of traditional metal removing processes</li> <li>Use the idea of metal removing operations such as turning, boring, broaching etc</li> </ul>

				<ul style="list-style-type: none"> <li>• Explain the concept of milling, grinding and surface finish operations</li> <li>• Explain the various types of gear cutting operations</li> <li>• Use different types of measurement tools used in production processes.</li> </ul>
20	ME 010 605	Mechatronics and Control System	Get basic concepts of mechatronics and control systems	<p>At the end of the course, students will be able to</p> <ul style="list-style-type: none"> <li>• Understand the scope of Mechatronics and elements of measurement systems</li> <li>• Understand the working of basic input/ output systems</li> <li>• Explain open and closed loop control systems</li> <li>• Define and calculate system response</li> <li>• Conduct frequency response analysis</li> </ul>
21	MN0 10 701	Design of Machine Elements	Enable to analyze, conceptualize, synthesize and design the mechanical components to meet the engineering requirements	<p>At the end of the course, students will be able to</p> <ul style="list-style-type: none"> <li>• Understand the phases in design process and basic concepts of standardization</li> <li>• Design threaded and welded joints</li> <li>• Design riveted joints and mechanical springs</li> <li>• Design shafts, axles and couplings</li> </ul>
22	ME 010 702	Dynamics of Machines	Enable to understand, explain and design the machine components in motion, by applying the scientific knowledge and force analysis in the area of vibration and balancing machinery	<p>At the end of the course, students will be able to</p> <ul style="list-style-type: none"> <li>• Balance rotating and reciprocating masses</li> <li>• Explain the basic constituents of free and forced vibrations</li> <li>• Analyze mechanical vibrations of multi degree of freedom systems</li> <li>• Deal with transient and non linear vibrations</li> <li>• Explain and apply the concepts of acoustics and noise control</li> </ul>
23	ME0 10 703	Gas Dynamics and Jet Propulsion	To understand the concepts of gas dynamics and apply the	<p>At the end of the course, students will be able to</p> <ul style="list-style-type: none"> <li>• Apply system and control</li> </ul>

			same to the engineering applications	<p>volume approaches in compressible fluid flow</p> <ul style="list-style-type: none"> <li>• Explain and analyze isentropic flow</li> <li>• Explain and analyze Rayleigh and Fanno flows</li> <li>• Solve fluid flow problems with normal and oblique shocks</li> <li>• Solve problems in jet and rocket propulsion systems.</li> </ul>
24	ME010704	Refrigeration and Air Conditioning	Understand, apply and innovate the theoretical concepts of refrigeration and engineering to satisfy the present engineering needs and for the future	<p>At the end of the course, students will be able to</p> <ul style="list-style-type: none"> <li>• Explain the working principles of different types of refrigeration</li> <li>• Solve the design and working problems of vapor compression systems</li> <li>• Explain the working of vapor absorption and cryogenics</li> <li>• Explain the component details of vapor absorption systems</li> <li>• Explain different air conditioning systems and their components.</li> </ul>
25	ME010705	Industrial Engineering	To understand the concepts, engineering practices and tools for the successful application and leading of industries	<p>At the end of the course, students will be able to</p> <ul style="list-style-type: none"> <li>• Explain the fundamentals and role of industrial engineering</li> <li>• Propose facility planning detail and material handling system requirements in real life</li> <li>• Explain purchasing and related issues and to propose alternatives</li> <li>• Conduct work study and method study</li> <li>• Apply basic concepts of inspection and quality control</li> </ul>
26	ME010801	Design of Transmission Elements	To enable the student to analyze and design complex machine components such as gears, pumps, rotating machinery and suspension systems	<p>At the end of the course, students will be able to</p> <ul style="list-style-type: none"> <li>• Design clutches and brakes</li> <li>• Design bearings</li> <li>• Design gears</li> <li>• Design IC Engines parts</li> </ul>

27	ME010802	Operations Management	Enable to forecast, plan and control the production in the present day, complex production processes and engineering needs	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>• Explain various functions of operations management</li> <li>• Apply different types of models of aggregate planning in real situations</li> <li>• Schedule operations</li> <li>• Identify and propose suitable maintenance plans and supervise them effectively</li> <li>• Explain the applicability of ERP, Kanban, FMS etc</li> </ul>
28	ME010803	Production Engineering	Understand the newer methods and concepts of production covering the area of tool engineering, newer engineering materials and advanced manufacturing practices to manage the present day engineering requirements	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>• Understand and apply various theories of metal cutting</li> <li>• Select tool materials, estimate tool wear and tool life</li> <li>• Understand and apply powder metallurgy and micro machining</li> <li>• Understand the production of composites and ceramics</li> <li>• Explain advanced machining processes</li> </ul>

