



# GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3161923

Semester VI

## NON DESTRUCTIVE TESTING

**Type of course:** Departmental elective

**Prerequisite:** Basic Knowledge of Material Science and Metallurgy

**Rationale:** To impart comprehensive knowledge about differentiate various defect types and select the appropriate NDT methods and their industrial applications..

### Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
3	0	2	4	70	30	30	20	150

### Content:

Sr. No.	Content	Total Hrs
1	Introduction: Fundamentals of and introduction to destructive and non-destructive testing. Scope and limitations of NDT, Visual examination methods, Different visual examination aids.	6
2	Dye penetrant Testing/ liquid penetrant testing: Principle, procedure, characteristics of penetrant, types of penetrants, penetrant testing materials, fluorescent penetrant testing method– sensitivity, application and limitations	6
3	Magnetic Particle Testing: Important terminologies related to magnetic properties of material, principle, magnetizing technique, procedure, equipment, fluorescent magnetic particle testing method, sensitivity, application and limitations	6
4	Ultrasonic Testing: Basic principles of sound propagation, types of sound waves, Principle of UT, methods of UT, their advantages and limitations, Piezoelectric Material, Various types of transducers/probe, Calibration methods, use of standard blocks, technique for normal beam inspection, flaw characterization technique, defects in welded products by UT, Thickness determination by ultrasonic method, Study of A, B and C scan presentations, advantage, limitations acoustic emission testing – principles of AET and techniques	8
5	Radiographic testing: X-ray and Gamma-Ray radiography, Their principles, methods of generation, Industrial radiography techniques, inspection techniques, applications, limitations, Types of films, screens and penetrameters. Interpretation of radiographs, Safety in industrial radiography.	8
6	Leak and pressure testing: Definition of leak and types, Principle, Various methods of pressure and leak testing, Application and limitation	4



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7	Eddy current testing: Principle, instrument , techniques, sensitivity, application, limitation Thermal methods of NDT	4
	<b>Total</b>	

### Reference Books:

1. Practical Non-destructive Testing – Baldev Raj, T. Jayakumar & M. Thavasimuthu, Norosa Publishing House, New Delhi.
2. Treaties on Non-destructive testing, Vol. 1,2 & 3 Edited by Dr. E.G. Krishnadas Nair, NDT Centre, Hal, Bangalore
3. Non-destructive testing, Warren J. McGonnagle, Gordon Breach, Science Publishers Ltd.
4. Ultrasonic Testing of Materials, J. Krautkramer & Herbert Krautkramer, Narosa Publishing House, New Delhi.
5. Non-destructive testing, R. Hatmshaw.
6. Ultrasonic Methods of Testing Materials, Leszek Filipezynski, Zdzislaw Pawlowski & Jerzywehr, Butterworths, London.

### Distribution of marks weightage for cognitive level

Bloom's Taxonomy for Cognitive Domain	Marks % weightage
Recall	10
Comprehension	20
Application	40
Analysis	20
Evaluate	10
Create	-

### Course Outcome:

After learning the course the students will able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Demonstrate the concepts of non-destructive testing methods.	25
CO-2	Make use of different methods of nondestructive testing	40
CO-3	Inspect the leakages and pressure of cylinders.	15
CO-4	Estimate the types of defect and size of defects.	20

### List of Experiments:

- 1.To study about need of Nondestructive testing (NDT).
2. To perform visual test for given sample using visual aid.
3. To perform Dye/Liquid Penetration Test for given sample with visible and fluorescent dye.
4. To study and perform Magnetic Particle test using different methods of magnetization.



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5. To study and perform Ultrasonic Test for weld sample.
6. To measure thickness using UT machine for given sample.
7. To study Radiographic Testing.
8. To study and perform Leak Testing.
9. To study of Eddy Current Test.
10. To study acoustic emission testing and thermography

### **Major Equipment:**

1. Prod type Magnetic Particle testing machine
2. Yoke type Magnetic Particle testing machine
3. Digital Ultrasonic Flaw Detector
4. Model of Radiography for demonstration of RT

### **List of Open Source Software/learning website:**

1. [www.nptel.ac.in](http://www.nptel.ac.in)
2. [www.nde-ed.org](http://www.nde-ed.org)