Birla Institute of Technology & Science, Pilani
Hyderabad Campus

**FIRST SEMESTER 2020-2021**

Course Handout

Date: 14-08-2020

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

*Course No.*: **MST G511**
*Course Title*: **Non-destructive Testing Techniques**
*Instructor-in-Charge*: **Ravi Shanker Vidyarthy**

**Course Description :** Ultrasonic testing, X-radiography, eddycurrent testing, magnetic methods of crack detection, liquid penetrant inspection, acoustic emission and acousto-ultrasonic testing techniques

**Scope and Objective of the Course:**

The course is aimed at laying the foundation of principles of nondestructive testing (NDT) techniques. (such as Ultrasonic Testing, X-radiography, Eddy-current Testing, Magnetic methods of crack detection, Acoustic Emission Testing etc.) and also to provide guidelines on developing specific NDE techniques and criteria for acceptance of materials for various applications. NDT is used across industries such as aerospace, oil and gas, nuclear, power generation, medical, rail and general manufacturing to name a few. Nondestructive Testing (NDT) plays an extremely important role in quality control, flaw detection and structural health monitoring covering a wide range of industries. There are varieties of NDT techniques in use. At the end of the course, the student would have understood these techniques thoroughly and ready for tackling new challenges of modern technological era.

**Textbooks:**

1. Nondestructive Testing Techniques by Ravi Prakash, New Age Publishers, New Delhi, 2007

**Reference books**

1. Non-Destructive Test and Evaluation of Materials by J Prasad, C. G. Krishnadas Nair, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2011.
2. Nondestructive Testing, Louis Cartz, ASM International
3. Nondestructive Evaluation and Quality Control, ASM Handbook, Vol. 17.

**Online resource links**

1. https://www.nde-ed.org

**Course Plan:**

| Lecture No. | Learning objectives | Topics to be covered | Chapter in the Text Book |
|---|---|---|---|
| 1-2 | Enable the students to understand the: - | Introduction to NDT Techniques | 1 |

| | | | |
|---|---|---|---|
| | Difference between destructive and Non-Destructive testing. Advantages and disadvantages of NDT, Need of NDT techniques, Types of NDT techniques. | | |
| 3-6 | This will give the in-depth knowledge of Liquid penetrant inspection technique. Basic principle, Types of dye and methods of application, Developer | Liquid Penetrant Inspection | 5 |
| 7-12 | Students shall learn the basic theory of magnetism, Magnetization methods, Field indicators, Particle application, Inspection. | Magnetic Particles Flaw Detection | 4 |
| 13-19 | This enable students to learn about Eddy current testing, Basic principle; Faraday's law, Inductance, Lenz's law, Self and Mutual Inductance. Application of eddy current testing, eddy current probes and recent development in eddy current testing. | Eddy-current Testing | 3 |
| 20-29 | Students shall learn about Ultrasonic testing: Basics of ultrasonic waves, Pulse and beam shapes, Ultrasonic transducers. Test method, Distance and Area calibration, Weld inspection by UT. | Ultrasonic Testing | 2 |
| 30-35 | Acoustic emission testing: Basic principle, Sources of acoustic emission, Source parameters, Kaiser-Felicity theory, Equipment and Data. Acousto-Ultrasonic Testing | Acoustic Emission Testing and Acousto-Ultrasonic Testing | 7 |
| 36-41 | Radiography: X-rays and their properties, X-ray generation, X-ray absorption and atomic scattering. Image formation, Image quality, Digital Radiography, Image interpretation, Radiation Shielding. Comparison and selection of NDT methods, | X-Radiography | 6 |
| 42-43 | Discussion of some industrial case studies. | Industrial Applications of NDT and Case Studies | Class Notes |

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| Practical No. | Experiment title |
|---|---|
| 1 | Visual inspection and Liquid Penetrant Inspection |
| 2 | Magnetic Particles Flaw Detection |
| 3 | Eddy-current Testing |
| 4 | Ultrasonic Testing |
| 5 | X-Radiography |

**Evaluation Scheme:**

| Component | Duration | Weightage (%) | Date & Time* | Nature of Component |
|---|---|---|---|---|
| Test 1 | 30 Min | 10 | September 10 – September 20 (During scheduled class hour) | OB |
| Test 2 | 30 Min | 15 | October 09 –October 20 (During scheduled class hour) | OB |
| Test 3 | 30 Min | 10 | November 10 – November 20 (During scheduled class hour) | OB |
| Lab component | During Lab session | 20 | Evenly spaced throughout the semester | Lab record and viva |
| Project | During scheduled class session | 10 | Evenly spaced throughout the semester | Report and viva |
| Comprehensive Examination | 2 Hr | 35 | 07/12 FN | OB |

**** Any change in date will be notified during the semester***

**Chamber Consultation Hour:** All kind of Consultation will be through mail and telephonic if required

**Notices:** All notices will be put up on CMS only.

**Make-up Policy:** Make-up will be given with prior concern and genuine reasons only.

**Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by, all the students throughout the semester and no type of academic dishonesty is acceptable**

**INSTRUCTOR-IN-CHARGE**