

Department Elective – II				
Fifth year of Five Years integrated M.Sc. (Physics)				
M.Sc. - V, Semester – IX				
MP 555 : Fundamentals of Non Destructive Testing	L	T	P	C
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- **INTRODUCTION TO NON DESTRUCTIVE TESTING** (02 Hours)
- **MECHANICAL BEHAVIOR OF MATERIALS** (04 Hours)
Elements of plastic deformation - work hardening, recovery, recrystallization and grain growth, types of fractures in materials and their identification - Basic Principles and different types of corrosion - Corrosion tests - protection against corrosion.
- **FRACTURE MECHANICS AND MODES OF FAILURES** (04 Hours)
Types of fractures - Ductile and brittle fractures - features of fracture - surface for ductile, brittle and mixed modes – fractography.
Stresses around cracks - linear elastic fracture mechanics - fracture toughness testing in practice - General yielding fracture mechanics- Notch bar fracture mechanics and the micro mechanics of cleavage fracture. The cleavage fibrous transition - fibrous fracture and impact testing
- **VISUAL TESTING** (10 Hours)
Fundamentals of Visual Testing , Visual perception, direct and indirect methods - mirrors, magnifiers, Boroscopes Fibrosopes, Fundamentals of Photoelasticity, testing of ferrites, A systems, computer enhanced system - Employer defined applications, metallic materials including raw materials and welds - Inspection objectives, inspection checkpoints, sampling plan, inspection pattern etc. classification of indications for acceptance criteria - Codes, Standards and Specifications (ASME, ASTM, AWS etc.)
- **LIQUID PENETRANT TESTING** (06 Hours)
Introduction to Penetrant testing, Penetrants and their application, penetrant removal, Drying, developing, inspection, equipments and control checks
- **MAGNETIC PARTICLE TESTING** (08 Hours)
Theory of magnetism - ferromagnetic, Paramagnetic materials - magnetisation by means of direct and alternating current - surface strength characteristics - Depth of penetration factors, Direct pulsating current typical fields, advantages - Circular magnetisation techniques, field around a strength conductors, right hand rule field - Prods technique, current calculation - Longitudinal magnetization.
- **ULTRA SONIC TESTING** (08 Hours)
Nature of sound waves, wave propagation - modes of sound wave generation - Various methods of ultrasonic wave generation - Principle of pulse echo method, through transmission method, resonance method - Advantages, limitations - contact testing, immersion testing, couplants - Data presentation, (TOFD)

(Total Contact Time (Theory) : 42 Hours)

BOOKS RECOMMENDED :

1. Raghavan V.	<i>Material Science and Engineering</i>	Prentice Hall, India	1998
2. Krautkramer J. and Krautkramer H.	<i>Ultrasonic Testing of Materials</i>	Springer-Verlag	1983
3. Shull P.J.,	<i>Nondestructive Evaluation: Theory, Techniques, and Applications,</i>	Marcel Dekker Inc	2002.
4. Hellier, C.,	<i>Handbook of Nondestructive Evaluation,</i>	McGraw-Hill Professional	2001
5. Bray, D.E. and R.K. Stanley, 1997,;	<i>Nondestructive Evaluation: A Tool for Design, Manufacturing and Service</i>	CRC Press	1996