SEMESTER 4

NON-DESTRUCTIVE TESTING

Course Code	**PEAOT411**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	**ESE Marks**	60
Credits	3	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	Nil	**Course Type**	Theory

Course Objectives:

1. To comprehend the fundamental ideas, methodologies, tools, applications and constraints of NDT approaches.

SYLLABUS

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Module No.	Syllabus Description	Contact Hours
1	**Visual Inspection :** tools, applications and limitations - Fundamentals of visual testing: vision, lighting, material attributes, environmental factors. visual perception, direct and indirect methods mirrors, magnifiers, boroscopes, fibroscopes, closed circuit television, light sources special lighting, a systems, computer enhanced system. **Liquid penetrant Testing :** Properties required for a good penetrant and developers - Types of penetrants and developers. LPI technique/ test procedure interpretation and evaluation of penetrant test indications, false indication and safety precaution required in LPI.	9

2	**Magnetic Particle Testing:** Methods of magnetization, magnetization techniques such as head shot technique, cold shot technique, central conductor testing, magnetization using products using yokes ,direct and indirect method of magnetization, continuous testing of MPI, residual technique of MPI, system sensitivity, checking devices in MPI. **Eddy Current Testing:** Physics aspects of ECT .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 equipments and accessories, Various application of ECT such as conductivity measurement, hardness measurement, defect detection coating thickness measurement.	**9**
3	**Ultrasonic Testing:** UT testing methods ,contact testing and immersion testing, normal beam and straight beam testing, angle beam testing, dual crystal probe, ultrasonic testing techniques, resonance testing, through transmission technique, pulse echo testing technique, instruments used UT. accessories such as transducers, types, frequencies, and sizes commonly used. Reference blocks with artificially created defects, calibration of equipments. **Radiography Testing (RT):** Electromagnetic radiation sources.Inspection techniques like SWSI, DWSI, DWDI, panoramic exposure, realtime radiography, films used in industrial radiography, types of film, speed of films, qualities of film screens used in radiography, quality of a good radiograph, film processing, interpretation, evaluation of test results, safety aspects required in radiography.	**9**
4	**Advanced NDI Techniques:** Principle and Procedure of Digital Signal and image Processing & Digital Image correlation Acoustic emission Inspection ,Thermography, Computed Tomography	**9**

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Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

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At the end of the course students should be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Identification of NDT Techniques which enable you to carry out various inspections in accordance with the established procedures.	**K2**
CO2	Familiarize with basic principles of electromagnetic NDT methods	**K2**
CO3	summarizing the principles of signal processing of ultrasonic signals and image processing of radiographic images.	**K2**
CO4	Analyzing the advanced techniques in NDT	**K4**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	2	1	-	-	-	-	-	2
CO2	3	3	1	1	2	1	-	-	-	-	-	2
CO3	3	3	1	1	2	1	-	-	-	-	-	2
CO4	3	3	1	2	3	1	-	-	-	-	-	2

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Practical Non- destructive testing	Baldev Raj	Alpha Sciense International	2008
2	Non - destructive testing	Hull V and V John	Micmillan	2012
3	Non Destructive testing Techniques	Ravi Prakash	New Academic Science	2009

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Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Recent developments in the field of non destructive testing, safety and material science	Elena Lysenko, Alexander Rogachev, Oldrich Stary	Springer	2022
2	New Technologies in electromagnetic non-destructive Testing	Songling Huang & Shen Wang	Springer	2016
3	Recent Advances in Non - Destructive Inspection	Carosena Meola	Nova Science publishers	2010

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://archive.nptel.ac.in/courses/113/106/113106070/