

## NON-DESTRUCTIVE TESTING

<b>Course Code</b>	20ME4702D	<b>Year</b>	IV	<b>Semester</b>	I
<b>Course Category</b>	Professional Elective- IV	<b>Branch</b>	ME	<b>Course Type</b>	Theory
<b>Credits</b>	3	<b>L-T-P</b>	3-0-0	<b>Pre-requisites</b>	Nil
<b>Continuous Internal Evaluation</b>	30	<b>Semester End Evaluation</b>	70	<b>Total Marks</b>	100

**Course Outcomes:** Upon successful completion of the course, the student will be able to

	<b>Statement</b>	<b>Skill</b>	<b>BTL</b>	<b>Units</b>
<b>CO1</b>	Discuss the basics of various Non-destructive testing methods.	Understand, Communication	L2	1,2,3,4,5
<b>CO2</b>	Illustrate Non-destructive testing methods for identifying defects in various fields.	Apply, Communication	L3	1,2,3,4,5
<b>CO3</b>	Select suitable Non-Destructive testing Methods for given application.	Apply, Communication	L3	5

<b>Contribution of Course Outcomes towards achievement of Program Outcomes &amp; Strength of correlations (3:High, 2: Medium, 1:Low)</b>														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>CO1</b>	3	2		1	2	1			2			1	3	1
<b>CO2</b>	3	2		1	2	1			2			1	3	1
<b>CO3</b>	3	2		1	1	1			2			1	3	1

<b>Syllabus</b>		
<b>UNIT</b>	<b>Contents</b>	<b>Mapped CO</b>
<b>I</b>	<p><b>Introduction to Non-Destructive Testing (NDT):</b> Introduction, destructive versus non-destructive testing, Factors influencing the reliability of NDT, Materials, Manufacturing Processes and Non-Destructive Testing Materials.</p> <p><b>Visual Inspection-</b> The eye, Optical aids used for Visual inspection, Applications</p> <p><b>Liquid Penetrant Testing –</b> Principles, types and properties of liquid penetrants, developers, advantages and limitations of various methods, Testing Procedure, Interpretation of results.</p>	<b>CO1 CO2</b>
<b>II</b>	<p><b>Magnetic Particle Testing-</b> Theory of magnetism, inspection materials, Magnetization methods, Interpretation and evaluation of test indications, Principles and methods of demagnetization, Residual magnetism.</p> <p><b>Eddy Current Testing-</b>Generation of eddy currents, Properties of eddy currents, Eddy current sensing elements, Probes, Instrumentation, Types of arrangement, Applications, advantages, Limitations, Interpretation/Evaluation.</p>	<b>CO1 CO2</b>
<b>III</b>	<p><b>Acoustic Emission Testing:</b> Introduction, principles of acoustic emission testing, sensitivity, applications, advantages and limitations, Structural Integrity Assessment, Leak detection</p> <p><b>Ultrasonic Testing:</b> Properties of sound beam, Ultrasonic transducers, Inspection Methods, Techniques for normal beam inspection and angle beam inspection, Flaw Characterisation Techniques, Flaw detection Equipment, Modes of Display, applications, advantages and limitations.</p>	<b>CO1 CO2</b>

<b>IV</b>	<p><b>Thermography</b>– Basic Principles, Detectors and equipment, Techniques, applications.</p> <p><b>Radiography Testing:</b> Basic Principle, Electromagnetic Radiation Sources, Radiation and Attenuation in the specimen, effect of Radiation on Film, Radiographic imaging, Inspection Techniques, Applications and limitations, Safety in Industrial Radiography.</p>	<b>CO1</b> <b>CO2</b>
<b>V</b>	<p><b>Selection of NDT Methods:</b></p> <p>Types of defects in Materials, pressure vassals, Pipelines, welding. Selection of suitable NDT method for inspecting weldments, pressure vassals and pipe lines.</p>	<b>CO1</b> <b>CO2</b> <b>CO3</b>

### Learning Resource

#### Text books

1. Non-Destructive Test and Evaluation of Materials, J. Prasad and C. G. K. Nair, 2/e, Tata McGraw Hill, 2011.
2. Practical Non-Destructive Testing, Baldev Raj, T. Jaya Kumar, M. Thavasimuthu, Narosa Publishing.

#### Reference books

1. C. Hellier, Handbook of Non-Destructive Evaluation, 1/e, McGraw Hill Professional, 2001.
2. Non-Destructive Examination and Quality Control, 9/e, ASM International, Vol.17, 1989

#### E- Resources & other digital material

1. <https://nptel.ac.in/courses/113/106/113106070/>
2. <https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-mm07/>