

**ELEMENTS OF MECHANICAL ENGINEERING**  
 [As per Choice Based Credit System (CBCS) scheme]  
 (Effective from the academic year 2015 -2016)  
 SEMESTER - I/II

Subject Code	15EME14/15EME24	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS - 04

**Course objectives:**

Students belonging to all branches of Engineering are made to learn certain fundamental topics related to mechanical engineering so that they will have a minimum understanding of mechanical systems, equipment and process.

**Module -1**

**Teaching Hours**

**Energy Resources** :Non-renewable and renewable energy resources, **Petroleum based** solid, liquid and gaseous fuels, Calorific values of fuels, Combustion and combustion products of fuels, **Solar Power** : Solar Radiation,

Solar constant (definition only), Solar Thermal energy harvesting, ex: liquid flat plate collectors, solar ponds (principle of operation only), Solar photovoltaic principle. **WindPower** :principle of operation of a typical windmill. **Hydro Power** :Principles of electric power generation from hydropowerplants, **Nuclear Power** : Principles of Nuclear power plants, **Bio Fuels** : introduction to bio fuels, examples of various biofuels used in engineering applications, Comparison of biofuels with petroleum fuels in terms of calorific value and emission. **Steam Formation and Properties** :

Classification of boilers, Lancashire boiler, Babcock and Wilcox boiler, boiler mountings and accessories (No sketches for mountings and accessories), wet steam, saturated and superheated steam, specific volume, enthalpy and internal energy. (No numerical problems in this module)

**10 Hours**

<b>Module -2</b>	
<p><b>Turbines and IC Engines and Pumps Steam turbines</b> :Classification, Principle of operation of Impulse and reaction turbines, Delaval's turbine, Parson's turbine. (No compounding of turbines).</p> <p><b>Gas turbines</b> :Classification, Working principles and Operations of Open cycle and closed cycle gas turbines.</p> <p><b>Water turbines</b> :Classification, Principles and operations of Pelton wheel, Francis turbine and Kaplan turbine</p> <p><b>Internal Combustion Engines</b> :Classification, I.C. Engines parts, 2 Stroke and 4 stroke Petrol engines, 4 stroke diesel engines. P-V diagrams of Otto and Diesel cycles. Problems on indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency, and specific fuel consumption, [numericals on IC Engines].</p>	<b>10 Hours</b>
<b>Module - 3</b>	
<p><b>Machine Tools and Automation Machine Tools Operations :</b> Turning, facing, knurling, Thread cutting, Taper Turning by swivelling the compound rest, Drilling, Boring, Reaming, Tapping, Counter Sinking, Counter Boring, -Plane milling, End milling, Slot milling. (No sketches of Machine tools, sketches to be used only for explaining operations. Students to be shown the available machine tools in the Machine Shop of the college before explaining the operations)</p> <p><b>Robotics and Automation :</b></p> <p><b>Robotics</b> :Introduction, classification based on robots configuration; Polar, cylindrical, Cartesian Coordinate and spherical. Application, Advantages, and disadvantages</p> <p><b>Automation</b> :Definition, types -Fixed, Programmable &amp; Flexible automation, NC/ CNC machines: Basic elements with simple block diagrams, advantages and disadvantages.</p>	<b>10 Hours</b>

<b>Module-4</b>	
<p><b>Engineering materials and joining processes :</b></p> <p><b>Engineering Materials</b> :Types and applications of Ferrous &amp; Nonferrous metals and alloys,</p> <p><b>Composites</b> :Introduction: Definition, Classification and applications (Air craft and Automobiles)</p> <p><b>Soldering, Brazing and Welding :</b></p> <p>Definitions, classification and method of soldering, Brazing and welding. Differences between soldering, Brazing and Welding. Description of Electric Arc Welding and Oxy-Acetylene Welding.</p>	<b>10 Hours</b>
<b>Module-5</b>	
<p><b>Refrigeration, Air-Conditioning :</b></p> <p><b>Refrigerants</b> :properties of refrigerants, list of commonly used refrigerants. Refrigeration –Definitions – Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, Relative COP, unit of Refrigeration. Principle and working of vapor compression refrigeration and vapour absorption refrigeration: Principles and applications of air conditioners, Room air conditioner.</p>	<b>10 Hours</b>
<p><b>Course outcomes:</b></p> <p>Students shall demonstrate knowledge associated with,</p> <ol style="list-style-type: none"> <li>1. Various Energy sources, Boilers, Prime movers such as turbines and IC engines, refrigeration and air-conditioning systems</li> <li>2. Metal removal process using Lathe, drilling, Milling Robotics and Automation.</li> <li>3. Fair understanding of application and usage of various engineering materials.</li> </ol>	
<p><b>Question paper pattern:</b></p> <ul style="list-style-type: none"> <li>• The question paper will have ten questions.</li> <li>• Each full Question consisting of 16 marks</li> <li>• There will be <b>2</b> full questions(with a <b>maximum</b> of <b>four</b> sub questions)</li> </ul>	

from each module.

- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer **5** full questions, selecting one full question from each module.
- Each full question will have sub questions covering all the topics under a module.

**Text Books:**

1. V.K.Manglik, “**Elements of Mechanical Engineering**”, PHI Publications, 2013. (Module-1,2,4,5)
2. MikellP.Groover, “**Automation, Production Systems & CIM**”, 3rd Edition, PHI (Module -3)
3. K.R.Gopalkrishna, “**A text Book of Elements of Mechanical Engineering**”- Subhash Publishers, Bangalore. (Module -1,2,3,4,5)

**Reference Books:**

1. S.TrymbakaMurthy, “**A Text Book of Elements of Mechanical Engineering**”, 4th Edition 2006, Universities Press (India) Pvt Ltd, Hyderabad.
2. K.P.Roy, S.K.HajraChoudhury, Nirjhar Roy, “**Elements of Mechanical Engineering**”, Media Promoters & Publishers Pvt Ltd, Mumbai, 7<sup>th</sup> Edition, 2012
3. Pravin Kumar, “**Basic Mechanical Engineering**”, 2013 Edition, Pearson.