**Breadth:**

<i>Sl. No</i>	<i>Course Code</i>	<i>Course Name</i>	<i>Course Objectives</i>	<i>Course Outcomes</i>
1	EN010106	Basic Civil Engineering	To familiarize all engineering students with the basic concepts of civil engineering so that they can perform better in this great profession “Engineering”	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>• Civil engineering materials and processes</li> <li>• Application of cement mortar</li> <li>• The building components</li> <li>• The concepts and uses different methods of surveying</li> <li>• The site plan preparation methods of building and roads</li> </ul>
2	EN010107	<a href="#">Basic Electrical Engineering</a>	Get an overview of all the fields of electrical engineering To prepare students	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>• <b>Analyse</b> electric circuits using Kichhoff’s laws, mesh</li> </ul>

			for learning advanced topics in electrical engineering	<p>analysis method and star-delta conversion technique.</p> <ul style="list-style-type: none"> <li>• <b>Solve</b> problems related to magnetic circuits, electromagnetic induction and series/ parallel ac circuits</li> <li>• <b>Explain</b> the principle of operation, construction, types and working of AC &amp; DC machines.</li> <li>• <b>Solve</b> problems related to balanced star and delta systems and three phase power measurement</li> <li>• <b>Understand</b> the basics of different power generation, transmission and distribution systems.</li> <li>• <b>Explain</b> the working principle of different types of lamps and need for energy management and power quality</li> </ul>
3	EN010 109	<a href="#">Basic Electronics Engineering.</a> & Information Technology	Get an overview of all the fields of electronics engineering and information technology	<p>Understand</p> <ul style="list-style-type: none"> <li>• The working of basic electronic circuit and its components</li> <li>• Basics of communication engineering</li> <li>• Basic electronic instrumentation</li> <li>• The basic concepts of IT and the elementary devices for IT</li> <li>• Basic concepts of computer software</li> </ul>
4	ME 010 305	Programming in C	To impart advanced knowledge in programming in C language to solve engineering problems	<p>At the end of the course, students will be able to</p> <ul style="list-style-type: none"> <li>• Understand the basic concepts of computer programming such as constants, variables, loops etc</li> <li>• Understand and apply the concepts of representing data through arrays</li> <li>• Understand the functions used in C language</li> <li>• Understand the use of pointers in C programming</li> </ul>

				Understand and practice the use of different types of files in C programming
5	ME 010 306(CE )	Strength of Materials and Structural Engineering	To study internal effects produced and deformations of bodies caused by externally applied forces. To understand the stresses and strains in different materials and analyze strength characteristic of structural members	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>• Explain the internal effects and deformations of bodies caused by externally applied forces</li> <li>• Understand the stresses and strains in different materials and analyze strength characteristic of structural members</li> <li>• Understand stress, strain, Hooks Law, elastic constants, bending moment and shear force</li> <li>• Study, analyze and calculate stresses on beams and deflection under linear and torsional effects</li> </ul> Analyze combined stresses on beams and columns and to solve engineering problems
6	ME 010 406(EE )	Electrical Technology	Understand the basic working principles of DC & Ac machines and its drives	At the end of the course, students will be able to <ul style="list-style-type: none"> <li>• Understand the basic working principles of DC Generators</li> <li>• Explain the theory and working of DC Motors, transformers and its components</li> <li>• Explain the theory and working of alternators and induction motors and its components</li> <li>• Classify and explain different types of industrial electric drives and applications</li> </ul> Explain the basic principles and applications of power semiconductor devices

**Electives: (only those subjects offered are listed)**

<i>Sl. No</i>	<i>Course Code</i>	<i>Course Name</i>	<i>Course Objective</i>
1	ME 010 606 L03	Automobile Engineering	Learn basic concepts of Automobile parts and its working. To develop an idea about the fundamentals on modern vehicle technologies. <u>Course Outcomes</u> After studying this course, the students will be able to: <ul style="list-style-type: none"> <li>• Classify automotive engines and to explain the working of the main</li> </ul>

