**Bachelor of Technology (Mechanical Engineering) (MECB4PUP)**

**Program & Courses Outcomes**

**B.Tech. (Mechanical Engineering)**

**(Program Outcomes, Program Specific Outcomes & Course Outcomes)**

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| **Program Name:** Mechanical Engineering | **Program Code**: MECB4PUP |
| **Program Outcomes:** **1.** Apply knowledge of mathematics, science, and engineering specialization to solve the complex engineering problems. **2.** Identify, formulate, review research literature, and analyze complex engineering problems to draw valid conclusions using first principles of mathematics, natural sciences, and engineering sciences.**3.** Design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, cultural, ethical, health and safety, manufacturability and sustainability. **4.** To function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings **5:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. **6:** Communicate effectively regarding various engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. **7:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. **8:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. |
| **Program Specific Outcomes:** 1. To apply knowledge of mathematics, science, and engineering specialization to solve the complex engineering problems. 2: To identify, formulate, review research literature, and analyze complex engineering problems to draw valid conclusions using first principles of mathematics, natural sciences, and engineering sciences.3: To design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, cultural, ethical, health and safety, manufacturability and sustainability.4: To function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.5: To learn and apply, professional ethics, responsibilities and norms of the engineering practice.6: To communicate effectively regarding various engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. 9: To recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. 10: To demonstrate knowledge and understanding of the engineering and management principles, and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. |

**B.Tech. (Mechanical Engineering)-I Year**

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| **Program Name:** Mechanical Engineering | **Program Code**: MECB4PUP |
| **Course Name:** Applied Physics | **Course Code**: MECB1101T |
| **Course Outcomes:** |
| 1 | Understand the basic scientific skills that are imperative for effective understanding of engineering subjects |
| 2 | Learn the phenomenon related to oscillations |
| 3 | Understand the diffraction, interference and polarization |
| 4 | Understand the basic concepts of lasers and optical fibres |
| 5 | Understand the basic concepts of quantum mechanics |
| 6 | Learn scientific knowledge to solve real world problems |
| 7 | The knowledge of physics relevant to engineering is critical for converting ideas into technology |

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| **Program Name:** Mechanical Engineering | **Program Code**: MECB4PUP |
| **Course Name:** Applied Mathematics-I | **Course Code**: MECB1102T |
| **Course Outcomes:** |
| 1 | Effective understanding of Engineering subjects |
| 2 | Development of basic mathematical skills |
| 3 | To inculcate the knowledge of basic concepts of mathematics for the solutions of Engineering and mathematical problems |
| 4 | Better understanding of various engineering and technological problems |
| 5 | Improvement in scientific knowledge to solve real world problems |
| 6 | Problem solving and analytic thinking |
| 7 | To enhance the ability to identify, formulate, abstract and solve engineering problems |

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| **Program Name:** Mechanical Engineering | **Program Code**: MECB4PUP |
| **Course Name:** Applied Chemistry | **Course Code**: MECB1103T |
| **Course Outcomes:** |
| 1 | Basic understanding of concepts of Chemistry |
| 2 | To solve various Chemistry related problems in Engineering and real world |
| 3 | Development of intellectual breadth of Engineering students |
| 4 | Better knowledge of Chemistry may help students to get better employment opportunities |

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| **Program Name:** Mechanical Engineering | **Program Code**: MECB4PUP |
| **Course Name:** Communication Skills | **Course Code**: MECB1104T |
| **Course Outcomes:** |
| 1 | The course has developed the overall personality of students. |
| 2 | To acquire soft skills, interpersonal skills and LSRW skills in English. |
| 3 | To enable students to enhance their vocabulary and develop comprehension skills by doing Textual analysis and interpretation through individual and group tasks. |
| 4 | The language lab provides students with user friendly modes of language learning like computer based language software and multimedia instructions. |

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| **Program Name:** Mechanical Engineering | **Program Code**: MECB4PUP |
| **Course Name:** Basic Electrical Engineering | **Course Code**: MECB1105T |
| **Course Outcomes:** |
| 1 | Learn basic concepts of Electrical Engineering  |
| 2 | Apply network laws and theorems to solve electric circuits. |
| 3 | Analyze transient and steady response of DC circuits. |
| 4 | Explain and analyse the behaviour of transformer. |
| 5 | Understand the principle and characteristics of DC motor and DC generator |

