Course Code	Course Title	L	T	P	C
17CE023	EXPERIMENTAL STRESS ANALYSIS	3	0	0	3

Course Objectives:

1. To understand the different strain gauge systems available.
2. To understand the utilization of strain gauges.
3. To study the importance of Non Destructive Testing.

Course Outcomes:

At the end of the course student will be able

1. To understand the mechanical properties of strain gauges
2. To understand the different methods in design the strain gauges.
3. To have a brief idea regarding two dimensional photo elasticity.

Activities:

1. Conduct an NDT test on various structural components using Rebound hammer.
2. Make Electrical Resistance strain gage using any of the design methods.
3. Conduct a laboratory experiment to determine Elastic moduli using a self-made Electrical Resistance strain gage.

Skills:

1. Ability to perform NDT Test and interpret the results
2. Ability to understand the science behind working of a strain gauge.
3. Understanding the practical applications of a strain gauge.
4. Determine the stress distribution in a acrylic block using the concept of photo elasticity.

UNIT-I: Introduction and Strain Measurement Methods:

Model & Prototype – Dimensional analysis-Factors influencing model design – Scale factors and Model material properties – Methods of model design - Definition of strain - its relation to experimental determinations - properties of strain gauge systems – Mechanical - Optical, Acoustic and Pneumatic types.

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:

Introduction - objectives of non destructive testing - Ultrasonic pulse velocity method – Rebound Hammer method – Acoustic Emission application to assessment of concrete quality

UNIT-IV: Photo Elasticity:
Introduction – temporary double refraction – Index ellipsoid and stress ellipsoid – the stress optic law – effects of stressed model in a polariscope for various arrangements - fringe sharpening.

UNIT-V: Two Dimensional Photo Elasticity:
Introduction - iso-chromatic fringe patterns – isoclinic fringe patterns – compensation techniques – calibration methods – separation methods – materials for photo- elasticity – properties of photo-elastic materials

TEXT BOOKS:

1. J.W. Dally and W.F. Riley, "Experimental Stress Analysis", McGraw-Hill, 1991.
2. L.S. Srinath, M.R. Raghavan, K. Lingaiah, G. Gargesa, B. Pant, and K. Ramachandra, "Experimental Stress Analysis", Tata McGraw Hill, 1984.

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. Sadhu Singh, "Experimental Stress Analysis", Khanna publications, 1990.