			<p>components</p> <ul style="list-style-type: none"> <li>• Explain the functioning, role and selection criteria of different types of gear boxes, axles and differentials</li> <li>• Explain the working of different types of suspension systems, springs and steering mechanisms</li> <li>• Explain the working of different types of braking systems, tyres and clutches</li> <li>• Explain the working of different types of electrical and electronic systems used for ignition, lighting and control of automobiles</li> </ul>
2	ME 010 606 L06	Project Management	<p><u>Course Objectives</u> To impart the basic concepts of Project selection. To develop an understanding of tools, techniques and software available for Project Management</p> <p><u>Course Outcomes</u> After studying this course, the students will be able to:</p> <ul style="list-style-type: none"> <li>• Conduct feasibility analysis of projects and to appraise projects</li> <li>• Use different types of financial evaluation methods to appraise the financial worth of a project</li> <li>• Carry out project risk analysis</li> <li>• Use network techniques for scheduling the tasks</li> <li>• Use computer software such as MS Project in real time situations</li> </ul>
3	ME010 706 L02	Turbo Machines	<p><u>Course Objectives</u> To develop an understanding of the functioning, repair and maintenance of turbo machines</p> <p><u>Course Outcomes</u> After studying this course, the students will be able to:</p> <ul style="list-style-type: none"> <li>• Classify the basic fluid machinery and dimension less parameters</li> <li>• Explain the working and design fluid fans and blowers</li> <li>• Explain the constructional details and working of centrifugal compressors</li> <li>• Explain the constructional details and working of axial flow compressors</li> <li>• Explain the constructional details and</li> </ul>



			working of axial and radial flow turbines
4	ME010 706 L04	Sales and Marketing Management	<p><u>Course Objectives</u> Understand the concepts of marketing and selling and the steps of managing sales</p> <p><u>Course Outcomes</u> After studying this course, the students will be able to:</p> <ul style="list-style-type: none"> <li>• Understand the basic concepts of marketing</li> <li>• Apply SWOT analysis to strategic business units</li> <li>• Propose strategies suitable for different stages of product life cycle</li> <li>• Understand the factors influencing consumer behavior</li> <li>• Understand the processes related to sales management</li> </ul>
5	ME010 804 L01	Aerospace Engineering	<p><u>Course Objectives</u> Understand the concepts of aerodynamics and apply the same to devices that enable design of air and space transport vehicles</p> <p><u>Course Outcomes</u> After studying this course, the students will be able to:</p> <ul style="list-style-type: none"> <li>• Explain the characteristics of atmosphere in aerospace applications</li> <li>• Solve two dimensional viscous flow problems in the aerospace fields</li> <li>• Apply momentum and blade element theories for designing aircraft engines</li> <li>• Do basic calculations related to straight and level flights</li> <li>• Explain basic measurements such as wind tunnels, air speed etc</li> </ul>
6	ME010 804 L05	Non Destructive Testing	<p><u>Course Objectives</u> Understand various nondestructive testing methods applicable in Engineering.</p> <p><u>Course Outcomes</u> After studying this course, the students will be able to:</p> <ul style="list-style-type: none"> <li>• Explain the basic techniques of visual and liquid penetrant inspection</li> <li>• Explain the basic techniques of magnetic particle inspection and holography</li> <li>• Explain and conduct ultrasonic testing</li> </ul>

			<ul style="list-style-type: none"> <li>• Describe the steps and suggest the use of different types radiographic testing methods</li> <li>• Explain eddy current and thermographic testing methods</li> </ul>
7	ME010 805 G01	Industrial Safety	<u>Course Objectives</u> Understand the principles and practices of industrial safety <u>Course Outcomes</u> After studying this course, the students will be able to: <ul style="list-style-type: none"> <li>• Explain the terms such safety planning, policies and programmes</li> <li>• Classify accidents, to identify the causes and to suggest the methods to prevent it</li> <li>• Explain the methods of conducting safety inspection, sampling, audit and survey</li> <li>• Classify industrial hazards and propose alternatives to prevent them</li> <li>• Explain fire chemistry and the ways to prevent fire hazards</li> </ul>

1.1.2. State how and where the POs are published and disseminated (3)  
Institute Marks 3.00

The POs are published in the department website and in the form of different display boards at appropriate locations where the same can be easily noticed. Awareness workshops are conducted and handouts are distributed to new batch of students. Discussions are arranged with parents, alumni and industrial experts so as to emphasize and enhance the collective activities in relation to the achievement of Pos.

