

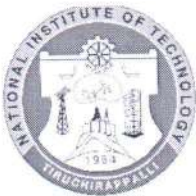


DEPARTMENT OF PRODUCTION ENGINEERING

COURSE PLAN – PART I			
Name of the programme and specialization	M.Tech – Manufacturing Technology		
Course Title	PR 613 – Heat Treatment		
Course Code	PR 613	No. of Credits	3
Course Code of Pre-requisite subject(s)	-		
Session	January 2024	Section (if, applicable)	-
Name of Faculty	Dr. C. Sathiya Narayanan	Department	PRODUCTION ENGINEERING
Official Email	csathia@nitt.edu	Telephone No.	0431-250-3511
Name of Course Coordinator(s) (if, applicable)	-		
Official E-mail	-	Telephone No.	-
Course Type (please tick appropriately)	<input type="checkbox"/> Core course	<input checked="" type="checkbox"/> Elective course	
Syllabus (approved in BoS)			
<p>Iron - Carbon Equilibrium Diagram: Effect of alloying element on properties of steel and heat treatments. Types and application of heat treatments in manufacturing Industries. TTT & CCT diagram for steels-Variou heating media used for heat treatment, furnaces, Temperature and atmosphere control- Selection of furnace for heat treatment.</p> <p>Heat Treatment Processes: Annealing - Normalising, Hardenability studies, Jominy end quench test, Grossman's experiments - Tempering, Austempering and Martempering. Thermomechanical treatments.</p> <p>Surface Modification Techniques: Induction hardening, flame hardening, electron beam hardening and Laser beam hardening. Carburising, nitriding, Carbonitriding, CVD and PVD processes, Ion implantation.</p> <p>Heat Treatment of Non-Ferrous Metals and Specific Alloy steels: Heat treatment of gray irons, white irons (malleabilising) and S.G.Irons. Austempering of S.G.Iron. Defects: Defects in heat treated parts, causes and remedy Design for heat treatment.</p>			
COURSE OBJECTIVES			
<p>To Identify the effect of heat treatment in various alloying elements.</p> <p>To apply surface modification techniques.</p> <p>To find the defects occurring in heat treated parts.</p>			
MAPPING OF COs with POs			
Course Outcomes	Programme Outcomes (PO) (Enter Numbers only)		
1. Identify the effect of heat treatment in alloying elements	1, 3		
2. Apply surface modification techniques	1, 5, 6		
3. Find the defects occurring in heat treated parts	1, 2		



COURSE PLAN – PART II			
COURSE OVERVIEW			
Study about the effect of alloying elements on properties of steel and its application in manufacturing industries.			
TTT and CCT diagram for steels and furnace for heat treatment.			
Various surface modification techniques and heat treatment processes.			
Defects in heat treated parts, causes and remedy for heat treatment.			
COURSE TEACHING AND LEARNING ACTIVITIES			(Add more rows)
S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	1 st	Iron – Carbon Equilibrium Diagram	C&T, PPT
2		Effect of Alloying Elements	C&T, PPT
3		Alloying properties of Steel	C&T, PPT
4	2 nd	Heat Treatments-Types	C&T, PPT
5		Heat Treatments Application	C&T, PPT
6		TTT diagram for steels	C&T, PPT
7	3 rd	CCT diagram for steels	C&T, PPT
8		Heat Treatment-Variou Heating Media	C&T, PPT
9		Heat Treatments-Furnaces	C&T, PPT
10	4 th	Heat Treatments-Temperature and Atmospheric control	C&T, PPT
11		Selection of Furnaces for Heat treatment	C&T, PPT
12		Introduction to Heat Treatment Processes	C&T, PPT
Cycle Test 1			
13	5 th	Heat Treatment Annealing process	C&T, PPT
14		Heat Treatment Normalising process	C&T, PPT
15		Hardenability Studies	C&T, PPT
16	6 th	Jominy End Quench test	C&T, PPT
17		Grossman's experiments	C&T, PPT
18		Tempering, Austempering Martempering	C&T, PPT
19	7 th	Thermo mechanical treatments	C&T, PPT
20		Surface Modification techniques	C&T, PPT



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21		Induction, Flame Hardening	C&T, PPT
22	8 th	Electron Beam Hardening	C&T, PPT
23		Laser Beam Hardening	C&T, PPT
24		Carburising, nitriding,	C&T, PPT
25	9 th	Carbonitriding	C&T, PPT
26		CVD & PVD processes	C&T, PPT
27		Ion implantation	C&T, PPT
Cycle Test 2			
28	10 th	Heat Treatment of Non-Ferrous Metals	C&T, PPT
29		Heat Treatment of Non-Ferrous Metals	C&T, PPT
30		Heat Treatment of Specific Alloy steels	C&T, PPT
31	11 th	Heat Treatment of Specific Alloy steels	C&T, PPT
32		Heat treatment of gray irons	C&T, PPT
33		Heat treatment of white irons	C&T, PPT
34	12 th	Heat treatment of S.G.Irons	C&T, PPT
35		Austempering S.G.Iron	C&T, PPT
36		Defects in heat treated parts	C&T, PPT
37	13 th	Causes of defects	C&T, PPT
38		Remedy for defects	C&T, PPT
39		Design for heat treatment.	C&T, PPT
40	14 th	Design for heat treatment.	C&T, PPT

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test-1	After 4 th week	60 Minutes	20
2	Cycle Test-2	After 9 th week	60 Minutes	20
3	Assignment	Once in 4 weeks	-	10
CPA	Compensation Assessment*	After 9 th week	60 Minutes	20
4	Final Assessment *	After 14 th week	180 Minutes	50

*mandatory; refer to guidelines on page 4



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

1. Feedback from the students during class committee meeting.
2. End semester feedback on course outcomes

COURSE POLICY (including compensation assessment to be specified)

60 minutes examination including all syllabus.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- 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.
- The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION, IF ANY

FOR APPROVAL

C. Sathya Narayan
Course Faculty _____

P. Senthil
CC- Chairperson _____

C. Sathya Narayan
HOD _____

(Dr. C. Sathya Narayanan)

(Dr. P. Senthil)

(Dr. C. Sathya Narayanan)



Guidelines

- a) The number of assessments for any theory course shall range from 4 to 6.
- b) Every theory course shall have a final assessment on the entire syllabus with at least 30% weightage.
- c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.
- d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G.
2018	2017	2016	2015	
35% or (Class average/2) whichever is greater.		(Peak/3) or (Class Average/2) whichever is lower		40%

- e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.
- f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.
- g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.