

Course Number and Name	
BME403 - INDUSTRIAL METALLURGY	
Credits and Contact Hours	
3 & 45	
Course Coordinator's Name	
Ms.Sucharitha	
Text Books and References	
<p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 1. G.E.Dieter, Mechanical Metallurgy, McGraw Hill ISE, 1999. 2. Raghavan, Material Science and Engineering, Prentice Hall of India Pvt. Ltd., 2004. <p>REFERENCES:</p> <ol style="list-style-type: none"> 1. D.Callister-Material Science And Engineering. 2. Arumugam, M.Material Science, Anuradha Publishers, 1997. 3. R.A.Flinn & P.K.Trojan, Engineering Materials and their Applications 4. Rajan, T.V. Sharma and Ashok Sharma, Heat Treatment – Principles and their techniques, Prentice Hall of India Pvt. Ltd., 2004. 5. www.studynama.com/.../315-Engineering-materials-metallurgy-lecture-n... 	
Course Description	
To impart knowledge on the structure, properties, treatment, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various engineering applications.	
Prerequisites	Co-requisites
Manufacturing Technology	Nil
required, elective, or selected elective (as per Table 5-1)	
Required	
Course Outcomes (COs)	
CO1	Upon completion of this course, the students will be able to differentiate materials, their processing, heat treatments in suitable application of mechanical engineering field.
CO2	Student gain knowledge in selecting materials
CO3	Understand mechanical properties of materials
CO4	Understand crystallography techniques
CO5	Learn surface engineering techniques
CO6	Understand fracture and learn to get rid of it.

Student Outcomes (SOs) from Criterion 3 covered by this Course													
COs/SOs	a	b	c	d	e	f	g	h	i	j	k	l	
CO1	H	H	L					M	M		H	H	
CO2	H	H	L					M	M		H	H	
CO3	H	H						M	M		H	H	
CO4	H	M	L					M	M		H	H	
CO5	M	H	L					M	M		M	M	
CO6	M	H	L					M	M		M	M	
List of Topics Covered													
UNIT I CRYSTALLOGRAPHY											9		
Structure of metals and alloys – Molecules and bonding – Crystal structure inter atomic distance and ionic radii, polymorphism, Miller indices of atomic planes, Bragg’s law, crystal defects – point, line and plane defects – Effect of crystal imperfection on mechanical properties- strengthening mechanism for improvement of mechanical properties – Allotropy, grain and grain boundaries – problems.													
UNIT II MECHANICAL PROPERTIES AND ELASTIC DEFORMATION											9		
Mechanical properties: Stress strain curve- elastic deformation – characteristics of elastic deformation – Atomic mechanism of elastic deformation – elastic deformation of an isotropic material – Modulus of elastic resilience. Elastic deformation: strain time curves – Damping capacity – viscous deformation – Plastic deformation – Dislocation and stress – strain curves, Schmid’s law. Critical resolved shear stress, Work hardening, Grain boundary hardening, solution hardening, Dispersion hardening.													
UNIT III FRACTURE AND ITS PREVENTION											9		
Mechanism of brittle fracture – ideal fracture stress (Griffith’s theory) – Ductile fracture- Difference between brittle and ductile fracture – fracture toughness – Cup and cone type of fracture – fatigue failure and its prevention – Creep – various stages in creep curve – factors affecting creep resistant materials – Mechanism of creep fracture.													
UNIT IV METALLURGY, FERROUS AND NON FERROUS ALLOYS											9		
Metallurgy: Solid solution – Intermetallic compound – Cooling curves – Non equilibrium – Phase rule – Interpretation of equilibrium diagram of Cu-Ni, Cu –Zn, Cu – Sn, Cu –Al.													
Ferrous alloys: Phase diagram and its significance – Allotropy and phase change of pure iron – steel and cast iron classifications – Equilibrium diagram for iron –Carbon, Microstructure representation for iron and steel – Application of ferrous alloys – Factors affecting mechanical properties. Heat treatment: Definition – annealing and normalizing. Types of annealing.TTT diagram – cooling curves superimposed on I.T. diagram. Hardenability, Jominy end quench test, Austempering, mar tempering.													
UNIT V SURFACE ENGINEERING											9		

Surface heat treatment – Diffusion methods – Carburizing – Nitriding – Cyaniding and carbonitriding – Applications – Thermal methods – flame hardening – induction hardening and their applications – Laser surface hardening–Vickers’s Hardness test.