#### Location of POs displayed

- 1) Front passage of each floor of Mechanical Engg. Department
- 2) HOD's room
- 3) In each laboratory blocks
- 4) College Website
- 5) College Calendar
- 6) Lab Manuals

2.1.3. Indicate the processes employed for defining of the POs (5) Institute Marks 4.00

The institute functions under the direct monitoring of the directorate of technical education, government of Kerala. Unlike the method of identifying and designing the courses and curriculum after defining the PEOs and POs in alignment with the graduate attributes, the Board of Studies constituted by the affiliating university (MG University) design the syllabus of the programme. Hence all the university affiliated institutes follow the same curriculum for identical programmes. The Expert members of each subject give suggestions to the the Board of Studies during the workshop organized in connection with syllabus revision as an initiative towards the consistency and relevance of the POs with graduate attributes.

2.1.4 Indicate how defined POs aligned to Graduate Attributes prescribed by the NBA (10) Institute Marks 9.00

<i><b>Programme Outcomes (POs)</b></i>	<b>Graduate Attributes of NBA (a – l)</b>											
	Engineering knowledge	Problem Analysis	Design and develop solutions	Investigation	Modern tool usage	Engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Lifelong learning	Project Management
	<b>a</b>	<b>b</b>	<b>c</b>	<b>d</b>	<b>e</b>	<b>f</b>	<b>g</b>	<b>h</b>	<b>i</b>	<b>j</b>	<b>k</b>	<b>l</b>
<b>1</b>	√	√	√		√						√	
<b>2</b>	√		√		√			√		√		
<b>3</b>	√	√		√	√	√	√	√	√		√	√
<b>4</b>				√			√		√	√		√
<b>5</b>		√	√			√		√	√	√		
<b>6</b>	√			√		√		√	√	√	√	√
<b>7</b>		√			√	√			√	√	√	√
<b>8</b>	√	√		√					√			
<b>9</b>			√				√	√		√		√
<b>10</b>	√		√		√						√	
<b>11</b>		√		√		√	√	√	√	√		√
<b>12</b>	√	√		√	√	√		√	√	√	√	√
<b>13</b>		√	√	√		√		√	√		√	√

We have adopted 12 POs specified by NBA and last PO i.e. PO 13 is formed in the context of Mechanical Engineering applied to modern industries. The PO mentioned in a general form but are applied to Mechanical Engineering programme. So the repeated use of the phrase “applied to Mechanical Engineering” is not followed. POs are different in many aspects and so the mapping with Graduate Attributes may vary.

1.1.3. Establish the correlation between the POs and the PEOs (5)



	EN010 103	<a href="#">Engineering Chemistry &amp; Environmental Studies</a>	H	M	M		H						H		
	EN010 104	Engineering Mechanics	H		M		H					M			
	EN010 105	<a href="#">Engineering Graphics</a>	H		M		M					M	H		
	EN010 106	Basic Civil Engineering	M		M		M					H	M		
	EN010 107	<a href="#">Basic Mechanical Engineering</a>	H		M	M	H			M		H	H		
	EN010 108	<a href="#">Basic Electrical Engineering</a>	H		M		H							M	
	EN010 109	<a href="#">Basic Electronics Engineering.</a> & Information Technology	H		M		H						M		
	EN010 110	Mechanical Workshop		H		H			M		H		M	H	H
	EN110 111	<a href="#">Electrical &amp; Civil Workshops</a>		H	H	H			M		H		M	H	H
S3	EN010 301A	Engineering Mathematics II	H		H		M						M		
	EN010 302	Economics & Communication Skills						H		M	M		M	M	
	ME010 303	Fluid Mechanics	H	H	M		H					M			
	ME 010 304	Metallurgy & Material Science	M		H							H	H		
	ME 010 305	Programming in C	H		H		M			M		H	M		
	ME 010 306(CE)	Strength of Materials & Structural Engineering	H		M		M					H			
	ME 010 307	<i>Computer Programming Lab</i>		H			H								
	ME 010 308	<i>Fluid Mechanics Lab</i>		H	H	M			M	H		H			M
S4	EN010 401	Engineering Mathematics III	H		M		H			M		H	M		
	EN010	Principles of				H		H	H	M	M			H	H