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| **Program Name:** Mechanical Engineering | **Program Code**: MECB4PUP |
| **Course Name:** Engineering Graphics | **Course Code**: MECB1106T |
| **Course Outcomes:** |
| 1 | Acquire knowledge of different conventions and methods of engineering drawing  |
| 2 | To understand dimensioned projections |
| 3 | Learn how to create two-dimensional images of objects using first angle orthographic projection |
| 4 | Learn how to create isometric, perspective and auxiliary projections. |

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| **Program Name:** Mechanical Engineering | **Program Code**: MECB4PUP |
| **Course Name:** Applied Chemistry Lab | **Course Code**: MECB1107P |
| **Course Outcomes:** |
| 1 | Development of skills to identify and solve Chemistry related practical problems |
| 2 | To develop abilities to cope up with new technologies like Spectrophoto meter,Conductometer, Distillation Plants etc. |
| 3 | To develop strong background with basic and practical knowledge of scientific and industrial communities |

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| **Program Name:** Mechanical Engineering | **Program Code**: MECB4PUP |
| **Course Name:** Applied Mathematics-II | **Course Code**: MECB1201T |
| **Course Outcomes:** |
| 1 | Effective understanding of Engineering subjects |
| 2 | Development of basic mathematical skills |
| 3 | To inculcate the knowledge of basic concepts of mathematics for the solutions of Engineering and mathematical problems |
| 4 | Better understanding of various engineering and technological problems |
| 5 | Improvement in scientific knowledge to solve real world problems |
| 6 | Problem solving and analytic thinking |
| 7 | To enhance the ability to identify, formulate, abstract and solve engineering problems |

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| **Program Name:** Mechanical Engineering | **Program Code**: MECB4PUP |
| **Course Name:** Computer Programming | **Course Code**: MECB1202T |
| **Course Outcomes:** |
| 1 | Understand the basic meaning and components of computer system |
| 2 | Define and distinguish hardware and software components of computer system |
| 3 | Design an algorithmic solution for a given problem |
| 4 | Write a maintainable C program for a given problem |
| 5 | Trace a given C program manually  |
| 6 | Write C program for simple applications of real life using structures and files |

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| **Program Name:** Mechanical Engineering | **Program Code**: MECB4PUP |
| **Course Name:** Basic Electronics Engineering | **Course Code**: MECB1203T |
| **Course Outcomes:** |
| 1 | Demonstrate the use of semiconductor diode in various applications |
| 2 | Discuss and explain the working of transistor, their configuration and application. |
| 3 | Recognize and apply the number system and Boolean algebra. |
| 4 | Define the communication system and differentiate various modulation techniques. |
| 5 | Explain radio transmission and reception. |

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| **Program Name:** Mechanical Engineering | **Program Code**: MECB4PUP |
| **Course Name:** Manufacturing Processes | **Course Code**: MECB1204T |
| **Course Outcomes:** |
| 1 | To know principles and science of various manufacturing processes used in industry. |
| 2 | Acquire knowledge about foundry practice, machining, machinery, tools, equipment, metal forming, welding techniques and operations required for basic manufacturing processes.  |
| 3 | To understand advantages and applications of various manufacturing processes |
| 4 | To apply the knowledge to select an appropriate manufacturing process, based upon viability & industrial applications. |
| 5 | Knowledge about the recent emerging areas in primary manufacturing processes. |

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| **Program Name:** Mechanical Engineering | **Program Code**: MECB4PUP |
| **Course Name:** Applied Mechanics (Branch Specific First Year Theory Elective) | **Course Code**: MECB1205T |
| **Course Outcomes:** |
| 1 | To describe fundamental laws of mechanics, system of forces and also modal the problems using free body diagram and equilibrium of forces. |
| 2 | To understand concept of friction, its application in daily life and to solve problems associated with it. |
| 3 | To determine moment of inertia and centroid of different types of areas. |
| 4 | To describe principle of virtual work and its calculation |
| 5 | To describe Newton law, motion curves and effects of motion with uniform and varying acceleration. |

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| **Program Name:** Mechanical Engineering | **Program Code**: MECB4PUP |
| **Course Name:** Advanced Physics(Branch Specific First Year Theory Elective) | **Course Code**: MECB1206T |
| **Course Outcomes:** |
| 1 | Understand the basic scientific skills that are imperative for effective understanding of engineering subjects. |
| 2 | Learn how to deal with vector algebra in physics |
| 3 | Learn about special theory of relativity, probability and statistics |
| 4 | Learn crystal systems and XRD technique.  |
| 5 | Understand the basic concepts of dielectrics and nanomaterials. |
| 6 | Learn scientific knowledge to solve real world problems |
| 7 | Learn basic concepts of superconductors |

