

DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE OUTLINE TEMPLATE			
Course Title	Physical Metallurgy		
Course Code	MT 611	No. of Credits	3
Department	MME	Faculty	Dr S KUMARAN
Pre-requisites Course Code	Not applicable		
Course Coordinator(s) (if, applicable)	Dr S KUMARAN		
Other Course Teacher(s)/Tutor(s) E-mail	--	Telephone No.	9944434705 Intercom : 3482
Course Type	<input type="checkbox"/> Core course <input checked="" type="checkbox"/> Elective course		
COURSE OVERVIEW			
<p>Introduction to engineering materials. Atomic structure and inter atomic bondings, theoretical concept of crystalline materials – types of packing, voids and packing factors for each of the packings, concept of alloy design using lattice positions and intristitial voids. Planes and directions and imperfections in solids. Polymorphism and allotropy.</p> <p>Diffusion, energetic of solidification Nucleation and growth-dealing homogeneous and heterogeneous nucleations and growth of solids, dendritic growth in pure metals, constitutional super cooling and dendritic growth in alloys.</p> <p>Phase diagrams – solid solution –types, Hume –Rothery rule. Phase diagrams – Binary- types – Lever rule. Solidification of different types of solid solutions – Iron-Carbon diagram – Effect of alloying element on Iron-carbon diagram. Ternary phase diagrams- Understanding of isotherms and isopleths.</p> <p>Het treatment of ferrous alloys; Annealing, Normalising, TTT and CCT diagrams, Hardening – hardenability measurements, tempering. Thermo mechanical treatments. Heat treatment furnaces – atmospheres – quenching media – case hardening techniques.</p> <p>Basic concept of dislocations their types and its interactions. Dislocations and strengthening mechanisms strengthening by grain-size reduction, solid solution strengthening, strain hardening, dispersion hardening and other recent modes of hardening.</p>			

COURSE OBJECTIVES				
To develop an understanding of the basis of physical metallurgy and correlate structure of materials with their properties for engineering applications.				
COURSE OUTCOMES (CO)				
Course Outcomes				Aligned Programme Outcomes (PO)
Upon completion of this class, the students will be able to:				
1. Describe the basic crystal structures (BCC, FCC, and HCP), recognize other crystal structures, and their relationship with the properties				1,2
2. Define and differentiate engineering materials on the basis of structure and properties for engineering applications				1,2
3. Select proper processing technologies for synthesizing and fabricating different materials				3,4,5
4. Analyse the microstructure of metallic materials using phase diagrams and modify the microstructure and properties using different heat treatments.				2,3,5
COURSE TEACHING AND LEARNING ACTIVITIES				
S.No.	Week	Topic	Mode of Delivery	
1	August	Fundamental of structure	Chalk and Board	
2	August-September	Solidification	Chalk and Board, Power Point	
3	September	Phase Diagrams	Chalk and Board, Power Point	
4	October-November	Heat Treatment of alloys	Chalk and Board, Power Point	
COURSE ASSESSMENT METHODS				
S.No.	Mode of Assessment	Week/Date	Duration (min.)	% Weightage
1	Assignment	September, November	60	10
2	Tutorial	August	120	10
3	Assessment (Written Test)	October	60	20
4	Seminar	October	15min/student	10
5	Final assessment	November	180	50

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

1. Avner, S. H., "Introduction to Physical Metallurgy", second edition, McGraw Hill, 1985.
2. William F. Hosford, Physical Metallurgy, Taylor & Francis Group, 2008
3. Raghavan, V., "Physical Metallurgy", Prentice Hall of India, 1985
4. Donald R Askland and Pradeep P Phule "Essentials of Materials Science and Engineering, Baba Barkha Nath Printers, Delhi.
5. Willam D. Callister, Jr. Materials Science and Engineering, Wiley India Pvt. Ltd.
6. Vijendra Singh, Physical Metallurgy, Standard Publishers.

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)

Student's feedback

COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)

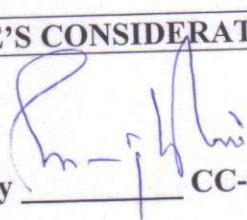
Min. attendance is 60%. Students with less than 60% attendance will be prevented for writing final assessment. She /He can undergo formative assessment as per Instt. Norms. Grading is as per Institute norms.

ADDITIONAL COURSE INFORMATION

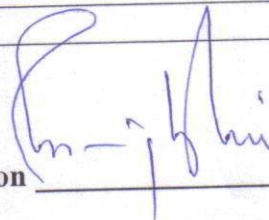
You are welcomed for technical discussion out of the class room. Please contact me through my email id or mobile

FOR SENATE'S CONSIDERATION

Course Faculty



CC-Chairperson



HOD

