

COURSE CODE	COURSE TITLE	L	T	P	C
1153AE104	SMART STRUCTURES	3	0	0	3

Course Category:

Allied Elective

a. Preamble :

The objective of this course is to have students learn the basic aspects of smart structural systems including smart materials, sensor technology, signal processing methods, modeling of smart structures and structural control concepts and expose them diverse and rapidly expanding applications of smart materials and technologies.

b. Prerequisite Courses:

- Strength of materials

c. Related Courses:

- Introduction to UAV

d. Course Educational Objectives :

- To understand the characteristics and classification of smart materials
- To understand the smart structural components such as sensors, actuators and controllers and their integration in a structure

e. Course Outcomes :

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Understand the ideas about instrumented structures and response.	K2
CO2	Perceive the strain measuring techniques using electrical strain gauge	K3
CO3	Grasp the technology of sensors and its operations.	K3
CO4	Apprehend the classification of actuators and their working principles.	K3
CO5	Know about signal processing and their control systems.	K3

Correlation of COs with Pos:**MECHANICAL**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H			M				H		H	
CO2	H	H	M	H		M			H		H	
CO3	H	H		M	M				H		H	
CO4	H	H		H					H		H	
CO5	H	H		H					H		H	

H- High; M-Medium; L-Low

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COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H			H				H			
CO2	H	H	M		H				H			
CO3	H	H	M		H				H			
CO4	H	H	M		H				H	M		
CO5	H	H	M		H				H	M		

H- High; M-Medium; L-Low

f. Course Contents**UNIT-I INTRODUCTION****9**

Introduction to Smart Materials and Structures – Instrumented structures functions and response –Sensing systems – Self diagnosis –Actuation systems and effectors.

UNIT-II MEASURING TECHNIQUES**9**

Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

UNIT-III SENSORS**9**

Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement –Fiber optic Techniques.– Fiber Optic Sensing Systems.

UNIT-IV ACTUATORS**9**

Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magneto structure Material – Shape Memory Alloys -Rheological Fluids– Electro magnetic actuation – Role of actuators and Actuator Materials.

UNIT-V SIGNAL PROCESSING AND CONTROL SYSTEMS

9

Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non-Linear.

TOTAL : 45

TEXT BOOKS

1. Brain Culshaw – Smart Structure and Materials Artech House – Borton. London-1996.A.V.
2. Srinivasan, D.M. McFarland, Smart Structures, Cambridge University Press, 2001

REFERENCES

1. L. S. Srinath – Experimental Stress Analysis – Tata McGraw-Hill, 1998.
2. J. W. Dally & W. F. Riley – Experimental Stress Analysis – Tata McGraw-Hill, 1998.