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| **Program Name:** Mechanical Engineering | **Program Code**: MECB4PUP |
| **Course Name:** Computer Programming Lab | **Course Code**: MECB1207P |
| **Course Outcomes:** |
| 1 | Design an algorithmic solution for a given problem |
| 2 | Write a maintainable C program for a given algorithm |
| 3 | Trace the given C program manually. |
| 4 | Write C program for simple applications of real life using structures and files. |

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| **Program Name:** Mechanical Engineering | **Program Code**: MECB4PUP |
| **Course Name:** Manufacturing Processes Lab | **Course Code**: MECB1208P |
| **Course Outcomes:** |
| 1 | Acquire skills in basic engineering practice for creating objects from raw materials. |
| 2 | To build practical knowledge for use of machine tools, sheet metal working, carpentry joints, forging processes, and welding techniques. |
| 3 | To apply practical understanding for use of pattern making, mould & core making, moulding tools and gating system. |
| 4 | Utilize measuring skills gained in workshop practice. |

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| **Program Name:** Mechanical Engineering | **Program Code**: MECB4PUP |
| **Course Name:** Electrical and Electronics Lab | **Course Code**: MECB1209P |
| **Course Outcomes:** |
| 1 | To acquire knowledge about basic tools used in electronic labs like multimeter.  |
| 2 | This course gives an overview of various electronic components like resistance, capacitance, inductors, switches, BJT and FET . |
| 3 | Acquired knowledge about CRO , function generator, printed circuit board and logic gates. |
| 4 | Able to understand the working principles of electronic circuits e.g. Rectifiers. |

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| **Program Name:** Mechanical Engineering | **Program Code**: MECB4PUP |
| **Course Name:** Applied Physic Lab | **Course Code**: MECB1210P |
| **Course Outcomes:** |
| 1 | Thoroughly understand the theoretical concepts of physics by experimentation.  |
| 2 | Understand the concept of electromagnetic waves |
| 3 | Understand the phenomena of reflection, refraction, interference and diffraction of electromagnetic light through various experiments. |
| 4 | Understand the optical properties of waves through experiments |
| 5 | Learn the use of Cathode ray oscilloscope. |
| 6 | Learn the use of He-Ne laser for different experiments. |

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| **Program Name:** Mechanical Engineering | **Program Code**: MECB4PUP |
| **Course Name:** Computer Graphics Lab(Branch Specific First Year Theory Elective) | **Course Code**: MECB1211P |
| **Course Outcomes:** |
| 1 | The student will learn 2D drafting using AutoCAD |
| 2 | The student will be introduced to various tools for creating and modifying the geometry. |
| 3 | The student will also be introduced to the tools for management of drawing data viz blocks and layers, along with entity attributes, such as line types and colours. |

