

**F.E. FIRST SEMESTER**  
**Course Code – 210102**  
**Course Name: BASIC MECHANICAL ENGINEERING**

<b>Credit Points</b>	<b>Teaching Hrs/Week</b>	<b>Practical Hrs/Week</b>
5	3	2

<b>Objective</b>	<ol style="list-style-type: none"> <li>1. To make all F.E. students familiar with Mechanical Engineering</li> <li>2. To learn basic concepts of thermodynamics and energy conversion.</li> <li>3. To understand essential properties of engineering materials.</li> <li>4. To learn basics of Machine Design &amp; Automobiles.</li> </ol>
<b>Prerequisites</b>	12 <sup>th</sup> Pass with Physics, Chemistry and Mathematics

Unit	Topic Name	Details	Hrs
<b>I</b>	<b>Fundamental Concept and Definitions</b>	Thermodynamic system, surroundings and boundary, thermodynamic properties, thermodynamic processes, Reversible and Irreversible Processes. Temperature and temperature scale. Macro and microscopic approach. Pressure measurement.	4
<b>II</b>	<b>First Law of Thermodynamics</b>	Principle of conservation of mass and energy, Continuity equation, First law of thermodynamics, Joules experiment, Application of first law to flow and non-flow processes and cycles. Concept of internal energy, flow energy and enthalpy. Application of steady flow energy equation to nozzles, turbines, pumps, compressors, Heat exchangers. Limitations of first law, statements of second and third law.	6
<b>III</b>	<b>Power Producing Devices</b>	Boiler and Steam turbines, Reciprocating I.C.Engines (Representation of Otto and Diesel cycles on P-V diagram), Gas turbines, Hydraulic turbines, Compressed air motor. (Theoretical study, using schematic diagrams, No numerical)	4
<b>IV</b>	<b>Power Absorbing Devices</b>	Reciprocating pumps and compressors, centrifugal pumps, Rotary compressors, blowers. Study of household refrigerators (representation of vapour compression cycle on P-h diagram) and window air conditioner using schematic diagrams (elementary treatment only, No numerical)	3
<b>V</b>	<b>Conventional and non-conventional energy sources</b>	Thermal, Hydraulic, Wind, Solar, Plants (schematic of plant layout)	3

<b>VI</b>	<b>Heat transfer:</b>	Basic modes of heat transfer: conduction, convection & radiation, Statement and explanation of: Fourier's law of heat conduction, Newton's law of cooling, and Stefan Boltzmann's law of radiation. (Numerical Treatment) Emissivity and its value for practical interpretation. Conducting and insulating materials and their properties, Use and types of extended surfaces like fins. (Descriptive treatment only) Description and types of heat exchanger.	
<b>VII</b>	<b>Introduction to Engineering Design</b>	<b>Design considerations:</b> Need of design, Stress, Strain, Modes of failure, Factor of safety, Tolerance, limits, fits, Aesthetic & Ergonomics Considerations Properties of Materials, Ferrous Metals & alloys, Non-Ferrous metals, Selection of Material	6
<b>VIII</b>	<b>Mechanical Drives and Elements</b>	Individual and group drives: belt drive, Rope drive, chain drive, gear drive and friction clutches & brakes (types and application only) Machine elements: Power transmission shafts, axles, key, couplings, bush and ball bearings (types and application only)	6
<b>IX</b>	<b>Self Study Topic: Automobiles.</b>	Introduction, classification, Basic parts (Motor Cycle & Car), Specifications, performance parameters (Descriptive treatment only), Engine Emission & Control: Air pollution, Euro & Bharat Norms, Hydro carbon, Carbon monoxide, NO <sub>2</sub> , particulates, catalytic converter	6

<b>Lab/ Term Work</b>
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| <ol style="list-style-type: none"> <li>1. The term work shall consist of the study and demonstration on the following:</li> <li>2. Study of Fire Tube Boiler</li> <li>3. Study of Water Tube Boiler</li> <li>4. I.C.Engine</li> <li>5. Study of House holds refrigerator and Window Air conditioner</li> <li>6. Study of Centrifugal Pump</li> <li>7. Study of Solar water heating system</li> <li>8. Study of heat exchangers</li> <li>9. Study of Power Transmitting elements Shaft, Coupling, Gears, Shaft and clutches</li> <li>10. Demonstration of Automobile</li> </ol> |
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Text Books	<ol style="list-style-type: none"> <li>1. P.K.NAG Engineering Thermodynamics Tata McGraw-Hill, Third Edition,2005</li> <li>2. V.B.BHANDARI, Design of Machine Elements Tata McGraw-Hill, Second, 2008.</li> <li>3. EASTOPE &amp; MCONKEY, Engineering Thermodynamics, Tata McGraw-Hill</li> <li>4. PRABHU, JAIGANESH AND JEBRAJ SCITECH Basic Mechanical Engineering</li> </ol>
Reference Books	<ol style="list-style-type: none"> <li>1. V.GANESHAN Internal Combustion Engines Tata McGraw-Hill, Third Edition,2007</li> <li>2. KRIPAL SINGH, Automobile Engineering</li> <li>3. R.K.RAJPUT Automobile Engineering Laxmi Publications</li> </ol>
Related Websites	

Examination Scheme	Internal Assessment = 40	Punctual submission of Assignments, Surprise Test and Pre-announced Tests
	Term Work = 25	Punctual submission of weekly Lab Work, Viva and Submission of Lab records at the end of term on due date.
	Final Theory Paper = 60	Written