3/4 B.Tech FIFTH Semester

AE5T3 EXPERIMENTAL STRESS ANALYSIS Credits: 3

Lecture:- 3 periods/week Internal assessment: 30marks

Tutorial: -1 period/week Semester end examination: 70 marks

Course Outcomes:

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

1. Explain overall concepts of stress/strain analysis by experimental means.
2. Discuss the theory and practice of common experimental stress analysis methods including moire methods, photo elasticity etc
3. Describe Brittle and bi-refrigent coatings and working of strain gauges.
4. Evaluate the stress and strain by moiré techniques

Prerequisites: Strength of materials

UNIT – I

STRAIN MEASUREMENT METHODS:

Various types of strain gauges, Electrical Resistance strain gauges, Gage Sensitivity and Gage Factor Semiconductor strain gauges, Temperature compensation, strain gauge circuits, **ANALYSIS OF STRAIN GAGE DATA:** Three Element Rectangular Rosette, Delta Rosette, strain gauge rosette.

UNIT-II

RECORDING INSTRUMENTS:

Introduction, static recording and data logging, dynamic recording at very low Frequencies, dynamic recording at intermediate frequencies, dynamic recording at high Frequencies, dynamic recording at very high frequencies.

UNIT – III

BRITTLE COATINGS and BIREFRINGENT COATINGS:

Brittle Coatings: Introduction, coating stresses, failure theories, brittle coating crack patterns, crack detection, ceramic based brittle coatings, resin based brittle coatings, test procedures for brittle coatings analysis, calibration procedures, analysis of brittle coating data.

BIREFRINGENT COATINGS:

Introduction, Coating stresses and strains, coating sensitivity, coating materials, application of coatings, effects of coating thickness, Fringe-order determinations in coatings, stress separation method Undercoating.

UNIT – IV

MOIRE METHODS:

Introduction, mechanism of formation of Moire fringes, the geometrical approach to Moire-Fringe analysis, displacement field approach to Moire-Fringe analysis, out of plane displacement measurements, out of plane slope measurements, sharpening and multiplication of Moire-Fringes, experimental procedure and techniques.

UNIT – V

PHOTO ELASTICITY:–

Introduction Polariscope – Plane and circularly polarized light, Bright and dark field setups, Isochromatic Fringe Patterns, Isoclinic Fringe Patterns, Compensation Techniques, Calibration Methods, Separation Methods, Shear Difference Method, Materials for Two-Dimensional Photo elasticity

Learning Resources

Text Books :

1. Experimental stress analysis, (Third Edition), by James Dally and Riley, Mc Graw-Hill International, , New Delhi.1978.
2. Experimental stress analysis, (6^{th} edition), by Dr. Sadhu Singh, Khanna Publishers, New Delhi, 1996.
3. Theory of Elasticity, (Third Edition), S.Timoshenke and JN. Goodier “” McGraw-Hill, New York ,1970.

Reference B**ooks:**

1. A treatise on Mathematical theory of Elasticity, by Augustus Edward Hough Love, University Press, fourth edition, 1906.
2. Experimental stress analysis principles and methods, by G.S. Holister, Cambridge university press, 1967.