**B.Tech. (Mechanical Engineering)-II Year**

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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Numerical Methods and Applications  | **Course Code**: MECB2101T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. To develop the skills among the students of engineering to solve mathematical and scientific problems of engineering using Numerical Methods.
2. To develop analytical and computational skills of the students to obtain numerical solution of complicated algebraic and transcendental equations, finding approximate solution of a system of linear and non-linear equations, and solving numerical differentiation and integration problems.
3. To develop the students about the various techniques for obtaining approximate solutions of initial and boundary value problems.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Operations Research  | **Course Code**: MECB2102T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. To use quantitative methods and techniques for effective decisions–making; model formulation and applications useful for solving business problems.
2. After completing the course, the student shall be able to develop critical thinking and objective analysis of decision problems; understand the characteristics of different types of decision-making environments and the appropriate decision making approaches and tools to be used in each type for improved decision–making.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Basic Thermodynamics | **Course Code**: MECB2103T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Understand the basic concepts of thermodynamics and apply different laws of thermodynamics to different processes.
2. Develop understanding of the thermodynamic cycles and operation of different systems working on these cycles.
3. Develop understanding of the properties of steam and the use of psychometric chart.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Strength of Materials  | **Course Code**: MECB2104T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Develop an understanding of the basic concepts of stresses and strains induced in various load carrying members viz. bar, shaft, beam, column.
2. Perform analysis of stresses (mechanical and thermal) in bar, torsional stresses in circular shaft, bending and shear stresses in beams, deflection of beams and stability of columns.
3. Understand the concept of compound stresses and application of different theories of failure.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Manufacturing Technology  | **Course Code**: MECB2105T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Develop an understanding of the principles, operations and capabilities of various metal casting, powder metallurgy, welding, metal machining and metal forming processes.
2. Develop basic knowledge of the mechanics, operation and limitations of different machining tools.
3. Understanding about the importance of process variables controlling various manufacturing processes.
4. Develop the inter-relationships between material properties and manufacturing processes.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Machine Drawing  | **Course Code**: MECB2106P |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Read, draw and interpret the machine drawings (2D & 3D) and related parameters.
2. Sketch the engineering drawing using orthographic projections and sectional views, practice of part drawings for simple machine components; draw the assembly drawings using part drawings.
3. Understand the concept of limits, fits and tolerances in the drawings.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Numerical Methods and Applications Lab  | **Course Code**: MECB2107P |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Develop understand the concepts of algebraic and transcendental equations’
2. Write codes to solve differential equation and integration problem
3. Develop codes for obtaining the solutions for initial and boundary value problems.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Strength of Materials Lab  | **Course Code**: MECB2108P |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Evaluate the mechanical properties of different materials, viz. Hardness, Impact strength, Tensile strength, Flexural strength, Shear strength, Young’s modulus, Shear modulus, Ductility.
2. Understand the mechanical behaviour of various load carrying members, viz. Beam, Shaft, Bar, subjected to different types of external loads (e.g. Flexural load, Tensile load, Compressive load, Impact load, Torque).
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Manufacturing Technology Lab  | **Course Code**: MECB2109P |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Understand the salient properties of different types of moulding sand and methods to evaluate these properties.
2. Perform different manufacturing processes, viz, Foundary, Machining and Welding, for producing different types of jobs.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Environmental and Road Safety Awareness (Qualifying subject)  | **Course Code**: MECB2110T |
| **Course Outcomes:** At the end of this course, the student will: 1. Acquire in depth knowledge of ecosystem, biodiversity and road safety.
2. Understand the factors responsible for accidents and their duties.
3. Learn the importance of multidisciplinary approach for traffic safety and rehabilitation.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Management Practices & Organisational Behaviour | **Course Code**: MECB2201T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Identify the personality traits for becoming a successful professional.
2. Understand the role of human interactions in an organization.
3. Identify the factors influencing the human behavior for achieving better results in terms of business planning, organizing, staffing, directing, coordinating and controlling the activities of business enterprise.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Theory of Machines | **Course Code**: MECB2202T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Develop understanding of the kinematic and dynamic analysis of machines and mechanisms, and kinematic synthesis.
2. Understand the functioning and analysis of different types of motion transmission devices.
3. Understand the turning moment diagram for an I.C. Engine and solve the related numerical problems.
4. Perform the analysis of various drives involving friction, brakes, dynamometers and governors.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Fluid Mechanics | **Course Code**: MECB2203T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Develop an understanding of the basic concepts, properties and behavior of different types of fluids.
2. Perform analysis of static, kinematic and dynamic analysis of fluids,
3. Develop dimensional equations for fluids in various situations.
4. Understand about the different dimensionless numbers and develop models based upon different types of similarities.
5. To analyze the fluid flow in pipes and open channels, and to compute the losses involved.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Applied Thermodynamics | **Course Code**: MECB2204T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Develop an understanding of the principles of the conversion of fossil fuel energy to useful power, working of Rankine cycle, performance characteristics of steam boiler, nozzles, diffusers and boiler draught system.
2. Understand the design concepts, and working of various sub-systems and components of thermal power plant.
3. Develop understanding of the operating principles and perform analysis of Impulse steam turbine, Reaction turbine, Condensers, and Reciprocating and Rotary Compressors.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Machine Design-I | **Course Code**: MECB2205T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Develop an understanding about the morphology of machine design.
2. Perform design analysis for various machine elements (viz. shafts, keys, levers, couplings, rivet, weld and bolt joints, pipe joints, knuckle and cotter joints, levers, brackets, connecting rods) subjected to static and variable loadings.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Mechanical Measurements and Metrology | **Course Code**: MECB2206T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Understand the basic terminology used in metrology & measurement science.
2. Develop understanding about the basic principles, construction and working of various measuring instruments extensively used in industries and R&D.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Fluid Mechanics Lab | **Course Code**: MECB2207P |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Develop understanding about various flow measuring devices for pipe flow and open channel flow, viz. venture-meter, orifice meter, rotameter, pitot tube, notches, orifice & mouthpiece.
2. Understand the practical applications Bernoulli’s equation.
3. Estimate the metacentric height & position of metacentre for the ship.
4. Analyse the frictional losses in pipe flow.
5. Develop an understanding of the difference between laminar and turbulent flow.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Applied Thermodynamics Lab | **Course Code**: MECB2208P |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Understand the construction and working of different types of steam boilers, mountings and accessories.
2. Evaluate the performance characteristics of steam turbine, condenser and compressor.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Computer Aided Design Lab | **Course Code**: MECB2209P |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Understand the concept of Computer Aided Design (CAD) through advanced modelling techniques.
2. Develop fully constrained parametric sketches and convert them into basic and advanced primitive shapes.
3. Construct complex geometries through Boolean operations on primitive shapes.
4. Develop an understanding of the logical feature-dependencies in history modelling.
5. Complete minor projects based upon Design and modelling of Mechanical Engineering Systems / products / problems using 3D parametric approach using Graphic Packages.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Punjabi (MECB2210T) / Punjabi *Mudhla Gyan* (MECB2211T) (Qualifying course) | **Course Code**: MECB2210T/ MECB2211T  |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Develop the ability to read, write and speak in Punjabi language.
2. Develop an interest in the field of Punjabi language and literature.
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**B.Tech. (Mechanical Engineering)-III Year**

