

Course code	Course Name	L-T-P-Credits	Year of Introduction
ME367	Non-Destructive Testing	3-0-0-3	2016
<b>Prerequisite : Nil</b>			
<b>Course Objectives</b> <ul style="list-style-type: none"> <li>To introduce the basic principles, techniques, equipment, applications and limitations of NDT methods such as Visual, Penetrant Testing, Magnetic Particle Testing, Ultrasonic Testing, Radiography, Eddy Current.</li> <li>To enable selection of appropriate NDT methods.</li> <li>To identify advantages and limitations of nondestructive testing methods</li> <li>To make aware the developments and future trends in NDT.</li> </ul>			
<b>Syllabus</b> Introduction to NDT- Visual Inspection- Liquid Penetrant Inspection- Magnetic Particle Inspection- Ultrasonic Testing- Radiography Testing- Eddy Current Testing.			
<b>Expected outcome</b> <ul style="list-style-type: none"> <li>The students will be able to differentiate various defect types and select the appropriate NDT methods for the specimen.</li> </ul>			
<b>Text book</b> <ul style="list-style-type: none"> <li>Baldev Raj, Practical Non – Destructive Testing, Narosa Publishing House ,1997</li> </ul>			
<b>Reference books</b> <ol style="list-style-type: none"> <li>Hull B. and V.John, Non-Destructive Testing, Macmillan,1988</li> <li>Krautkramer, Josef and Hebert Krautkramer, Ultrasonic Testing of Materials, Springer-Verlag, 1990</li> </ol>			
<b>Course Plan</b>			
Module	Contents	Hours	End Sem. Exam Marks
<b>I</b>	Introduction to NDT, Comparison between destructive and NDT, Importance of NDT, Scope of NDT, difficulties of NDT, future progress in NDT, economics aspects of NDT.	1	15%
	<b>Visual Inspection</b> - tools, applications and limitations - Fundamentals of visual testing: vision, lighting, material attributes, environmental factors.	1	
		1	
		1	
	visual perception, direct and indirect methods mirrors, magnifiers, boroscopes, fibrosopes, closed circuit television, light sources	1	
		1	
	special lighting, a systems, computer enhanced system	1	
<b>II</b>	<b>Liquid Penetrant Inspection:</b> principles, properties required for a good penetrants and developers - Types of penetrants and developers	1	15%
		1	
	and advantages and limitations of various methods of LPI - LPI technique/ test procedure	1	
		1	
	interpretation and evaluation of penetrant test indications, false indication	1	

	and safety precaution required in LPI, applications, advantages and limitations	1	
<b>FIRST INTERNAL EXAMINATION</b>			
<b>III</b>	<b>Magnetic Particle Inspection (MPI)</b> - Principles of MPI, basic physics of magnetism, permeability, flux density, cohesive force, magnetizing force, retivity, residual magnetism	1	<b>15%</b>
		1	
	Methods of magnetization, magnetization techniques such as head shot technique, cold shot technique, central conductor testing, magnetization using products using yokes	1	
	direct and indirect method of magnetization, continuous testing of MPI, residual technique of MPI, system sensitivity, checking devices in MPI	1	
	Interpretation of MPI, indications, advantage and limitation of MPI.	1	
<b>IV</b>	<b>Ultrasonic Testing (UT)</b> : principle, types of waves, frequency, velocity, wavelength, reflection, divergence, attenuation, mode conversion in ultrasonic UT testing methods	1	<b>15%</b>
		1	
	contact testing and immersion testing, normal beam and straight beam testing, angle beam testing, dual crystal probe, ultrasonic testing techniques	1	
		1	
	resonance testing, through transmission technique, pulse echo testing technique, instruments used UT, accessories such as transducers, types, frequencies, and sizes commonly used	1	
		1	
	Reference blocks with artificially created defects, calibration of equipment, Applications, advantages, limitations, A, B and C scan - Time of Flight Diffraction (TOFD).	1	
<b>SECOND INTERNAL EXAMINATION</b>			
<b>V</b>	<b>Radiography Testing (RT)</b> : Principle, electromagnetic radiation sources: X-ray source, production of X-rays, high energy X-ray source, gamma ray source - Properties of X-rays and gamma rays	1	<b>20%</b>
		1	
	Inspection techniques like SWSI, DWSI, DWDI, panoramic exposure, real time radiography, films used in industrial radiography, types of film, speed of films, qualities of film	1	
	screens used in radiography, quality of a good radiograph, film processing, interpretation, evaluation of test results, safety aspects required in radiography	1	
	applications, advantages and limitations of RT	1	
<b>V1</b>	<b>Eddy Current Testing (ECT)</b> - Principle, physics aspects of ECT like conductivity, permeability, resistivity, inductance, inductive reactance, impedance	1	<b>20%</b>
		1	
	Field factor and lift of effect, edge effect, end effect, impedance plane diagram in brief, depth of penetration of ECT, relation between frequency and depth of penetration in ECT	1	
	equipments and accessories, various application of ECT such as	1	

	conductivity measurement, hardness measurement, defect detection	1	
	coating thickness measurement, advantages and limitations of eddy current testing	1	
<b>END SEMESTER UNIVERSITY EXAMINATION</b>			

### Question Paper Pattern

**Maximum marks: 100**

**Time: 3 hrs**

The question paper should consist of three parts

**Part A**

There should be 2 questions each from module I and II

Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

**Part B**

There should be 2 questions each from module III and IV

Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

**Part C**

There should be 3 questions each from module V and VI

Each question carries 10 marks

Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: Each question can have a maximum of four sub questions, if needed.

