## 4/4 B.Tech. EIGHTH SEMESTER

**ME8T2A NON DESTRUCTIVE EVALUATION Credits: 4**

**Lecture:- 4 periods/week** **Internal assessment: 30marks**
**Tutorial: --** **Semester end examination: 70 marks**

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**Objectives:**

1. Familiarize with various ultrasonic hardness tests.
2. Gain knowledge about X-ray radiography.
3. Acquire knowledge on different types of ultrasonic tests.
4. Get educated on Holography and applications of NDT.

**Learning outcomes:**

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

1. Demonstrate the knowledge about different flaw detection techniques.
2. Gain knowledge of X-ray and gamma ray radiography inspection process.
3. Familiarize with basic principles of ultrasonic testing.
4. Apply different holography techniques and know about real time applications of NDT.

**Pre-Requisites:**

Production Technology

**UNIT-I**
**ULTRASONIC HARDNESS TESTING**:
Flaw detection using dye penetrants- magnetic particle inspection-introduction to electrical impedance, principles of eddy current testing, flaw detection using eddy currents.

**UNIT –II**
**INTRODUCTION TO X-RAY RADIOGRAPHY:**
the radiographic process, X-ray and Gamma ray sources, Geometric principles, Factors governing exposure, radio graphic screens, scattered radiation, arithmetic of exposure, radiographic image quality and detail visibility, industrial X-ray films.

**UNIT-III**

**X-RAY RADIOGRAPHY PROCESES:**

fundamentals of processing techniques, process control, the processing room, special processing techniques, paper radiography, sensitometric characteristics of X-ray films, film graininess signal to noise ratio in radiographs. The photographic latent image, radiation protection.

**UNIT – IV**

**INTRODUCTION TO ULTRASONIC TESTING:**

Generation of ultrasonic waves, Horizontal and shear waves, Near field and far field acoustic wave description, Ultrasonic probes – Straight beam, direct contact type, Angle beam, Transmission/reflection type, and delay line transducers, acoustic coupling and media.

**UNIT – V**

**ULTRASONIC TESTS:**

Transmission and pulse echo methods, A-scan, B-scan, C-scan, F-scan and P-scan modes, Flaw sizing in ultrasonic inspection: AVG, Amplitude, Transmission, TOFD, Satellite pulse, Multi-modal transducer, Zonal method using focused beam. Flow location methods, Signal processing in Ultrasonic NDT; Mimics, spurious echos and noise. Ultrasonic flaw evaluation.

**UNIT – VI**

**HOLOGRAPHY:**

Principles and practices of Optical holography, acoustical, microwave, x-ray and electron beam holography techniques.

**UNIT – VII**

**APPLICATIONS – I**:

NDT in flaw analysis of Pressure vessels, piping

**UNIT – VII**

**APPLICATIONS – II**:

NDT in Castings, Welded constructions, etc., Case studies.

## Learning resources

**Text books:**


1. Ultrasonic testing, (3rd edition), by Krautkramer and Krautkramer, Springer-Verlag; .1983.
2. Ultrasonic inspection to Training for NDT, by E.A. Gingel, Prometheus Press, 2006.
3. Metals and alloys, by ASTM Standards, Vol 3.01,