COURSE CONTENT

STRESS ANALYSIS AND VIBRATION								
I SEMSTER: CAD/CAM								
Course Code	**Category**	**Hours /Week**			**Credits**	**Maximum Marks**		
BCCD09	**Elective**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	-	-	3	40	60	100
Contact Classes:48	**Tutorials Classes: Nil**	**Practical Classes: Nil**				**Total Classes:48**		
Pre requisites: Mechanical Vibrations								

I. COURSE OVERVIEW:

The course covers the basic aspects of experimental stress analysis that includes exhaustive treatment of the most versatile techniques like photoelasticity and strain gauges. In addition, it also provides the fundamental aspects of different experimental techniques such as Moiré and Brittle Coatings and also a brief introduction to the nondestructive technique.

II. COURSE OBJECTIVES:

The students will try to learn:

I. The various measurement techniques involved for measuring parameters, types of Extensometers and their uses in various fields.
II. The effects of static and dynamic strain gauges and their classifications.
III. The concepts of Photo elastic effects and transmission of Photo elasticity.
IV. The failure theories in brittle coating and basics of Non-Destructive Testing and their types.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1 Illustrate the modern electronic measuring principle for different physical parameters
CO 2 Explain the measurement of strain under static and dynamic loads
CO 3 Apply knowledge on strain gauges and load cells for measuring mechanical quantities
CO 4 Analysis of measuring circuits and strains of different strain gauge rosettes
CO 5 Explain the concepts, types of photo elasticity and photo elastic materials

IV. COURSE CONTENT:

MODULE -I: Extensometers and Displacement Sensors (09)

Principles of Measurements, Accuracy, Sensitivity and Range of Measurements, Mechanical, Optical, Acoustical and Electrical Extensometers and their Uses, Advantages and Disadvantages, Capacitance Gauges, Laser Displacement Sensors.

MODULE -II: Electrical Resistance Strain Gauges (09)

Principle of operation and requirements, Types and their uses, Materials for Strain Gauges, Calibration and temperature compensation, Cross Sensitivity, Wheatstone Bridge and Potentiometer, Circuits for Static and Dynamic strain measurements, Strain indicators, Rosette Analysis, Stress Gauges, Load Cells, Data Acquisition, Six Component Balance.

MODULE -III: Photo Elasticity (09)

Two-Dimensional Photo elasticity, Photo elastic Materials, Concept of Light – Photo elastic Effects, Stress Optic Law, Transmission Photo elasticity, Jones Calculus, Plane and Circular Polariscopes.
Interpretation of Fringe Pattern, Calibration of Photo elastic Materials, Compensation and separation Techniques, Introduction to Three-Dimensional Photo Elasticity.

MODULE -IV: Brittle Coating and Moire Techniques (09)
Relation Between Stresses in Coating and Specimen, Use of Failure Theories in Brittle Coating, Moire Method of strain Analysis

MODULE -V: Non–Destructive Testing (09)
Fundamentals of NDT, Acoustic Emission Technique, Radiography, Thermography, Ultrasonics, Eddy Current Testing, Fluorescent Penetrant Testing

V. TEXT BOOKS:

1. J. W. Dally, W.F. Riley, "Experimental Stress Analysis", Tata McGraw Hill Inc., 1st edition, 2013.
2. L. S. Srinath, M.R. Raghava, K. Lingaiah, G. Garagesha, B. Pant, K. Ramachandra, "Experimental Stress Analysis", Tata McGraw Hill, New Delhi,1st edition,1984.

VI. REFERENCE BOOKS:

1. M. Hetenyi, "Hand Book of Experimental Stress Analysis", John Wiley and Sons Inc., New York, 1st edition, 1972.
2. A. A. Pollock, "Acoustic Emission in Acoustics and Vibration Progress", Ed. Stephens R.W.B. Chapman and Hall, 1st edition, 1993.

VII. WEB REFERENCES:

1. http:// nptel.ac.in/courses/112/103/112103111/

VIII. E-TEXT BOOK:

1. http:// 160592857366.free.fr/joe/e books/Mechanical Engineering Books Collection/VIBRATIONS/ mechVib theory and applications.pdf

VIII. MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Assignments
4. Model question paper – I
5. Model question paper – II
6. Lecture notes
7. PowerPoint presentation