

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

<b>COURSE OUTLINE TEMPLATE</b>			
<b>Course Title</b>	Testing Inspection and Characterization		
<b>Course Code</b>	MT 618	<b>No. of Credits</b>	3
<b>Department</b>	MME	<b>Faculty</b>	Dr K SIVAPRASAD
<b>Pre-requisites, Course Code</b>	Not applicable		
<b>Course Coordinator(s) (if, applicable)</b>	Dr K SIVAPRASAD		
<b>Other Course Teacher(s)/Tutor(s) E-mail</b>	--	<b>Telephone No.</b>	9444192278 Intercom : 3466 ksp@nitt.edu
<b>Course Type</b>	<input type="checkbox"/> Core course	<input checked="" type="checkbox"/> Elective course	

**COURSE OVERVIEW**

Purpose and importance of destructive tests – Concepts, and method of Tensile, hardness, bend, torsion, fatigue and creep testing.  
 Purpose and limitations of NDT, Concepts, operating principles, advantages, limitations, of liquid penetrant and magnetic particle testing, eddy current testing, ultrasonic testing radiography, acoustic emission, thermal imaging method.  
 Comparison of NDT methods and selection of NDT methods.  
 Tools of characterisation - Light microscopy, basic principles and special techniques. X-ray diffraction and its applications in materials characterization.  
 Electron microscopy, Construction, operation and applications of scanning electron microscope (SEM), transmission electron microscope (TEM), Thermal analysis: Thermo gravimetric analysis, differential thermal analysis, differential scanning calorimetry & dilatometry.

**COURSE OBJECTIVES**

To provide an understanding of the basic principles of various testing, Inspection and characterization tools and use those tools to analyze metallurgical components.

**COURSE OUTCOMES (CO)**

<b>Course Outcomes</b>	<b>Aligned Programme Outcomes (PO)</b>
Upon completion of this class, the students will be able to:	
1. Know various destructive and non-destructive methods of testing materials	1
2. Know the principles of metallurgical microscope, X-ray Diffractometer (XRD), Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM), Thermal analysis and dilatometer	1, 6
3. Describe the various sample/specimen preparation techniques for XRD, SEM, TEM and thermal analysis and quantitative metallography	1,4,5,6
4. Determine crystal structure, lattice parameter, phase identification, solvus line estimation and residual stress analysis using XRD	1,2
5. Select the appropriate tool to characterize the material by knowing its merits and demerits. Analyze the material in atomic level by using different modes of TEM like bright and dark field imaging, selected area diffraction	2,3,5
6. Evaluate the specimen by thermal analysis, dilatometry, resistivity and magnetic measurements	2,3

<b>COURSE TEACHING AND LEARNING ACTIVITIES</b>			
S.No.	Week	Topic	Mode of Delivery
1	August-Septemer	Basics of Materials Testing	Chalk and Board
2	September	Introduction to NDT & E	Chalk and Board, Power Point
3	September -October	Optical Microscopy and XRD	Chalk and Board, Power Point
4	October-November	Electron Microscopy and other topics	Power Point

<b>COURSE ASSESSMENT METHODS</b>				
S.No.	Mode of Assessment	Week/Date	Duration (min.)	% Weightage
1	Assessment-I (objective type test)	5 <sup>th</sup> week	45	15
2	Assessment – II (Mini-Project)	7 <sup>th</sup> week	1 week	15
3	Assessment III (Descriptive test)	10 <sup>th</sup> week	1 hr	15
4	Assessment-IV (Oral presentation)	12 <sup>th</sup> week	2 days	15
5	Final Assessment	November	180	40

<b>ESSENTIAL READINGS :</b>
1. Non-destructive testing, B.Hull and V.John, Macmillan, 1988.
2. Modern Physical Metallurgy and Materials Engineering, R. E. Smallman, R. J. Bishop, sixth edition, Butterworth-Heinemann, 1999.
3. Materials Characterisation, P.C.Angelo, Elsevier (India) Pvt. Ltd, Haryana, 2013,

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

Student's feedback


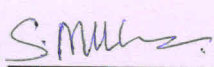

**COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)**

Attendance is not mandatory. Only one re-assessment (written test) would be conducted, for those students who miss either A-I or A-II or both for 15 marks. Who fail in this subject can appear for supplementary examination. If the candidate fails in supplementary exam, he/she has to appear for FA only.

**ADDITIONAL COURSE INFORMATION**

You are welcome for technical discussion out of the class room. Please contact me through mail or mobile.

**FOR SENATE'S CONSIDERATION**

  
 Course Faculty \_\_\_\_\_ CC-Chairperson  HOD   
 (K.SIVAPRASAD) (DR.S.MUTHUKUMARAN)