

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

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COURSE PLAN – PART I			
Name of programme and specialization	MTech: Industrial Metallurgy		
Course Title	Industrial Heat Treatment		
Course Code	MT 702	No. of Credits	3
Department	MME	Faculty	Dr D. K. Satapathy
Pre-requisites Course Code	Physical Metallurgy	Section (if, applicable)	NA
Course Coordinator(s) (if, applicable)		Department	MME
Other Course Teacher(s)/Tutor(s) E-mail	deepaksatapathy245@gmail.com	Telephone No.	9437347529
Course Type	<input checked="" type="checkbox"/> Core course <input type="checkbox"/> Elective course		

Syllabus (approved in BoS)

Principles of Heat treatment: Purpose of alloying, effect of alloying elements on ferrite, cementite, Fe-Fe₃C system, tempering and TTT Curves, Austenitic Transformation, Pearlitic Transformation, Bainitic Transformation, Martensitic Transformation

Chemical and Thermo mechanical heat treatment: Annealing, Normalizing, Hardening, mechanism of heat removal during quenching, quenching media, size and mass effect, hardenability, tempering, austempering. Carburizing, cyaniding, flame and induction hardening, residual stresses, deep freezing, thermo mechanical treatments: HTMT, LTMT, Ausforming, Isoforming, Cryoforming.

Heat treatment of Ferrous alloys; Heat treatment of Plain carbon, Alloy and structural steels and Cast Iron;

Non-ferrous metals and alloys: Precipitation hardening, aging treatment, study of copper, aluminum, Mg and nickel and their alloys

Furnaces: Heat treatment furnaces and their design, atmosphere control vacuum heat treatment etc.




Defects in Heat treatment and their remedies, Economics of heat treatment

COURSE OBJECTIVES

Course objective: The heat treatment technology deals with the factors and mechanisms involved in the control of composition and properties of various materials with ‘getting it right’ economically, operationally, and environmentally.

COURSE OUTCOMES (CO)	
Course Outcomes	Aligned Programme Outcomes (PO)
The student will have the ability to understand the advantages of heat treatment like increasing the strength of material, improve machining, improving formability, restore ductility after a cold working operation. Thus it is a very enabling manufacturing process that can not only help other manufacturing process, but can also improve product performance by increasing strength or other desirable characteristics.	

COURSE PLAN – PART II			
COURSE OVERVIEW			
<ul style="list-style-type: none"> • Fe-Fe₃C system, tempering and TTT Curves, Austenitic Transformation, Pearlitic Transformation, Bainitic Transformation, Martensitic Transformation • Chemical and Thermo mechanical heat treatment: Annealing, Normalizing, Hardening, Heat treatment of Ferrous alloys: • Heat treatment of Plain carbon, Alloy and structural steels and Cast Iron • Non-ferrous metals and alloys: Precipitation hardening, aging treatment, study of copper, aluminum, Mg and nickel and their alloys • Furnaces: Heat treatment furnaces and their design, atmosphere control vacuum heat treatment etc. • Defects in Heat treatment and their remedies, Economics of heat treatment 			
COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	3 rd - 4 th week January	Principles and Solid State Transformation	On-line (MS Teams) Digital Pad
2	1 st – 4 th Week February	Heat Treatment Processes	
3	1 st – 3 rd week March	Heat Treatment of various Alloys	
4	4 th week March -2 nd week April	Equipment and Heat treatment defects	

COURSE ASSESSMENT METHODS (shall range from 4 to 6)				
S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assignment	1 st week April	-	20
2	Class Test 1	2 nd week April	40 min	25
3	Class Test 2	3 rd week April	40 min.	25
CPA	Compensation Assessment	-	60 min	25
5	End Semester	-	2hrs	30
COURSE EXIT SURVEY Student's Feedback				
COURSE POLICY (preferred mode of correspondence with students, policy on attendance, compensation assessment, , academic honesty and plagiarism etc.)				
<p>MODE OF CORRESPONDENCE (email/ phone etc) : communication through class reps and E-mail</p> <p>ATTENDANCE : Minimum attendance 75%. If less than 75% attendance, He /She will be prevented from writing the end semester and re-do the course. Students secured F grade should re-appear the examination as per Institute norms</p> <p>COMPENSATION ASSESSMENT : If any students miss the test in genuine ground (production of certificate or letter from the authorized personnel), She / he will be permitted for compensation assessment</p> <p>ACADEMIC HONESTY & PLAGIARISM : If any students involve in malpractice in test or final examination, She /he will be prevented from writing the final assessment and awarded F grade and re-do the course (as per Instt. Regulations)</p>				
ADDITIONAL INFORMATION				
Nil				
FOR APPROVAL				
<p>  Course Faculty _____  CC-Chairperson _____  HOD _____ </p>				