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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Web Technologies | **Course Code**: MECB3101T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Develop a dynamic webpage by using javascript and DHTML.
2. Develop the coding skills of the students for writing a well-formed / valid XML document, and to write a server-side java application.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Machine Design – II | **Course Code**: MECB3102T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Perform design analysis of various machine elements, viz. Brakes, Clutches, Gears, Pressure Vessels, Bearings (Sliding and Rolling element), Belt drives and Springs.
2. Develop an understanding of the response of various machine elements subjected to real-life loading conditions.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Dynamics of Machines | **Course Code**: MECB3103T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Design different types of toothed gears and gear trains based on the involute profile.
2. Analyse and balance the forces and couples arising from rotating and reciprocating masses.
3. Develop kinematic profile of cams for different types of followers and perform generalized dynamic analysis of cam-follower mechanisms.
4. Understand the origin of gyroscopic effect, analyze its role in any system containing rotating masses and develop an understanding the concept of 1, 2 and 3-axis spin-stabilization.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Heat and Mass Transfer | **Course Code**: MECB3104T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Understand the fundamental and advanced concepts of various heat transfer modes, viz, conduction, convection and radiation modes, and the basics of mass transfer.
2. Develop knowledge about heat transfer during phase-change processes, viz. boiling and condensation.
3. Understand the functioning and design concepts of different types of heat exchangers.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Industrial Metallurgy and Materials | **Course Code**: MECB3105T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Understand the phase diagrams and their practical applications.
2. Understand the concepts of various types of heat treatment processes along with chemical and surface heat treatment processes for different types of alloys.
3. Develop an understanding of various non-ferrous alloys, their chemical composition, properties and applications.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Industrial Engineering | **Course Code**: MECB3106T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Develop an understanding of concept, tools, and techniques of industrial engineering viz. plant location and layout techniques, concepts of line balancing, materials management, production planning and control, work measurement, and ergonomics etc.
2. Develop an insight into the design and continuous improvement of systems by effectively integrating people, processes and technology.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Web Technologies Lab | **Course Code**: MECB3107P |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Design and implement dynamic websites with good aesthetics.
2. Understand Web Application Terminologies, Internet Tools, E – Commerce and other web services.
3. Develop an insight about Online Gaming Programming.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Dynamics of Machines Lab | **Course Code**: MECB3108P |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Develop an understanding of the kinematics and dynamics of various physical systems, viz. epicyclic gears, cam-follower mechanism, pendulum, Journal bearing, gyroscope etc.
2. Develop an understanding about the static and dynamic balancing of rotating masses.
3. Understand and compare the working of different types of governors.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Heat and Mass Transfer Lab | **Course Code**: MECB3109P |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Develop an understanding of the conductive, convective and radiative heat transfer through experiments.
2. Develop an ability to perform heat transfer experiments using standard laboratory equipment.
3. Analyse the performance parameters of different types of heat exchangers.
4. Develop an understanding of heat transfer processes involving phase change.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Summer Training | **Course Code**: MECB3110P |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Apply the theoretical concepts to real life industrial environment.
2. Handle a live industrial project and provide techno-economically viable solutions.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Drug Abuse: Problem, Management And Prevention (Qualifying Course) | **Course Code**: MECB3111T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Develop an understanding about the causes of drug abuse and their consequences.
2. Manage and prevent drug abuse.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Computer Aided Design | **Course Code**: MECB3201T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Make 3D models using CAD software like Pro Engineer.
2. Perform 2D and 3D geometric transformations.
3. Apply general functions of graphics package (Part & assembly modeling, drafting, kinematic analysis, manufacturing simulation & finite element analysis).
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Machining Science | **Course Code**: MECB3202T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Design the conditions for maximizing the tool life.
2. Make calculation of economic cutting speed in machining.
3. Evaluate factors influencing metal removal rate in machining.
4. Select and design the Jigs and Fixtures for machining operations.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Refrigeration and Air Conditioning | **Course Code**: MECB3203T |
| **Course Outcomes:** At the end of this course, students will be able to:1. Compare the performance of various air refrigeration systems.
2. Analyse the factors which can enhance refrigerating effect and reduce work input.
3. Design a modern refrigerator for the domestic purposes.
4. Learn about the conditioning of air in summer and winter seasons for human comfort.
5. Determine the cooling and heating load for small buildings like class room, labs.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Mechanical Vibrations | **Course Code**: MECB3204T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Perform Fourier analysis on any periodic functions or recorded data.
2. Analyse the behaviour of single DoF system under free or forced vibrations.
3. Determine the effectiveness of vibration isolation elements.
4. Work-out response analysis of multi DoF system excited by any complex periodic function.
5. Estimate first natural frequency of a multi DoF system.
6. Determine critical speeds of vertical and horizontal shafts.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Project-I | **Course Code**: MECB3205P |
