III Year I Semester	L	T	P	C
Code: 20ME5427	3	0	0	3

NON DESTRUCTIVE EVALUATION

Course Objectives:

The Students will acquire the knowledge

1. To learn basic concepts of non-destructive testing and industrial applications
2. To learn the elements of ultrasonic test and limitations of ultrasonic test
2. To learn the concepts involved in the liquid penetrant test and eddy current test
3. To learn the basic principles and operating procedures of magnetic particle testing
4. To learn the basic concepts involved in the infrared and thermal testing (At least, two equipments on Non-destructive evaluation process are to be demonstrated)

UNIT–I

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

UNIT–II

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.

UNIT–III

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 UNIT–IV 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

UNIT–V

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 behaviour of

materials–IR imaging in aerospace applications, electronic components, Honey comb and sandwich structures–Case studies.

Text Books:

1. Non destructive test and evaluation of Materials/J Prasad, GCK Nair/TMH Publishers
2. Ultrasonic testing of materials/ H Krautkramer/Springer
3. Non destructive testing/Warren, J Mc Gonnagle / Godan and Breach Science publishers
4. Non destructive evaluation of materials by infrared thermography / X. P. V. Maldague, Springer Verlag, 1st edition, (1993)

References:

1. Ultrasonic inspection training for NDT/E.A. Gingel/Prometheus Press
2. ASTMStandards,Vol3.01, Metals and alloys
3. Non-destructive, Hand Book – R. Hamchand

Course Outcomes:

At the end of the course the students shall be able to:

1. Understand the concepts of various NDE techniques and the requirements of radiography techniques and safety aspects. (BL-2)
2. Interpret the principles and procedure of ultrasonic testing (BL-2)
3. Understand the principles and procedure of Liquid penetration and eddy current testing (BL-2)
4. Illustrate the principles and procedure of Magnetic particle testing (BL-2)
5. Interpret the principles and procedure of infrared testing and thermal testing (BL-2) CO-PO Mapping