

## MATERIAL AND MECHANICS OF SOLIDS LABORATORY

<b>IV Semester: ME</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AMEB14	Core	L	T	P	C	CIA	SEE	Total
		-	-	2	1	30	70	100
<b>Contact Classes: Nil</b>		<b>Tutorial Classes: Nil</b>		<b>Practical Classes: 24</b>		<b>Total Classes: 24</b>		
<b>I. COURSE OVERVIEW:</b>								
Materials and mechanics of solids laboratory can examine samples to detect surface and internal flaws, determine micro structural features, evaluate heat treatments and ensure conformance to required specifications. It covers the method of visualizing the micro structure of ferrous and non ferrous materials, to observe the mechanical properties through experimentation. Designing machines, structures, and vehicles, which are reliable as well as safe and cost effective, requires a proper knowledge of engineering as well as material selection.								
<b>II. OBJECTIVES:</b>								
<b>The course will enable the students to:</b>								
I The fundamental knowledge of crystallography and phase diagrams under various chemical compositions of ferrous and non ferrous metals.								
II The Preparation of samples for investigating the micro structure of different materials to observe the defects.								
III The experimental observation of mechanical properties of materials as per ASTM standards.								
IV The affluence of mechanical, automobile and aeronautical engineering problems towards gaining the experience for how mechanics of solids is applied in engineering practice.								
<b>III. COURSE OUTCOMES:</b>								
<b>After successful completion of the course, students should be able to:</b>								
CO 1	Study the micro structure of ferrous and non ferrous materials for observing the defects in order to increase the strength of a structure. .							Understand
CO 2	Observe the microstructures of ferrous and non ferrous materials to investigate the novel materials for fabricating the robust products.							Apply
CO 3	Determine the modulus of elasticity and percentage of elongation along with hardness number of a various metals for observing the tensile strength and hardness .							Apply
CO 4	Determine the modulus of rigidity and torque of a various metals for observing the shear strength in relation to angle of twist with the help of basic concepts.							Apply
<b>IV. SYLLABUS:</b>								
<b>LIST OF EXPERIMENTS</b>								
<b>Week-1</b>	<b>MICROSTRUCTURE OF PURE METALS</b>							
Preparation and study of the micro Structure of pure metals like iron, cu and al.								
<b>Week-2</b>	<b>MICROSTRUCTURE OF STEELS</b>							
Preparation and study of the microstructure of mild steels, low carbon steels, high-C steels.								
<b>Week-3</b>	<b>MICROSTRUCTURE OF CAST IRON</b>							
Study of the micro structures of cast irons.								
<b>Week-4</b>	<b>MICROSTRUCTURE OF NON FERROUS ALLOYS</b>							
Study of the micro structures of non-ferrous alloys.								

<b>Week-5</b>	<b>MICROSTRUCTURE OF HEAT TREATED STEELS</b>
Study of the micro structures of heat treated steels.	
<b>Week-6</b>	<b>HARDENABILITY OF STEELS</b>
Hardenability of steels by jominy end quench test.	
<b>Week-7</b>	<b>HARDNESS OF STEELS</b>
To find out the hardness of various treated and untreated steels.	
<b>Week-8</b>	<b>TENSION TEST</b>
To Find % of elongation and young's modulus of a material.	
<b>Week-9</b>	<b>TORSION TEST</b>
To find the torsional rigidity of a material.	
<b>Week-10</b>	<b>HARDNESS TEST</b>
Brinell's hardness test. Rockwell hardness test.	
<b>Week-11</b>	<b>SPRING TEST</b>
Testing on compressive and elongation springs.	
<b>Week-12</b>	<b>COMPRESSION TEST</b>
Compression test on springs.	
<b>Week-13</b>	<b>IMPACT TEST</b>
Charpy. Izod test.	
<b>Week-14</b>	<b>SHEAR TEST</b>
Punch shear test on aluminium sheet.	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Sidney H Avner, "Introduction to Physical Metallurgy", McGraw Hill Education, 2<sup>nd</sup> Edition, 2008.</li> <li>2. William, Callister, "Material Science and Engineering", Wiley, 9<sup>th</sup> Edition, 2014.</li> <li>3. V Raghavan, "Elements of Material Science", PHI Learning Company Pvt Ltd, 6<sup>th</sup> Edition, 2015.</li> <li>4. Er.Amandeep Singh Wadhva, "Engineering Materials and Metallurgy", Laxmi Publications, 1<sup>st</sup> Edition, 2008.</li> <li>5. Traugott Fisher, "Material Science", 1<sup>st</sup> Edition, Academic Press Elsevier, 2013.</li> </ol>	
<b>Web References:</b>	
1. <a href="http://www.iare.ac.in">http://www.iare.ac.in</a>	