Course Code	Course Title	L	T	P	C
20SE011	**EXPERIMENTAL STRESS ANALYSIS**	**3**	**0**	**0**	**3**

PRE-REQUISITE COURSES: ENGINEERING MECHANICS AND MATERIAL SCIENCE

COURSE OBJECTIVES:

To understand the different strain gauge systems available. To understand the calibration of strain gauges. To study the importance of Non-Destructive Testing.

COURSE OUTCOMES:

At the end of the course student will be able

CO's	Course Outcomes	PO's
1	To understand the mechanical properties of strain gauges and applications	5
2	To understand the design and performance of strain gauges	4
3	To understand the methods of Non-Destructive testing	5
4	To understand the methods of photo elasticity and models	1,2
5	To have a brief idea regarding experiments in material testing.	3

SKILLS:

- ✓ Ability to perform NDT Test and interpret the results
- ✓ Ability to understand the science behind working of a strain gauge.
- ✓ Understanding the practical applications of a strain gauge.
- ✓ Determine the stress distribution in anacrylic block using the concept of photo elasticity.

UNIT-I:

INTRODUCTION AND STRAIN MEASUREMENT METHODS: Strain gauge, principle, types, performance and uses-Moire Fringe - Hydraulic jacks and pressure gauges – load cells – Proving Rings –Calibration of Testing Machine.

UNIT-II:

ELECTRICAL RESISTANCE STRAIN GAUGES: Introduction – gauge construction – strain gauge adhesives - mounting methods – gauge sensitivities and gage factor – performance characteristics of wire and foil strain gauges – environmental effects - Analysis of strain gauge data – the three-element rectangular rosette – the delta rosette – correction for transverse sensitivity.

UNIT-III:

NON – DESTRUCTIVE TESTING: Load testing on structures, buildings, bridges and towers – Rebound Hammer – acoustic emission –ultrasonic testing principles and application – Holography – use of laser for structural testing – Brittle coating

UNIT-IV:

PHOTO ELASTICITY: Introduction – the stress optic law – effects of stressed model in a polariscope for various arrangements - Fringe Multiplication with Partial Mirrors.

UNIT-V:

EXPERIMENTS IN MATERIAL TESTING: Introduction - To Plot a Graph Between Actual Stress and Actual Strain for a Sample Under Tension Using UTM - Buckling Test on Columns Using UTM - Determination of Shear Centre of a Channel Section - Creep Test - Fatigue Test - Determination of Young's Modulus and Poisson's Ratio - Determination of Shear Modulus - Calibration of a Proving Ring - Calibration of a Photo elastic Model for Stress Fringe

TEXT BOOKS:

1. DallyJ.W., and RileyW.F. "Experimental Stress Analysis", McGraw-Hill,1991.
2. Sadhu Singh, "Experimental Stress Analysis", Khanna publications,1990.
3. JindalU.C., "Experimental Stress Analysis", pearson,2013
4. Srinath,L.S. M.R. Raghavan, K. Lingaiah, G. Gargesa, B. Pant, and K. Ramachandra, "Experimental Stress Analysis", Tata McGraw Hill,1984.
5. Sirohi,R.S. Radhakrishna,H.C. "Mechanical Measurements", New Age International (P) Ltd. 1997
6. BrayD.E. &StanleyR. K, "Non-destructive Evaluation", McGraw Hill Publishing Company, N.Y.1989

REFERENCES:

1. K. Ramesh, Digital Photoelasticity – Advanced Techniques and Applications, Springer,2000.
2. George Hamor Lee, "An Introduction Experimental Stress Analysis", John Wiley & Sons Publishers,1950.
3. Alessandro Freddi, "Experimental Stress Analysis for materials and structures", Springer international,2015.
4. F.D James, "Modern Experimental Stress Analysis", Wiley,2004