

EXPERIMENTAL STRESS ANALYSIS

II Semester: AE																													
Course Code	Category	Hours /Week			Credits	Maximum Marks																							
BAEC18	Elective	L	T	P	C	CIA	SEE	Total																					
		3	-	-	3	30	70	100																					
Contact Classes:45		Tutorial Classes: Nil		Practical Classes: Nil			Total Classes: 45																						
<p>I. COURSE OVERVIEW: This course deals with theory behind the experimental techniques and their process. The main focus is on principal of measurements and their uses on the practical problems. The students will learn about the electrical circuits, their sensitivity and effects. Broad knowledge on the two photo-elasticity concepts, techniques, materials used and their effects. A glimpse of three dimensional photo elasticity will be given. Various applications of coatings will be discussed along with advantages. A view point on calibration photo elastic model materials is appreciated. Two element and three element rosettes and gauges are addressed.</p>																													
<p>II. COURSE OBJECTIVES: The students will try to learn:</p> <ol style="list-style-type: none"> I. The effects of force and motion while carrying out the innovative design functions of engineering. Bring awareness on experimental method of finding the response of the structure to different types of load. II. The relation between the mechanics theory, experimental stress analysis, and the mechanical, optical, pneumatic and electrical strain gauges for strain measurement. III. The fundamental concepts and newly experimental techniques and able to use the experimental techniques on the practical problems. IV. The fine presentation related to the experimental paper. 																													
<p>III. COURSE OUTCOMES: After successful completion of the course, students will be able to:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">CO</th> <th style="width: 70%;">Outcome</th> <th style="width: 20%;">Action</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">CO 1</td> <td>Understand the principles and range of measurements used to discover the responses of the structure</td> <td style="text-align: center;">Understand</td> </tr> <tr> <td style="text-align: center;">CO 2</td> <td>Apply about the various extensor meters for finding the response of the structure to different types of loads.</td> <td style="text-align: center;">Apply</td> </tr> <tr> <td style="text-align: center;">CO 3</td> <td>Analyse the strain sensitivity in metallic alloys and techniques for strain measurement</td> <td style="text-align: center;">Analyze</td> </tr> <tr> <td style="text-align: center;">CO 4</td> <td>Make a use of the two- and three-dimensional photo elasticity concepts and effects</td> <td style="text-align: center;">Apply</td> </tr> <tr> <td style="text-align: center;">CO 5</td> <td>Apply the various photo-elastic coatings, methods and their applications to the study of stress distribution</td> <td style="text-align: center;">Apply</td> </tr> <tr> <td style="text-align: center;">CO 6</td> <td>Explain the effect of stress model, fringe order techniques and calibration photo elastic model materials</td> <td style="text-align: center;">Apply</td> </tr> </tbody> </table>									CO	Outcome	Action	CO 1	Understand the principles and range of measurements used to discover the responses of the structure	Understand	CO 2	Apply about the various extensor meters for finding the response of the structure to different types of loads.	Apply	CO 3	Analyse the strain sensitivity in metallic alloys and techniques for strain measurement	Analyze	CO 4	Make a use of the two- and three-dimensional photo elasticity concepts and effects	Apply	CO 5	Apply the various photo-elastic coatings, methods and their applications to the study of stress distribution	Apply	CO 6	Explain the effect of stress model, fringe order techniques and calibration photo elastic model materials	Apply
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<p>IV. COURSE SYLLABUS: MODULE-I: MEASUREMENTS & EXTENSOMETER (10) Principles of measurements, accuracy, sensitivity and range of measurements; Mechanical, optical acoustical and electrical extensometers and their uses, advantages and disadvantages.</p> <p>MODULE-II: ELECTRICAL RESISTANCE STRAIN GAGES (08) Strain sensitivity in metallic alloys, gage construction, adhesives and mounting techniques, gage sensitivity and gage factor, performance characteristics, environmental effects, strain gage circuits; Potentiometer, wheat stone's bridges, constant current circuits.</p>																													

MODULE-III: TWO AND THREE DIMENSIONAL PHOTO-ELASTICITY (10)

Two dimensional photoelasticity; Concepts of light-photo-elastic effects, stress optic law-interpretation of fringe pattern-compensation and separation techniques; Photoelastic materials; Introduction to three dimensional photoelasticity.

Photoelastic (Bi-refrigent) coatings, effects of coating thickness, brittle coatings, types of brittle coatings, advantages and brittle coating applications, crack detection methods and Moire methods: Applications and advantages.

MODULE-IV: PHOTO-ELASTICITY (09)

Nature of light, wave theory of light, optical interference, stress optic law , effect of stressed model in plane and circular polariscopes, isoclinics and iso-chromatics, fringe order determination fringe multiplication techniques, calibration photoelastic model materials.

MODULE-V: STRAIN ANALYSIS METHODS (08)

Two element, three element rectangular and delta rosettes, correction for transverse strain effects, stress gauge, plane shear gauge, and stress intensity factor gauge.

V. TEXT BOOKS:

1. Dally and Riley, "Experimental Stress Analysis", McGraw-Hill, New York, 1978.
2. Sadhu Singh, "Experimental Stress Analysis", Khanna Publisher, 4th Edition, 2009.
3. Srinath L.S tata , "Experimental stress Analysis", McGraw-Hill, 3rd Edition, 2012.

VI. REFERENCE BOOKS:

1. M.M.Frocht, John Wiley & sons, "Photoelasticity Vol I and Vol II", McGraw Hill, 2nd Edition, 1969.
2. Perry and Lissner , "Strain Gauge Primer", McGraw Hill, 2nd Edition, 1969.

VII. WEB REFERENCES:

1. https://www.youtube.com/playlist?list=PLU14u3cNGP62esZEwffjMAsEMW_YArxYC
2. www.nptel.ac.in/syllabus/syllabus.php?subjectId=112106068www.textofvideo.nptel.iitm.ac.in/112106068/lec1.pdf

VIII. E-TEXT BOOKS:

1. www.scribd.com/doc/241582542/Experimental-Stress-Analysis-by-Dally-and-Riley-P-1554n
2. www.apm.iitm.ac.in/smlab/kramesh/book_5.html
3. www.myopencourses.com/subject/experimental-stress-analysis-1
4. <https://www.amazon.com/Data-Structures-C-Noel-Kalicharan/dp/1438253273>