



## SYLLABUS

### **UNIT-I:**

#### **Liquid Penetrant Testing**

**11 Periods**

Physical Principles; Description of the process; Penetrant Methods-water washable, Postemulsifiable, Solvent removable methods; Materials used in penetrant inspection- Penetrants, emulsifiers, solvent cleaners, developers; Selection of penetrant method.

### **UNIT-II:**

#### **Ultrasonic Testing**

**13 Periods**

General characteristics of ultrasonic waves-Wave propagation, Longitudinal waves, Transverse waves, Surface waves, Lamb waves; Major variables in ultrasonic inspection-Frequency, Acoustic impedance, Angle of incidence, Critical angles, Beam intensity; Attenuation of ultrasonic beams- Acoustic impedance effects, Absorption, Scattering, Diffraction, Near field and far field effects, Beam Spreading, Beam diameter; Pulse-Echo method-Principles of Pulse-Echo method, A-scan, B-scan and C-scan displays; Angle beam techniques, Couplants, Inspection of Castings, Inspection of flat rolled products, Corrosion monitoring.

### **UNIT-III:**

#### **Radiographic Testing**

**13 Periods**

Principles of radiography-Radiation Sources, Image conversion, Radiation safety ;Attenuation of electromagnetic radiation- Atomic attenuation process, Effective absorption of X-rays; Principles of shadow formation- Distortion Geometric unsharpness, Shadow Intensity and the inverse-square law; Image conversion media-X-Ray film, Lead screens; Inspection of weldments, Inspection of tubular sections, Radiographic appearance of specific types of flaws- Castings, weldments .

### **UNIT-IV:**

#### **Magnetic particle Inspection**

**12 Periods**

Description of magnetic fields-Magnetized Ring, Magnetized bar, circular magnetization, Longitudinal magnetization; Methods of generating magnetic fields-Yokes, Coils, Central conductors, Direct contact method, Prod contact, Induced current; Magnetic particles and suspending liquids.

#### **Eddy Current Inspection**

Principles of operation; Operating variables-Coil Impedance, Electrical Conductivity, Magnetic permeability, Lift off factor, Fill factor, Edge effect, Skin effect, Inspection coils, Discontinuities detectable by eddy current inspection

### **UNIT-V:**

#### **Thermal Inspection**

**12 Periods**

Principles of thermal Inspection-Heat transfer mechanisms, surface preparation, Establishing heat flow; Thermal inspection equipment- Noncontact temperature sensors, Contact temperature sensor, Applications

#### **Acoustic Emission Inspection**

Introduction; Acoustic emission waves and Propagation; Acoustic emission sensors and preamplifiers, Structural Test Applications.

**Text books:**

1. ASM Handbook *Nondestructive Evaluation and Quality Control Volume 17* ASM International.
2. Baldev Raj , T. Jaya Kumar and M.Thavasimuthu, *Practical Non-Destructive Testing* Narosa Publishing House.

**Refernce books:**

1. Paul E.Mix *Introduction to nondestructive testing: a training guide* John wiley & sons 2005.
2. Chuck Hellier *Handbook on Nondestructive Evaluation* McGraw-Hill Professional, 2001.

**Web resources:**

<https://www.nde-ed.org>