

## ELEMENTS OF MECHANICAL ENGINEERING

OE –I: VI Semester: AERO / MECH / CIVIL								
OE – III: VIII Semester: CSE / CSE (AI & ML) / CSE (DS) / CSE (CS) / CSIT / IT / ECE / EEE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AMEC35	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
<b>Contact Classes: 45</b>		<b>Tutorial Classes: Nil</b>		<b>Practical Classes: Nil</b>		<b>Total Classes: 45</b>		
<b>I. COURSE OVERVIEW:</b>								
<p>Understand about the working, functions and applications of equipment are used in daily life. Identify the broad context of Mechanical engineering problems, including describing the problem conditions and identifying possible contributing factors. Understand the fundamental elements of Mechanical engineering systems, system components and processes, with a good understanding of associated safety, quality, schedule and cost considerations. Employ mathematics, science, and computing techniques in a systematic, comprehensive, and Rigorous manner to support the study and solution of Mechanical engineering problems.</p>								
<b>II. COURSE OBJECTIVES:</b>								
<b>The students will try to learn:</b>								
<ul style="list-style-type: none"> <li>I Familiarize with fundamental of mechanical systems.</li> <li>II Understand and appreciate the significance of mechanical engineering in different fields of engineering.</li> <li>III The various permanent and temporary joints in engineering applications subjected to various loading conditions.</li> <li>IV Understanding the application and usage of various engineering materials</li> </ul>								
<b>III. COURSE OUTCOMES:</b>								
<b>After successful completion of the course, students should be able to:</b>								
CO1	Define Gas laws, Boyle’s law, Charle’s law, gas constant, relation between Cp and Cv, various non-flow processes .like constant volume processes, constant pressure process, isothermal process, adiabatic process, polytropic process						Remember	
CO2	Understand knowledge of formation of steam and use of steam table for identifying the various parameters at given conditions and apply to steam power plant.						Understand	
CO3	Explain the working principle of Internal combustion engines and classification of 2-stroke engines and 4-stroke.						Understand	
CO4	Demonstrate the working of pumps and air compressors and explain the refrigeration, types of refrigeration and air conditioning.						Apply	
CO5	Illustrate the concepts various metals cutting machines for lathe describe various driving mechanisms of lathe.						Apply	
CO6	Select engineering materials, their properties, manufacturing methods for encountered in engineering practice.						Analyse	
<b>IV. COURSE SYLLABUS:</b>								
<b>MODULE-I: SOURCES OF ENERGY, BASIC CONCEPTS OF THERMODYNAMICS (9)</b>								
<p><b>Sources of Energy :</b> Introduction and application of energy sources like fossil fuels, hydel, solar, wind, nuclear fuels and bio-fuels; environmental issues like global warming and ozone depletion.</p> <p><b>Basic concepts of Thermodynamics:</b> Introduction, states, concept of work, heat, temperature; Zeroth, 1st, 2nd and 3rd laws of thermodynamics. Concept of internal energy, enthalpy and entropy (simple numericals ).</p>								
<b>MODULE –II: BOILER AND TURBINES(9)</b>								
<p>Boilers: Introduction to boilers, classification, Lancashire boiler, Babcock and Wilcox boiler. Introduction to boiler mountings and accessories (no sketches).</p>								

Turbines: Hydraulic Turbines-Classification and specification, Principles and operation of Pelton wheel turbine, Francis turbine and Kaplan turbine (elementary treatment only).

Hydraulic Pumps: Introduction, classification and specification of pumps, reciprocating pump and centrifugal pump, concept of cavitations and priming.

### **MODULE –III: PROPERTIES, COMPOSITION AND INDUSTRIAL APPLICATIONS OF ENGINEERING MATERIALS(9)**

Metals-Ferrous: cast iron, tool steels and stainless steels and nonferrous: aluminum, brass, bronze. Polymers - Thermoplastics and thermosetting polymers. Ceramics -Glass, optical fiber glass, cermets. Composites -Fiber reinforced composites, Metal Matrix Composites, Smart materials -Piezoelectric materials, shape memory alloys, semiconductors and insulators.

**Joining Processes: Soldering, Brazing and Welding** Definitions. Classification and methods of soldering, brazing and welding. Brief description of arc welding, oxy-acetylene welding, TIG welding, and MIG welding.

### **MODULE –IV: MACHINE TOOLS(9)**

**Lathe** -Principle of working of a center lathe. Parts of a lathe. Operations on lathe –Turning, Facing, Knurling, Thread Cutting, Drilling, Taper turning by Tailstock offset method and Compound slide swiveling method, Specification of Lathe.

**Milling Machine**-Principle of milling, types of milling machines. Working of horizontal and vertical milling machines. Milling processes -plane milling, end milling, slot milling, angular milling, form milling, straddle milling, and gang milling.

### **MODULE –V: INTRODUCTION TO ADVANCED MANUFACTURING SYSTEMS (9)**

**Computer Numerical Control (CNC):** Introduction. Components of CNC, open loop and closed loop systems, advantages of CNC, CNC Machining centers and Turning centers.

**Robots:** Robot anatomy, joints and links, common robot configurations. Applications of Robots in material handling, processing and assembly and inspection

### **V.TEXT BOOKS**

1. V. K. Manglik, “Elements of Mechanical Engineering”, Prentice Hall, 1<sup>st</sup> Edition, 2013.
2. Mikell P. Groover, “Automation, Production Systems and CIM”, Prentice Hall, 4<sup>th</sup> Edition, 2013

### **VI.REFERENCE BOOKS:**

1. S. Trymbaka Murthy, “A Text Book of Elements of Mechanical Engineering”, University Press, 4<sup>th</sup> Edition, 2006.
2. K. P. Roy, S. K. Hajra Choudary, Nirjhar Roy, “Element of Mechanical Engineering”, Media Promoters & Publishers, 7<sup>th</sup> Edition, 2012.
3. Pravin Kumar, “Basic Mechanical Engineering”, Pearson, 1<sup>st</sup> Edition, 2013

### **VII.WEB REFERENCES:**

1. <http://www.nptel.ac.in/courses/112107144/>
2. <http://www.nptel.ac.in/courses/112101098/download/lecture-37.pdf>