



Course Title: NON DESTRUCTIVE TESTING

Credit Units: 04

Course Level: UG

Course Code: MAE402

L	T	P/S (hrs)	SW/F W	TOTAL CREDIT UNITS
3	0	2	-	4

Course Objectives: NDT techniques are used for locating flaws as well as for characterizing material properties. Flaws within the materials can play havoc and may cause planes to crash, reactors to fail, trains to derail, pipelines to burst and alike. However if we detect the flaws using NDT techniques, all these catastrophic failures can be avoided. Use of NDT techniques results in better confidence in the material and one may opt for lower value of factor of safety. Understanding the basic principles of various NDT techniques, nature of flaws, importance of NDT techniques, various applications of NDT techniques, limitations of NDT techniques, codes, standards and specifications related to non-destructive testing techniques etc. would be taught to the students and thus the students would have proper skills and would be equipped with proper competencies to locate a flaw in various materials, products. They would also be ready to use NDT techniques for *in-situ* situations too.

Pre-requisites: The student should have basic knowledge of the following.

- Basic Mathematics.
- Basic Physics
- Fundamentals of Materials Science and Engineering.

Course Contents/Syllabus:

	Weightage (%)
Module I Overview: Scope and advantages of NDT. Comparison of NDT with Destructive Tests. Some common NDT methods used since ages, Terminology. Flaws and Defects, Visual inspection, Equipment used for visual inspection. Chalk dust test. Attractive uses of above tests in detecting surface cracks, bond strength and similar defects.	20%
Descriptors/Topics	

<p>1. Definition of Nondestructive testing.</p> <p>2. Types of NDT Techniques.</p> <p>3 Limitations of NDT methods.</p> <p>4. NDT Techniques for Applications other than Flaw Detection.</p>	
Module II: Surface Methods	20%
<p>Descriptors/Topics</p> <p>1. Visual Inspection - Physical Principles, Limitations, Applications.</p> <p>2. Liquid Penetrant Testing - Physical Principles, Methodology, Limitations, Applications.</p> <p>3. Magnetic Particle Inspection - Physical Principles, Methodology, Limitations, Applications.</p>	
Module III: Various Non Destructive Testing Methods	40%
<p>Descriptors/Topics</p> <p>1. Ultrasonic testing.</p> <p>2. Eddy Current testing.</p> <p>3. Acoustic emission testing and Acousto-ultrasonic testing.</p> <p>4. Radiographic Methods - Principles of X-ray and Gama ray radiography.</p> <p>5. Miscellaneous NDT methods.</p>	
Module IV: Industrial Applications	20%
<p>Descriptors/Topics</p> <p>1. Nuclear Industry.</p> <p>2. Aerospace Industry.</p> <p>3. Transportation Industry.</p> <p>4. Process Industry.</p>	

Student Learning Outcomes:

On completion of the course the student will have:

1. Ability to apply scientific and technical knowledge to the field of non-destructive testing.
2. Ability to use the relevant non-destructive testing methods for various engineering practice.
3. Ability to recognize and achieve high levels of professionalism in their work.
4. Recognition of the need and ability to engage in lifelong learning, thought process and development

Pedagogy for Course Delivery:

The course pedagogy will include lectures, numerical practice, case studies, seminars and presentations. It would also include discussion on real life problems and demonstrations of NDT methods.

Lab/ Practical details:

To illustrate the techniques, the working of following equipment/ instruments will be shown

1. Liquid penetrant testing of surface defects
2. Magnetic particle flaw detection in a material
3. Ultrasonic testing
4. To measure thickness using ultrasonic method.

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	Total
75%	25%	100%

Theory Assessment (L&T):

	Continuous Assessment/Internal Assessment				End Term Examination
Components (Drop down	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Lab/ Practical/ Studio Assessment:

Components (Drop down)	Continuous Assessment/Internal Assessment				End Term Examination	
	A	PR	LR	V	PR	V
Weightage (%)	5	10	10	5	35	35

Text & References:**Text Books:**

1. Nondestructive Testing Techniques, Ravi Prakash, New Age International Publishers, 2012.
2. Practical Non-destructive Testing, Baldev Raj, T. Jayakumar and M. Thavasimuthu Woodhead Publishing, 2002.

Reference Books:

1. Non-destructive Evaluation - A tool in Design, Manufacturing and Service by D.E. Bray and R. K. Stanley, Revised Edition CRC Press, 1996.
2. NDT Handbooks Vol 1-17, ASNT Press, OH, USA.
3. Nondestructive Testing, "Warren J. McGonnagle", McGraw-Hill, 1961.

Any other Study Material:

1. Nondestructive Evaluation - Theory, Techniques, and Applications, by P.J. Shull, Marcell Decker Inc., NY 2002