

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME54e – NON-DESTRUCTIVE TESTING

(Professional Elective - I)

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Course Objectives: The objectives of the course are to make the students

- Introduce basic concepts of non destructive testing.
- Familiarize with characteristics of ultrasonic test, transducers, rejection and effectiveness.
- Describe concept of liquid Penetrant, eddy current and magnetic particle tests, its applications and limitations.
- Explain the principles of infrared and thermal testing, applications and honey comb and sandwich structures case studies.
- Impart NDE and its applications in pressure vessels, casting and welded constructions.

UNIT I

10 Hours

Introduction to non-destructive testing: Radiographic test, Sources of X and Gamma Rays and their interaction with Matter, Radiographic equipment, Radiographic Techniques, Safety Aspects of Industrial Radiography.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain non destructive testing techniques L2
- Summarize the basic concepts of Radiographic test L2
- Outline the concepts of sources of X and Gamma Rays L2
- Explain the radiographic techniques L2
- Discuss the safety aspects of industrial radiography. L4

UNIT II

10 Hours

Ultrasonic test: Principle of Wave Propagation, Reflection, Refraction, Diffraction, Mode Conversion and Attenuation, Sound Field, Piezo-electric Effect , Ultrasonic Transducers and their Characteristics, Ultrasonic Equipment and Variables Affecting Ultrasonic Test, Ultrasonic Testing, Interpretations and Guidelines for Acceptance, Rejection - Effectiveness and Limitations of Ultrasonic Testing.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the principle of ultrasonic test. L2
- Analyze the performance of wave propagation, reflection, refraction, diffraction and sound field in ultrasonic test. L4
- Discuss the characteristics of ultrasonic transducers. L4
- Outline the limitations of ultrasonic testing. L2

UNIT III


10 Hours

Liquid Penetrant Test: Liquid Penetrant Test, Basic Concepts, Liquid Penetrant System, Test Procedure, Effectiveness and Limitations of Liquid Penetrant Testing.

Eddy Current Test: Principle of Eddy Current, Eddy Current Test System, Applications of Eddy Current-Testing Effectiveness of Eddy Current Testing.

Magnetic Particle Test: Magnetic Materials, Magnetization of Materials, Demagnetization of Materials, Principle of Magnetic Particle Test, Magnetic Particle Test Equipment, Magnetic Particle Test Procedure, Standardization and Calibration, Interpretation and Evaluation, Effective Applications and Limitations of the Magnetic Particle Test.

Learning Outcomes:


 Head
 Mechanical Engineering Department,
 JNTUA College of Engineering,
 PULIVENDULA - 516 390.

At the end of this unit, the student will be able to

- Illustrate the procedure of Liquid Penetrant, eddy current and magnetic particle test. L2
- Outline the limitations of Penetrant, eddy current and magnetic particle tests. L2
- Explain the effectiveness of Penetrant, eddy current and magnetic particle tests L2
- Apply the applications of Magnetic particle test. L3

UNIT IV**8 hours**

Infrared And Thermal Testing: Introduction and fundamentals to infrared and thermal testing–Heat transfer –Active and passive techniques –Lock in and pulse thermography–Contact and non contact thermal inspection methods–Heat sensitive paints –Heat sensitive papers –thermally quenched phosphors liquid crystals –techniques for applying liquid crystals –other temperature sensitive coatings – Inspection methods –Infrared radiation and infrared detectors–thermo mechanical behavior of materials– IR imaging in aerospace applications, electronic components, Honey comb and sandwich structures– Case studies.

Learning Outcomes:

At the end of this unit, the student will be able to

- Discuss the fundamentals of thermal testing. L6
- Explain the techniques of liquid crystals, active and passive. L2
- Illustrate thermal inspection methods. L2
- Outline the limitations of thermal testing. L2
- Explain the applications of honey comb and sandwich structures. L2

UNIT V**8 Hours**

Industrial Applications of NDE: Span of NDE Activities Railways, Nuclear, Non-nuclear and Chemical Industries, Aircraft and Aerospace Industries, Automotive Industries, Offshore Gas and Petroleum Projects, Coal Mining Industry, NDE of pressure vessels, castings, welded constructions

Learning Outcomes:

At the end of this unit, the student will be able to

- Illustrate applications of NDE. L2
- Explain the applications of Railways, Nuclear and chemical industries. L2
- Outline the limitations and disadvantages of NDE. L2
- Explain the applications of NDA of pressure vessels, casting and welding constructions L2

Text Books:

1. J Prasad, GCK Nair , Non destructive test and evaluation of Materials, Tata mcgraw-Hill Education Publishers, 2008.
2. Josef Krautkrämer, Herbert Krautkrämer, Ultrasonic testing of materials, 3/e, Springer-Verlag, 1983.
3. X. P. V. Maldague, Non destructive evaluation of materials by infrared thermography, 1/e, Springer-Verlag, 1993.

Reference Books:

1. Gary L. Workman, Patrick O. Moore, Doron Kishoni, Non-destructive, Hand Book, Ultrasonic Testing, 3/e, Amer Society for Nondestructive, 2007.
2. ASTM Standards, Vol 3.01, Metals and alloys

Course Outcomes:

At the end of this Course the student will be able to

- Explain various methods of non-destructive testing. L3
- Apply relevant non-destructive testing method different applications. L3
- Explain the applications of Railways, Nuclear and chemical industries. L2
- Outline the limitations and disadvantages of NDE. L2
- Explain the applications of NDA of pressure vessels, casting and welding constructions L2