



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

COURSE PLAN – PART I			
Name of the programme and specialization	M.Tech. Welding Engineering, M.Tech. Industrial Metallurgy, M.Tech. Materials Science and Engineering		
Course Title	Physical Metallurgy		
Course Code	MT611	No. of Credits	3
Course Code of Pre-requisite subject(s)	Nil		
Session	Jul 2023	Section (if, applicable)	NA
Name of Faculty	Dr. V. Karthik	Department	MME
Email	karthikv@nitt.edu	Telephone No.	9788444987
Name of Course Coordinator(s) (if, applicable)			
E-mail		Telephone No.	
Course Type	Core course <input type="checkbox"/>		Elective course <input checked="" type="checkbox"/>
Syllabus (approved in BoS)			
<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)
At the end of the course student will be able to:				
1. Describe the basic crystal structures (BCC, FCC, and HCP), recognize other crystal structures, and their relationship with the properties				1,4,5,6
2. Define and differentiate engineering materials on the basis of structure and properties for engineering applications				1, 4, 6, 8, 11
3. Select proper processing technologies for synthesizing and fabricating different materials				1,3,5
4. Analyse the microstructure of metallic materials using phase diagrams and modify the microstructure and properties using different heat treatments				1,3,5
COURSE PLAN – PART II				
COURSE OVERVIEW				
The course starts with introduction to crystal structures, imperfections and diffusion. Discuss about the phase diagrams, heat treatment of ferrous alloys and strengthening mechanisms.				
COURSE TEACHING AND LEARNING ACTIVITIES				
S.No.	Week/Contact Hours	Topic	Mode of Delivery	
1	I-III	Introduction to crystal structures and crystal imperfections	Chalk and talk + power points + animated/real videos	
2	IV-VI	Diffusion, nucleation and growth concepts		
3	VI-IX	Phase diagrams with examples		
4	X-XII	Heat treatment of ferrous alloys		
5	XIII-XIV	Strengthening Mechanisms		
COURSE ASSESSMENT METHODS (shall range from 4 to 6)				
S.No.	Mode of Assessment	Week	Duration (mins)	% Weightage
1	Video Podcast	X 03-06 Oct 2023	5	10
2	Mid Semester	XV 06-10 Nov 2023	60	20
3	Term Paper	XVII	-	10
4	Mini-project	V-XIX	-	30
CPA	Compensation Assessment	XIX	60	20
5	Final Assessment	XXI 18-22 Dec 2023	180	30

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

The exit survey will be assessed based on the questionnaire prepared by the class teacher and expected attainment is 75% on 1-10 scale basis

COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)

MODE OF CORRESPONDENCE (email/ phone etc)

Email/Mobile/Whatsapp

COMPENSATION ASSESSMENT POLICY

It will be given during XIX (between 4th and 8th Dec 2023) week for those who are absent on genuine grounds for the Mid semester examination.

ATTENDANCE POLICY

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

ACADEMIC DISHONESTY & PLAGIARISM

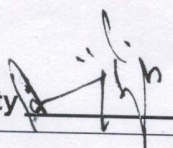
- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

ADDITIONAL INFORMATION

The Course faculty is available for consultation at any time. Students can contact the faculty at any time through whatsapp or phone call or by mail.

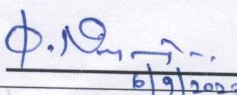
FOR APPROVAL

Course Faculty

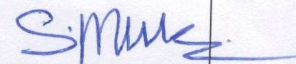


CC-Chairperson

(Working)


07/09/2023

HOD



07/09/2023