| **Course Outcomes:** At the end of this course, the student would be able to:1. Complete a project, based upon Design and Analysis of Mechanical Engineering Systems / Products / Technical problems/ Assemblies using CAD–FEM techniques.
2. Develop a sound technical knowledge about the selected project topic.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Machining Science Lab | **Course Code**: MECB3206P |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Determine the geometry of a cutting tool using the Tool Maker’s Microscope, along with contact and non-contact type instruments for measuring tool tip temperature.
2. Develop hand-on working experience using various machines, like lathe, radial drill, milling machine, surface and cylindrical grinders, planer and shaper.
3. Develop an understanding of the effect of various machining parameters on the surface finish.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Refrigeration and Air Conditioning Lab | **Course Code**: MECB3207P |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Understand the working of an air conditioning unit and evaluate its performance.
2. Evaluate the performance of various vapour compression refrigeration systems, along with the Electrolux Vapour Absorption system.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Communication Skills Lab | **Course Code**: MECB3208P |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Attend telephone calls, make oral presentations, deliver class seminars and participate in paper reading.
2. Participate in group discussions conduct meetings.
3. Handle Business Communication and Correspondence
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Industry 4.0 | **Course Code**: MECB3209T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Understand the concepts of Artificial Intelligence and Machine Learning
2. Identify the application areas for Internet of Things.
3. Demonstrate the application of Digital Manufacturing.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Industrial Automation & Robotics | **Course Code**: MECB3210T |
| **Course Outcomes:** At the end of this course, the student will be able to: 1. Design and implement automated systems using pneumatics.
2. Provide hydraulic solutions for designing automated systems.
3. Design and implement electro-pneumatic/hydraulic solutions for automated systems.
4. Apply PLC programming and implement it on PLC kits.
5. Select and program Robots for different industrial applications.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Work Study & Methods Engineering | **Course Code**: MECB3211T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Calculate the basic work content of a specific job for employees of an organization, thereby calculating the production capacity of man power of an organization.
2. Rate the workers engaged on a live job and calculate basic, allowed and standard time for the workers.
3. Analyse the existing methods of working for a particular job and develop a improved methods.
4. Devise appropriate wage and incentive plans for the employees of an organization.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Welding Technology | **Course Code**: MECB3212T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Become more familiar with the fundamental principles of joining technology.
2. Identify the selection of appropriate welding process for joining operations.
3. Recommend an appropriate material as electrode of filler material for the parent metals to be joined.
4. Understand the advancements in welding techniques.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Facilities Planning | **Course Code**: MECB3213T |
| **Course Outcomes:** At the end of this course, the students will be able to:1. Select appropriate location for establishing industrial plants by applying the concepts of location selection.
2. Plan and design plant and production layouts through basic strategies and with computer applications.
3. Identify and analyse the problems in the existing layout/ material handling system and optimize the layout/ material handling system.
4. Suggest appropriate material handling strategies in the industries.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Industrial Quality Control | **Course Code**: MECB3214T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Understand the basic concepts of Quality, Quality planning & Control, process capabilities, Statistical quality Control, Control charts, Total quality Management, Quality Standards, Quality & Reliability and Six Sigma.
2. Apply the various quality concepts in the actual practice in industries.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Mechatronics | **Course Code**: MECB3215T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Select and use appropriate Transducers & Sensors for automated solutions.
2. Design and implement digital logics using various gates.
3. Program and implement solutions using various Microcontrollers.
4. Program automated solutions using PLC.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Advanced Operations Research | **Course Code**: MECB3216T |
| **Course Outcomes:** At the end of this course the students should be able to:1. Use variables for formulating simple and complex mathematical models in management science.
2. Describe, formulate and solve problems related to linear programming, integer programming, dynamic programming, queuing and simulations in an industrial and service environment.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Machine Tool Design | **Course Code**: MECB3217T |
| **Course Outcomes:** At the end of this course the students should be able to:1. Understand the fundamental principles of metal cutting processes and machine tools.
2. Design jigs and fixtures.
3. Optimise the machining process parameters.
4. Identify and solve real life problems for developing appropriate processes related to machine tools.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Total Quality Management | **Course Code**: MECB3218T |
| **Course Outcomes:** At the end of this course the students should be able to:1. Apply the concept of quality, total quality management & determine the impact of quality on profitability.
2. Formulate Taguchi’s loss function; analyse & focus on customer requirements using Kano’s model.
3. Measure the cost of poor quality, process effectiveness and efficiency to track performance quality.
4. Identify areas for improvement & carry out improvements.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Rapid Prototyping | **Course Code**: MECB3219T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Develop physical prototype through rapid prototyping.
2. Analyse different rapid prototyping systems based on their principles of operation and materials used.
3. Identify and select the best Rapid Prototyping Technology for a given application/component.
4. Analyse & detect the errors in STL files.
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**B.Tech. (Mechanical Engineering)-IV Year**

