B. Tech. Civil Engineering				
Course code: Course Title	**Course Structure. Credit=4**			**Pre-Requisite**
CE 342: Experimental Mechanics	L	T	P	CE104: Mechanics of solids
	3	0	2	

Course Objective: Fostering students' competence in experimental mechanics suitable for research, industrial, defence, and space applications.

S. No	Course Outcomes (CO)
CO1	Introduction to Basic Theory of Elasticity.
CO2	Introduction to Full-field method using Photoelasticity (2D and 3D) for both static and dynamic stress analysis, including Digital Photoelasticity.
CO3	Introduction to the Full-field method using Moire method of stress analysis and the DIC (Digital Image Correlation) method.
CO4	Introduction to Point-wise application of Electrical resistance Strain Gauge, Piezo-Electric, Photo-Electric method, and apply to develop transducers for various research, Industrial, Defence, and Space applications. Application of AI & ML in strain assessment.
CO5	Students are able to design and analyse data for Research, Industrial, Defence, and Space applications.

S. No	Contents	Contact hours
UNIT 1	Introduction to the Theory of Elasticity, Concept of Stress and Strain Tensor, Transformation equations in 2D and 3D stress and Strain analysis. Dynamic Stress Analysis.	8
UNIT 2	Introduction to Nature of Light, Wave Plate, Plane Polariscope, Circular Polariscope. Effect of the stressed photoelastic model on Plane Polariscope, Circular Polariscope. Determination of Isoclinics on a Circular Disc. Determination of Isochromatics on a Circular disc subjected to diametrical compression. Separation of Principal stresses. Determination of Material fringe value using monochromatic light. Casting of the photoelastic sheet using Araldite (CY-230) and Hardener (HY-951). Application on the model beam of photoelastic material subjected to concentrated loads (3- 3-point and 4-point loadings). Application to 2D and 3D stress analysis and use of Digital Photoelasticity.	10
UNIT 3	Introduction to Moiré methods and shape determination. Moiré methods using electronic grating. Moiré methods using Laser Interferometer for in-plane and out-of-plane strain determination. Introduction to Digital Image Correlation (DIC) method and application to Research, Industrial, Defence, and Space problems. Full-field stress analysis Method of brittle coating.	8

UNIT 4	Introduction to Point-wise application of Electrical resistance Strain Gauge, Piezoelectric, Photo-Electric method, and apply to develop transducers for various research, Industrial, Defence, and Space applications.	8
UNIT 5	Point-wise Static and Dynamic Stress analysis using Electrical resistance strain gauges. Application of AI & ML in strain assessment. Application to research, industrial, Defence, and Space problems. Strain measurement using piezo sensors, fiber-optic sensors, etc.	8
	TOTAL	**42**

REFERENCES		
S. No.	**Name of Books/Authors/Publishers**	**Year of Publication / Reprint**
1	Dally and Riley, "Experimental stress analysis," McGraw-Hill.	2021
2	Handbook of Stress Analysis, SEM publication.	2021
3	Engineering Mechanics, Timoshenko, Young, and Rao. TMH books.	2017
4	K. Ramesh: Special Issue OLEN: Developments in Photoelasticity and Diverse Applications.	2025
5	K. Ramesh: New Book: Developments in Photoelasticity - A Renaissance.	2024
6	Instrumentation, Measurement and Analysis by B. C. Nakra and K. K. Chaudhary, Tata McGraw-Hill.	1985
7	Experimental Methods for Engineers by J P Holman and W J Gajda, McGraw-Hill Co.	1978