

<b>Devi Ahilya University, Indore, India</b>				<b>BE-I Year (Common to all branches)</b>			
<b>Institute of Engineering &amp; Technology</b>				<b>Semester- 1</b>			
<b>Subject Code &amp; Name</b>	<b>Instructions Hours per Week</b>			<b>Credits</b>			
<b>MER1C3: Elements of Mechanical Engineering</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>
	<b>3</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>5</b>
<b>Duration of Theory Paper: 3 Hours</b>							

**Learning Objectives:**

- To understand the basic fundamentals of Mechanical Engineering in light of thermal engineering and production engineering.
- To provide an insight about the basic thermal and production processes, materials, components and applications.

**Prerequisites:** Nil.

**COURSE OF CONTENTS**

**UNIT I**

Thermodynamics and energy, Temperature and Zeroth law of thermodynamics, Systems and control volume, Properties of a system, Energy transfer by heat and work, First law of thermodynamics, Energy analysis of closed systems, Internal energy and enthalpy of ideal gases, Energy analysis of steady flow systems, Analysis of some steady flow engineering devices, Relevant review problems.

**UNIT II**

Properties of pure substance, p-v and T-s diagram for a pure substance, Mollier diagram for a pure substance, Quality or dryness fraction, Steam tables, Methods for measurement of steam quality, Relevant review problems.

**UNIT III**

Basic considerations in the analysis of power cycles, Air standard assumptions, Overview of reciprocating engines, Thermodynamic analysis of Otto cycle: Ideal cycle for spark ignition engines, Thermodynamic analysis of Diesel cycle: Ideal cycle for compression ignition engines, Comparison of Otto and Diesel cycles, Effect of Specific Heat and Dissociation on the performance of the cycles, Relevant review problems.

**UNIT IV**

Metal Casting: Classification and overview of metal casting processes: sand casting, expandable mould casting and permanent mould casting; Patterns, cores and moulding; Elements of gating systems; Heating, pouring and solidification; Casting quality: cleaning, finishing and defects.

**UNIT V**

Welding and Machining: Fundamentals of welding and overview of welding processes: Oxy- Acetylene gas welding, Arc welding: TIG, MIG, SAW etc., Resistance welding; Soldering & Brazing; weld quality and defects; Fundamentals of metal machining and introduction to turning and related operations; Constructional features of lathe, Geometry of single point cutting tool and cutting tool materials.

**Learning Outcomes:**

- Upon Completing the Course, Student will able to:
- Understand basics of thermodynamics and components of steam.
- Identify engineering materials, their properties, manufacturing methods encountered in engineering practice.
- Understand basics of internal combustion engines.
- Understand functions and operations of welding, casting and machine tools including milling, shaping, grinding and lathe machines.

**BOOKS RECOMMENDED:**

1. Nag P K, Engineering Thermodynamics, The McGraw-Hill Companies, Fourth Edition.
2. P N Rao, Manufacturing Technology, Vol. I and Vol.2 Tata McGraw-Hill, 4<sup>th</sup> Edition, 2014.
3. Hajra & Chaudhary, Work Shop Technology, Vol. 1 & 2, 12<sup>th</sup> Edition, Media Promoters & Pub, 2007.
4. Cengel Y A, Boles M A, Thermodynamics-An Engineering Approach, The McGraw-Hill Companies, Fifth Edition.
5. Mikell P. Groover, Fundamentals of Modern manufacturing, 3<sup>rd</sup> Edition, John Wiley and Sons.