PRINCIPLES& APPLICATIONS OF NDT METHODS									
	Credits:3								
Instruction: 3period& 1Tutorial/week	Sesional Marks :40								
End Exam: 3 Hours	End Exam Marks:60								

# **Prerequisites:**

**Engineering Physics** 

# **Course Objective:**

To provide the basic knowledge, advantages and limits of different fundamental techniques in NDT to detect the flaws in engineering components.

# **Course Outcomes:**

By t	he end of the course student able to:
1	Familiar with detection of surface flaws in nonporous materials.
2	Apply the ultrasound technique to detect the flaws in the materials.
3	Understand and apply the radiography to identify discontinuities and cracks in
	components.
4	Interpret the surface and sub surface flaws in ferromagnetic and conducting materials.
5	Diagnose the health of some engineering structures with thermography and acoustic
	emission methods.

# Mapping of course outcomes with program outcomes

		РО											PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
со	1														
	2														
	3														
	4														
	5														

# SYLLABUS

## UNIT-I: Liquid Penetrant Testing

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

Generalcharacteristics 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**

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

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**

Principles of thermal Inspection-Heat transfer mechanisms, suface 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.

## **11 Periods**

### 13 Periods

# **13 Periods**

#### **12 Periods**

## **12 Periods**

# 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