ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
UGC Autonomous
(Affiliated to AU, Approved by AICTE & Accredited by NBA & NAAC with 'A' Grade)
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DEPARTMENT OF PHYSICS

OPEN ELECTIVE

(COMMON TO ALL BRANCHES) – (R-19)

L-T-P-E-O-C
3-1-0-0-0-3

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 the 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.

SYLLABUS

UNIT-I: **11 Periods**

Introduction to NDT

What is NDT, difference between destructive testing and NDT, Methods of NDT, Various applications of NDT.

Liquid Penetrant Testing

Physical Principles; Description of the process; Penetrant Methods-water washable, Postemulsifiable, Solvent removable methods;

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.

UNIT-V:

Thermal Inspection **12 Periods**

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.

Text books:

1. ASM Handbook*Nondestructive Evaluation and Quality Control Volume 17*ASM International.
2. BaldevRaj , 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