Course code	Course Name	L-T-P - Credits	Year of Introduction
AO309	EXPERIMENTAL STRESS ANALYSIS	3-0-0-3	2016

Prerequisite: Nil

Course Objectives

- To study the various experimental techniques involved for measuring displacements, stresses, strains in structural components.

Syllabus

Principles of measurements – Extensometers - Capacitance gauges, Laser displacement sensors- electrical resistance strain gauges - static and dynamic strain measurements - strain indicators- Rosette analysis- stress gauges- load cells- Two-dimensional photo elasticity- Transmission photo elasticity- polariscopes - Introduction to three-dimensional photo elasticity -Relation between stresses in coating and specimen-Fundamentals of NDT

Expected Outcome

The students will acquire knowledge about

- Stress and strain measurements in loaded components.
- The usage of strain gauges and photo elastic techniques of measurement.
- Use of NDT in stress analysis

Text Books:

1. Dally, J.W., and Riley, W.F., "Experimental Stress Analysis", McGraw Hill Inc., New York 1998.
2. Sadhu Singh, "Experimental Stress Analysis", Khanna Publishers, New Delhi, 1996.
3. Srinath, L.S., Raghava, M.R., Lingaiah, K., Garagesha, G., Pant B., and RaMachandra, K., "Experimental Stress Analysis", Tata McGraw Hill, New Delhi, 1984.

References:

1. Durelli. A.J., "Applied Stress Analysis", Prentice Hall of India Pvt Ltd., New Delhi, 1970
2. Hetenyi, M., "Hand book of Experimental Stress Analysis", John Wiley and Sons Inc., New York, 1972.
3. Max Mark Frocht, "Photo Elasticity", John Wiley and Sons Inc., New York, 1968
4. Pollock A.A., Acoustic Emission in Acoustics and Vibration Progress, Ed. Stephens R.W.B., Chapman and Hall,1993.
5. Ramesh, K., Digital Photoelasticity, Springer, New York, 2000

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Principles of measurements, Accuracy, Sensitivity and range of measurements	1	15%
	Mechanical and Optical extensometers and their uses, Advantages and disadvantages	2	
	Acoustical and Electrical extensometers and their uses, Advantages and disadvantages	2	
	Capacitance gauges.	1	
II	Principle of operation of electrical resistance strain gauges and requirements, Types and their uses.	2	15%
	Materials for strain gauges	1	

	Calibration and temperature compensation, cross sensitivity	2	
FIRST INTERNAL EXAMINATION			
III	Wheatstone bridge and potentiometer circuits for static and dynamic strain measurements	1	15%
	Rosette analysis – Numerical Problems	4	
	strain indicators	1	
	Wheatstone bridge and potentiometer circuits for static and dynamic strain measurements	2	
IV	Two-dimensional photo elasticity, Photo elastic materials	2	15%
	Concept of light - photo elastic effects	1	
	Stress optic law, Transmission photo elasticity	3	
	plane and circular polariscopes.	1	
SECOND INTERNAL EXAMINATION			
V	Interpretation of fringe pattern	1	20%
	Calibration of photo elastic materials	2	
	Compensation and separation techniques	2	
	Moire method of strain analysis.	2	
	Introduction to three-dimensional photo elasticity	2	
VI	Fundamentals of NDT	2	20%
	Acoustic Emission Technique	2	
	Radiography, Thermography, Ultrasonic Testing	2	
	Eddy Current testing, Fluorescent Penetrant Testing	1	
	Introduction to brittle coating	1	
END SEMESTER EXAM			

Question Paper Pattern

Maximum marks: 100 Exam duration: 3 hours

The question paper shall consist of three parts

Part A
4 questions uniformly covering modules I and II. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B
4 questions uniformly covering modules III and IV. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C
6 questions uniformly covering modules V and VI. Each question carries 10 marks
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: In all parts, each question can have a maximum of four sub questions, if needed.