

GUJARAT TECHNOLOGICAL UNIVERSITY

CIVIL (CONSTRUCTION ENGINEERING AND MANAGEMENT) (14)

SMART MATERIAL AND SMART STRUCTURE

SUBJECT CODE: 2721409

SEMESTER: II

Type of course: MAJOR ELECTIVE - III

Prerequisite: NA

Rationale: NA

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	ESE (V)		PA (I)			
					ESE	OEP	PA	RP		
3	2#	0	4	70	30	30	0	10	10	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Introduction Introduction to Smart Materials and Structures - Instrumented Structures Functions And Response -Sensing systems - Self-diagnosis - Signal processing consideration - Actuation systems and effectors.	12	
2	Sensors Sensing Technology - Types of Sensors - Physical Measurement using Piezo Electric Strain, measurement - Inductively Read Transducers - The LVOT - Fiber Optic Techniques. Chemical and Bio-Chemical sensing in Structural Assessment - Absorptive chemical sensors -Spectroscopes - Fibre Optic Chemical Sensing Systems and Distributed measurement.	14	
3	Measuring Techniques Measuring Techniques - Strain Measuring Techniques using Electrical strain gauges, Types -Resistance - Capacitance - Inductance - Wheatstone bridges - Pressure transducers - Load cells -Temperature Compensation - Strain Rosettes.	14	
4	Actuators Actuator Techniques - Actuator and actuator materials - Piezoelectric and Electrostrictive Material - Magneto structure Material - Shape Memory Alloys - Electro rheological Fluids- Electromagnetic actuation - Role of actuators and Actuator Materials.	14	

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Reference Books:

- 1) Brain Culshaw - Smart Structure and Materials Artech House - Borton. London-1996.
- 2) Srinivasan, A.V and Michael McFarland. D, "Smart Structures - Analysis and Design, Cambridge University Press, 2001.
- 3) L. S. Srinath, Experimental Stress Analysis, Tata McGraw-Hill, 1998.
- 4) J. W. Dally & W. F. Riley, Experimental Stress Analysis, Tata McGraw-Hill, 1998.
- 5) Mukesh V. Gandhi, Brian S. Thompson, Smart Materials and Structures, Springer, May-1992

Course Outcome:

After learning the course the students should be able to:

1. apply latest developments regarding smart materials and their use in structures.
2. Use various latest technology of measurements, predictions and alarming.

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website