

Course code	Course Name	L-T-P-Credits	Year of Introduction
ME367	Non-Destructive Testing	3-0-0-3	2016
Prerequisite : Nil			
Course Objectives			
<ul style="list-style-type: none"> 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. To enable selection of appropriate NDT methods. To identify advantages and limitations of nondestructive testing methods To make aware the developments and future trends in NDT. 			
Syllabus			
Introduction to NDT- Visual Inspection- Liquid Penetrant Inspection- Magnetic Particle Inspection- Ultrasonic Testing- Radiography Testing- Eddy Current Testing.			
Expected outcome			
<ul style="list-style-type: none"> The students will be able to differentiate various defect types and select the appropriate NDT methods for the specimen. 			
Text book			
<ul style="list-style-type: none"> Baldev Raj, Practical Non – Destructive Testing, Narosa Publishing House ,1997 			
Reference books			
<ol style="list-style-type: none"> Hull B. and V.John, Non-Destructive Testing, Macmillan,1988 Krautkramer, Josef and Hebert Krautkramer, Ultrasonic Testing of Materials, Springer-Verlag, 1990 			
Course Plan			
Module	Contents	Hours	End Sem. Exam Marks
I	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%
	Visual Inspection - 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	
II	Liquid Penetrant Inspection: 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	
FIRST INTERNAL EXAMINATION			
III	Magnetic Particle Inspection (MPI) - Principles of MPI, basic physics of magnetism, permeability, flux density, cohesive force, magnetizing force, retivity, residual magnetism	1	15%
		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	
IV	Ultrasonic Testing (UT): principle, types of waves, frequency, velocity, wavelength, reflection, divergence, attenuation, mode conversion in ultrasonic UT testing methods	1	15%
		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	
SECOND INTERNAL EXAMINATION			
V	Radiography Testing (RT): 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	20%
		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	
V1	Eddy Current Testing (ECT) - Principle, physics aspects of ECT like conductivity, permeability, resistivity, inductance, inductive reactance, impedance	1	20%
		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	
END SEMESTER UNIVERSITY EXAMINATION			

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.