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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Computer Integrated Manufacturing Systems | **Course Code**: MECB4101T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Understand the fundamental concepts of numeric control, CNC and DNC.
2. Deploy various Design considerations using Automated Guided Vehicles.
3. Design various machine members from CAD/CAM approach to NC part programming.
4. Understand of concepts of Flexible Manufacturing Systems, Sustainable Development and Green Engineering along with various emerging technologies, like Expert Systems, Computer vision, Simulation, Concurrent Engineering and Just in Time.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Fluid Machines | **Course Code**: MECB4102T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Develop conceptual understanding of turbines and their installations.
2. Analyse the flow of fluids in pumps and turbines.
3. Analyse the reaction of fluid on the blades of various types of turbines.
4. Determine the performance of pumps under different operating conditions.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Automobile Engineering | **Course Code**: MECB4103T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Understand the construction and working of various sus-systems of an automobile, viz. transmission, steering, braking, suspension systems and Automobile Emissions and Air Pollution.
2. Know about the advanced engineering concepts, such as antilock braking systems, electronic stability programs etc.
3. Know about various types of emissions and norms.
4. Develop a basic understanding of the energy storage and management systems in electric vehicles.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** I. C. Engines | **Course Code**: MECB4104T |
| **Course Outcomes:** At the end of this course, the students will be able to:1. Understand operation and various performance parameters of IC Engines, along with analysis of various factors affecting the performance.
2. Design the cooling system for an I.C. Engine.
3. Understand the thermodynamics of combustion, heat transfer and friction phenomena with reference to engine power, efficiency and emissions.
4. Follow the latest developments in the field of I.C. engines, alternative I.C. engine fuels and Alternative to I.C. engines.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Computer Integrated Manufacturing Systems Lab | **Course Code**: MECB4105P |
| **Course Outcomes:** At the end of this course, the students will be able to:1. Write CNC programs using G and M codes.
2. Write CNC programs using software tools for generative manufacturing.
3. Select different types of tool-entry paths and operations for 3-Axis milling.
4. Post process the programs for different types of CNC controllers.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Fluid Machines Lab | **Course Code**: MECB4106P |
| **Course Outcomes:** At the end of this course, the students will be able to:1. Determine the performance characteristics of different types of turbines.
2. Determine the performance characteristics of different types of pumps.
3. To design various components of pumps and turbines, and have an in-depth knowledge about their characteristics.
4. Determine the performance of hydraulic ram.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MCB4PUP |
| **Course Name:** I.C. Engines Lab | **Course Code**: MECB4107P |
| **Course Outcomes:**  At the end of this course, the students will be able to:1. Develop an understanding about various components of I.C. and C.I. Engines, viz. cooling, lubrication and fuel-injection systems.
2. Determine the IHP and plot the valve timing diagrams of engines.
3. Perform testing of Petrol and Diesel engines and plot their characteristic curves.
4. Draw heat balance sheet for a Multi Cylinder Petrol & Constant speed Diesel Engines.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Project – II  | **Course Code**: MECB4108P |
| **Course Outcomes:** At the end of this course, the students will be able to:1. Complete a project, based upon Design and Analysis of Mechanical Engineering Systems / Products / Technical problems/ Assemblies using CAD-FEM techniques.
2. Develop a sound technical knowledge about the selected project topic.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Non Traditional Manufacturing | **Course Code**: MECB4109T |
| **Course Outcomes:** At the end of this course, the students will be able to:1. Categorize different material removal, joining processes as per the requirements of materials being used to manufacture end product.
2. Select material processing technique with the aim of cost reduction, reducing material wastage & machining time.
3. Identify the process parameters affecting the product quality in various advanced machining of metals/ non-metals, ceramics and composites.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Product Design & Development | **Course Code**: MECB4110T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Understand the concept of product planning, design and development.
2. Develop sensitisation for the aspects of manufacturability and assembly, while designing a product.