	402(ME)	Management													
	ME 010 403	Hydraulic Machines	H		M		H					M	M		
	ME 010 404	Manufacturing Process	M	H	M		H					M	M		H
	ME 010 405	Machine Drawing			H		M					H			
	ME 010 406(EE)	Electrical Technology	H		M										M
	ME 010 407	<i>Hydraulic Machines Lab</i>		H	H	M	M			H		M	M		
	ME 010 408(CE)	<i>Strength of Materials Lab</i>	H	H	M		M				M		M		
S5	EN010 501A	Engineering Mathematics IV	H	M	H		M					H			
	ME 010 502	Computer Aided Design & Manufacturing	M	H			H						M		
	ME 010 503	Advanced Mechanics of Materials	H		H		M								
	ME 010 504	Kinematics of Machinery	H		M		H					M			
	ME 010 505	I.C Engines & Combustion	H		M		H					M		M	M
	ME 010 506	Thermodynamics	H		H		H					M			
	ME 010 507	<i>Computer Graphics &amp; Drafting</i>		H			H			M		M		M	
	ME 010 508	<i>Electrical &amp; Electronics Lab</i>		H	M								M	M	
S6	ME 010 601	Mechanics of Machines	H		H		M			H		M	M		
	ME 010 602	Heat & Mass transfer	H		M		H			M		M	M		
	ME 010 603	Thermal Systems & Applications	H	M	H		M					H	H		
	ME 010 604	Metrology & Machine Tools	M	M	H							H	H	M	M
	ME 010 605	Mechatronics & Control System	H		H		H					M			
	ME 010 606 L01	Computational Fluid Dynamics	H		H		H					H	M	M	
	ME 010 606 L03	Automobile Engineering	M		H		M					H			M
	ME 010 606 L06	Project Management	M		H			H		M	H		H	M	M
	ME 010 607	Heat Engines Lab	M	H		H		M					M	M	
	ME 010	<i>Machine Tools</i>	M	H		M						H	M	M	H

	608	<i>Lab</i>													
S7	ME 010 701	Design of Machine Elements	H		M		H					H			
	ME 010 702	Dynamics of Machines	H		M		H		M		H	M			
	ME 010 703	Gas Dynamics & Jet Propulsion	H	M	H		H				M	M			
	ME 010 704	Refrigeration & Air Conditioning	M	M	H					H			M	M	
	ME 010 705	Industrial Engineering	M	M	H		H		M			M			
	ME010 706 L02	Turbo Machines	H		H		M				M				
	ME010 706 L04	Sales and Marketing Management	M		M		H	H	M	M				H	H
	ME 010 707	Mechanical Measurements Lab	M	H	M		H					M	M		
	ME 010 708	<i>Advanced Machine Tools Lab</i>		H	M							M	M		
	ME 010 709	Seminar		H	M				H		H	M		M	M
	ME 010 710	<i>Project</i>	H	H		M		M		H	M	H		H	M
S8	ME010 801	Design of Transmission Elements	H		H		M					M		M	
	ME010 802	Operations Management	M		H		M	H	H		M	H	H	M	
	ME010 803	Production Engineering	M		H				M				H	M	
	ME010 804 L01	Aerospace Engineering	H		M		H				H	M			
	ME010 804 L03	Cryogenics	H		M		H								
	ME010 804 L05	Non Destructive Testing	M	M	H		H		M		M		H	H	
	ME010 805 G01	Industrial Safety	M	M	H		M			M		M		M	
	ME010 805 G05	Optimization Methods in Design	H		M		H		M	M			M	M	
	ME010 806	Mechanical Systems Lab		H	H		M				H	M		M	
	ME010 807	Project	H	H		M		M		H	M	H		H	M
	ME010 808	Viva Voce	H		M		M	M	H				H	M	M
			<b>54</b>	<b>14</b>	<b>15</b>	<b>3</b>	<b>8</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>10</b>	<b>3</b>	

The correlations between the Course Outcomes and Programme Outcomes may vary among the courses. H is the suffix given to high correlations (with correlation of .9) and M is the suffix given to medium correlations (with correlation score of .6). Very low correlations are kept as

blank.

A discussion was made among the staff members for deciding on the correlation scores and the suffix ‘H’ or ‘M’ was given after arriving on a common agreement.

