

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE OUTLINE			
Course Title	PHYSICAL METALLURGY		
Course Code	MTPC15	No. of Credits	4
Department	MME	Faculty	V MUTHUPANDI
Pre-requisites Course Code	Nil		
Course Coordinator(s) (if, applicable)	Not applicable		
Other Course Teacher(s)/Tutor(s) E-mail	-----	Telephone No.	0431-2503457
Course Type	Theory		
COURSE OVERVIEW			
Introduction to crystallography, imperfections in crystals, alloy structure, phase diagram and transformation during equilibrium cooling and thermodynamic concepts of phase diagrams.			
COURSE OBJECTIVES			
To provide knowledge on basics of physical metallurgical concepts essential for the rest of the program.			
COURSE OUTCOMES (CO)			
Course Outcomes	Aligned Programme Outcomes (PO)		
At the end of the course student will be able to:			
1. Understand the geometry and crystallography of crystalline materials using Bravais lattices, and Miller and Miller Bravais indices.	[1, 2]		
2. Describe the characteristics of cubic and hexagonal crystal systems and recognize other crystal structures.	[1, 2]		
3. Classify the defects in crystals and determine grain size.	[1,2,11]		
4. Solve diffusion related problems.	[1,2, 5]		
5. Distinguish solid solutions. Interpret cooling curves and identify transformation temperatures.	[1,2,11]		
6. Identify the type of binary equilibrium diagrams and follow the solid state equilibrium transformation on cooling.	[1,2]		
7. Able to explain the effects of non-equilibrium cooling on solidification.	[1,2]		
8. Appreciate the use of thermodynamic concepts in the construction of phase diagram.	[1,2]		

COURSE TEACHING AND LEARNING ACTIVITIES				
S.No.	Week	Topic	Mode of Delivery	
1	1	Crystallography - co-ordination number, effective number of atoms, packing factor, crystal system relevant to metals, indexing of crystal planes and directions in cubic and hexagonal system, linear and planar density, interplanar spacing.	Chalk & Talk, PPT	
2	2			
3	3	Crystal imperfections and its types; point defects, dislocations - unit dislocation, partial dislocation, motion of dislocations, slip and twin crystal orientation, concept of texture, grain and grain boundaries, methods of grain size determination.	Chalk & Talk, PPT	
4	4			
5	5	Self-diffusion, diffusion in alloy, diffusion mechanisms, activation energy, laws of diffusion- Fick's I law, II law, interdiffusion and Kirkendall effect, types of diffusion and examples of diffusion; problems based on diffusion.	Chalk & Talk, PPT	
6	6			
7	7	Solid solutions and its types and intermediate phases - Hume Rothery's rule - solidification of metals and alloys, cooling curves, concepts of phase diagrams, coring and segregation as applied to various binary systems, ternary systems.	Chalk & Talk, PPT	
8	8			
9	9			
10	10			
11	11			
12	12	Thermodynamic properties of binary metallurgical systems, free energy-composition curves and their relation to phase diagrams of different types; ternary phase diagram - Gibbs phase triangle.	Chalk & Talk, PPT	
13	13			
14	14			
COURSE ASSESSMENT METHODS				
S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1.	Cycle test -1	5 th Week	1 hr	20
2.	Cycle Test- 2	10 th week	1hr	20
3.	2 Assignments	-	-	10
4.	End semester exam	15 th or 16 th week	3hr	50
ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc				

1. Physical Metallurgy – Vijendra Singh, Standard Publishers, 2002
2. Materials Science and Engineering- Callister, Wiley India, 2007
3. Class notes & PPTs provided by the faculty

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

Students will be encouraged to give genuine feedback. Feedback form will be collected after the completion of the syllabus. Knowledge gained by the students on the subject will be assessed from the continuous assessment and from the end semester examination.

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

Students are expected to attend all the classes.

The assignments should be hand written by the respective student. Zero mark will be awarded for the total assignment, otherwise.

For students could not give the cycle test (with prior intimation for genuine reasons), a retest will be conducted on 11th or 12th week.

Relative grading proposed by the institute will be followed for the award of final grade.

Failed students can select either supplementary or formative assessment. A special supplementary examination will be conducted within 15 days from the reopening date of the subsequent semester and examination will be for 100 marks. The highest eligible grade in this case will be 'A' and the respective marks for the award of other grades are given below.

85 - 100 marks – 'A' Grade

75 - 84 marks – 'B' Grade

65 - 74 marks – 'C' Grade

55 - 64 marks – 'D' Grade

40 - 54 marks – 'E' Grade

0 - 39 marks – 'F' Grade


ADDITIONAL COURSE INFORMATION

Students are encouraged to participate in the class room discussions and can feel free to approach the faculty to clarify their doubts related to the subject matters.

FOR SENATE'S CONSIDERATION


Faculty


Class Committee Chairman


HoD