3. Become aware of the legal issues concerning safety standards, patents and copyrights.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Production Planning & Control | **Course Code**: MECB4111T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Apply analytical skills and problem-solving tools to the analysis of the operations problems like forecast demand, material requirement planning, inventory etc.
2. Forecast the requirement of resources for various production processes.
3. Design an appropriate strategy for resource planning through MRP.
4. Optimise the productivity of shop-floor by designing suitable production systems.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**:MECB4PUP |
| **Course Name:** Metal Forming | **Course Code**: MECB4112T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Demonstrate the basic principle of bulk and sheet metal forming operations for analysis of forces.
2. Determine the forces involved in different metal forming operations.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Heat Exchangers | **Course Code**: MECB4113T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Select the parallel flow and counter flow heat exchanger as per requirement using advanced analysis
2. Design a heat exchanger through analysis of the thermal performance, while recognizing and evaluating the conflicting requirements of heat transfer optimization and pressure drop minimization.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Project Management | **Course Code**: MECB4114T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Develop an ability to apply the concepts of project, life cycle, and systems approach.
2. Handle tasks of time-estimation and project scheduling.
3. Exhibit competencies in project-costing, budgeting and financial appraisals in real-life problems.
4. Check feasibility of a new project to ensure its sustainability in the long-term.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Power Plant Engineering | **Course Code**: MECB4115T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Understand the basic functions of boiler mountings and accessories
2. Develop an understanding about the principles and application of various types of power plants.
3. Gain an insight into the non-conventional modes of power generation.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Finite Element Methods | **Course Code**: MECB4116T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Demonstrate the basic steps involved in FEM analysis.
2. Formulate simple problems into finite elements.
3. Describe and implement the FEM as a numerical tool in engineering analysis.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Productivity Management | **Course Code**: MECB4117T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Assess the productivity of an organization, analyse and find ways to improve.
2. Design the systems for measuring total productivity/total factor productivity/partial productivity in manufacturing and service sectors.
3. Set the targets for meeting productivity levels and in-turn improve the performance in different functional areas.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Developments in Manufacturing Management | **Course Code**: MECB4118T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Demonstrate the concepts of Lean Manufacturing, Quality Function Deployment and Business Process Re-Engineering.
2. Design and implement the systems for 5S, Just-in-time manufacturing and Concurrent Engineering
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Non-Conventional Energy Resources | **Course Code**: MECB4119T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Understand the energy scenario and the consequent growth of the power generation from renewable energy sources.
2. Calculate the terrestrial solar radiation on an arbitrary tilted surface.
3. Understand the basic physics of wind and solar power generation.
4. Evaluate the factors in site selection for installation of renewable energy systems.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Modeling and Simulation | **Course Code**: MECB4120T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Apply the knowledge of probability concepts to understand system concept
2. Simulate the operation of a system and make improvements in the working of system based upon the results of simulations.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Business Intelligence | **Course Code**: MECB4121T |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Apply the knowledge of business enterprise data management
2. Utilize data management techniques effectively
3. Carry out Multi-Dimensional Data Modelling
4. Demonstrate the skills related to enterprise reporting.
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| **Program Name:** Bachelor of Technology (Mechanical Engineering) | **Program Code**: MECB4PUP |
| **Course Name:** Project Semester | **Course Code**: MECB4201P |
| **Course Outcomes:** At the end of this course, the student will be able to:1. Develop an acumen to work in the industry.
2. Apply the concepts learnt in classroom and laboratory courses in the real-life industrial environment.
3. Handle a live industrial project and provide techno-economically viable solutions.
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