

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

COURSE OUTLINE TEMPLATE			
<b>Course Title</b>	Industrial Heat Treatment		
<b>Course Code</b>	MT 702	<b>No. of Credits</b>	3
<b>Department</b>	MME	<b>Faculty</b>	Dr S KUMARAN
<b>Pre-requisites Course Code</b>	Physical Metallurgy (UG/PG Level)		
<b>Course Coordinator(s) (if, applicable)</b>	Dr S MUTHUKUMARAN		
<b>Other Course Teacher(s)/Tutor(s) E-mail</b>	--	<b>Telephone No.</b>	9944434705 Intercom : 3482
<b>Course Type</b>	<input checked="" type="checkbox"/> <b>Core course</b> <input type="checkbox"/> <b>lective course</b>		
COURSE OVERVIEW			
<p>Principles of Heat treatment: Purpose of alloying, effect of alloying elements on ferrite, cementite, Fe-Fe<sub>3</sub>C system, tempering and TTT Curves, Austenitic Transformation, Pearlitic Transformation, Bainitic Transformation, Martensitic Transformation</p> <p>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.</p> <p>Heat treatment of Ferrous alloys:</p> <p>Heat treatment of Plain carbon, Alloy and structural steels and Cast Iron</p> <p>Non-ferrous metals and alloys: Precipitation hardening, aging treatment, study of copper, aluminum, Mg and nickel and their alloys</p> <p>Furnaces: Heat treatment furnaces and their design, atmosphere control vacuum heat treatment etc.</p> <p>Defects in Heat treatment and their remedies, Economics of heat treatment</p>			
COURSE OBJECTIVES			
<p><b>Course objective:</b> 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.</p>			

<b>COURSE OUTCOMES (CO)</b>				
<b>Course Outcomes</b>				<b>Aligned Programme Outcomes (PO)</b>
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.				
<b>COURSE TEACHING AND LEARNING ACTIVITIES</b>				
<b>S.No.</b>	<b>Week</b>	<b>Topic</b>	<b>Mode of Delivery</b>	
1	2 <sup>nd</sup> - 4 <sup>th</sup> week January	Principles and Solid State Transformation	Chalk and Board	
2	1 <sup>st</sup> – 4 <sup>th</sup> Week February	Heat Treatment Processes *	Chalk and Board, Power Point	
3	1 <sup>st</sup> – 3 <sup>rd</sup> week March	Heat Treatment of various Alloys	Chalk and Board	
4	4 <sup>th</sup> week March - 2 <sup>nd</sup> week April	Equipment and Heat treatment defects	Chalk and Board	
<b>COURSE ASSESSMENT METHODS</b>				
<b>S.No.</b>	<b>Mode of Assessment</b>	<b>Week/Date</b>	<b>Duration</b>	<b>% Weightage</b>
1	Assignment	3 <sup>rd</sup> Week February	---	5
2	Experimentation	3 <sup>rd</sup> week January to 2 <sup>nd</sup> April	20 hrs	10
3	Mid-term test	4 <sup>th</sup> week February	1hr 30 min.	25
4	Seminar & Industrial Visit	1 <sup>st</sup> week March	15min/student	5+5
5	End Semester	2 <sup>nd</sup> /3 <sup>rd</sup> week April	3hrs	50

<b>ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc</b>
1. Heat Treatment Principle and Techniques by Rajan, Sharma
2. Principles of Heat treatment of steels by R C Sharma, New Age International, 2007
3. The steel Handbook by AlokNayar, McGraw-Hill Education, 2001

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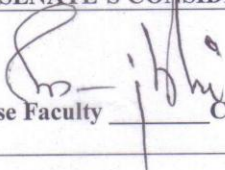
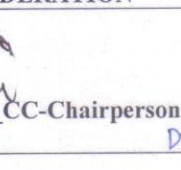

Student's feedback
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<b>COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)</b>
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Minimum attendance 75%. If less than 75% attendance, He /She will be prevented from writing End Semester Exam and re-do the course. Students secured F grade will re-appear the examination as per Institute norms
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<b>ADDITIONAL COURSE INFORMATION</b>
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<b>FOR SENATE'S CONSIDERATION</b>
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<p>    </p> <p> Course Faculty _____ CC-Chairperson <u>S. Muthukumar</u> 2/11/17 HOD _____  <small>Dr. S. MUTHUKUMARAN</small> </p>
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