1.2.2. Explain how modes of delivery of courses help in the attainment of the POs

(10) Institute Marks 9.00

Course delivery was made by either class room teaching, self learning, group learning or case study discussion. Lecture classes used black board, white board and LCD projector. Tutorial sessions were used to solve problems, drawing or case study discussion. Self learning was enabled by the use of NPTEL, referring the internet, library search and special assignments.

**Methods of Content Delivery:**

For certain subjects assignments are to be submitted online and the classes are conducted using power point presentation. Downloaded e-learning materials and power point presentations are sometimes distributed to students through group mail. Department provides the facility to access NPTEL e-learning materials and e-journals. Main project implementation makes use of design and simulation tools.

Example of modes of delivery of the courses

Course	Course Type	Modes of content delivery	Effectiveness of methods
Basic Sciences and Mathematics	Theory Subjects (Maths, Physics and Chemistry)	Class room lecture, tutorial, class and home assignments, peer group assignments, problem solving, class notes and general reading	Lecture classes followed by problem solving in the tutorial session was found effective
Humanities	Economics and Communication Skills, Principles of Management	Class room lecture, tutorial, class and home assignments, peer group assignments, seminars, role play, problem solving, class notes and general reading	Case study discussions, clarification of the facts and figures and class seminars were found effective.
Professional Core Subjects	Theory Subjects of Mechanical Engg.	Class room lecture, tutorial, class and home assignments, preparation of models by students, peer group assignments, problem solving, class notes and general reading	Courses like automobile engineering was made effective by giving special assignments for describing the features of new generation cars. Courses like Theory of



			machines was made effective using animations.
Electives	Elective subjects	Class room teaching, on line and internet data resources, published journals, reference texts, individual and group assignments, PPT presentations etc.	Electives such as CFD, Crogenics etc were made interesting and effective with the help of pictyures, movies, simulation models etc.
Laboratory/ Workshop	Practical Session	Descriptions, demonstrations, joint problem solving, report writing, modeling, group and individual assignments, drawing and calculation, explanation of real time use in industry	Procedure was explained first. Students were asked to take individual or group readings. Discussions were made about the inferences to be drawn. Real life applications of lab experiments are explained to the students.
Project/Seminar	Project Work Seminar	Group projects, preferably in industry. Team guidance starting from the problem selection till it ends. Mid session evaluation of project performance	Individual and group presentation at intermediate stages improved the confidence of students. Rubrics were used to measure the knowledge and work performance.

2.2.3. Indicate the extent to which the laboratory and project course work are contributing towards the attainment of the POs (20) Institute Marks 19.00

Serial No.	Theory/Lab/Project	Number of Credits allotted	Percentage Composition
1	Theory	183	86
2	Lab	22	10
3	Project/Mini project	7	4

Students are given additional practical experiments and simulation exercises to supplement the curriculum provided by the affiliated university.

The PEOs mapping with different laboratory and project components in the curriculum are tabulated below.

Serial	Code	Name of Lab/Project	PEOs specified	POs specified
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No.				
1	EN010 110	Mechanical Workshop	II, III	1,2,4,7,9,11,12,13
2	EN110 111	<a href="#">Electrical &amp; Civil Workshops</a>	II, III	1,2,4,7,9,11,12,13
3	ME010 307	Computer Programming Lab	I, III	2,4,5,7,12
4	ME010 308	Fluid Mechanics Lab	I, II, III	2,4,5,8,10
5	ME010 407	Hydraulic Machines Lab	I, II	1,2,3,5,9,12,13
6	ME010 408	Strength of Materials Lab	II, III	1,2,3,5,9,12
7	ME010 507	CAD/CAM Lab	I, II	2,4,7,9,12
8	ME010 508 (EE)	Electrical and Electronics Lab	II, III	2,3,11,12
9	ME010 607	Heat Engines Lab	I, II, III	2,3,5,8,10,11,13
10	ME010 608	Machine Tools Lab	I, II, III	2,3,5,8,10,11
11	ME010 708	Mechanical Engineering Lab	I, II, III	2,3,5,8,10,11
	ME010 709	Heat Transfer Lab	I, II, III	2,3,5,8,10,11
12	ME010 710	Project	I, II, III, IV	2,3,4,5,7,9,11
13	ME010 807	Mechanical Measurements Lab	I, II, III	2,3,5,7,10,11,13
14	ME010 808	Project	I, II, III, IV	2,3,4,5,7,9,11