STRUCTURAL HEALTH MONITORING

I Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB07	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

The course will provide the students with in-depth knowledge of technologies in structural health monitoring using smart materials as sensing and actuating elements to interrogate the structures. Damage detection techniques such as wave, impedance, and vibration-based damage detection techniques will be discussed and applied to different types of structures. , Advanced signal processing techniques such as wavelet, neural network and principal component analysis will be used to make the damage more quantifiable.

II. COURSE OBJECTIVES:

The course should enable the students to:

I. Diagnosis the distress in the structure understanding the causes and factors.
II. Assess the health of structure using static field methods.
III. Assess the health of structure using dynamic field tests.
IV. Suggest repairs and rehabilitation measures of the structure.

III. COURSE OUTCOMES:

CO 1	Explain the factors effecting structural health for the maintenance of structures.	**Remember**
CO 2	Illustrate the concept of various methods applied for monitoring of structures for structural safety.	**Understand**
CO 3	Interpret the importance of structural audit and assessment of health structures for the monitoring of structures.	**Understand**
CO 4	Recognize the importance of static tests and sensor systems for the safety of buildings.	**Apply**
CO 5	Demonstrate health monitoring of structures by using Dynamic Response Method.	**Apply**
CO 6	Outline piezo-electric materials and other smart materials for repair and rehabilitation of structures.	**Understand**

IV. SYLLABUS

UNIT-I	STRUCTURAL HEALTH	Classes: 09
Definition, Principles, significance of SHM, Factors affecting Health of Structures, Causes of Distress, Regular Maintenance.		
UNIT-II	**STRUCTURAL HEALTH MONITORING**	**Classes: 09**
Concepts, Use of Sensors, Building Instrumentation,Various Measures, Structural Safety in Alteration.		

UNIT-III	STRUCTURAL AUDIT AND STATIC FIELD TESTING	Classes: 09
Assessment of Health of Structure, Collapse andInvestigation, InvestigationManagement, SHM Procedures. State-of-Art damage identification and pattern reorganization methods. Types of Static Tests, Simulation and Loading Methods, sensor systems andhardware requirements, Static Response Measurement.		
UNIT-IV	**DYNAMIC FIELD TESTING**	**Classes: 09**
Types of Dynamic Field Test, Stress History Data, Dynamic ResponseMethods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.		
UNIT-V	**INTRODUCTION TO REPAIRS AND REHABILITATIONS OF STRUCTURES**	**Classes: 09**
Case Studies (Site Visits), piezo-electric materials and other smart materials, electro–mechanical impedance (EMI) technique,Adaptations of EMI technique.		
Text Books:		
1. Daniel Balageas, Claus_PeterFritzen, Alfredo Güemes , "Structural Health Monitoring" , John Wiley and Sons, 2006. 2. Douglas E Adams, "Health Monitoring of Structural Materials and Components_Methods with Applications", John Wiley and Sons, 200		
Reference Books:		
1. J. P. Ou, H. Li and Z. D. Duan , "Structural Health Monitoring and Intelligent Infrastructure", Vol1, Taylor and Francis Group, London, UK, 2006. 2. Victor Giurglutiu, "Structural Health Monitoring with Wafer Active Sensors", Academic Press Inc, 2007.		
Web References:		
1. http://nptel.ac.in/courses/112104160/3 2. http://nptel.ac.in/downloads/112104160/		
E-Text Books:		
1. https://books.google.co.in/books?id=DXOsGoqtiggC&printsec=frontcover#v=onepage&q&f=false. 2. https://www.researchgate.net/publication/273059503_Introduction_to_Structural_Health_Monitoring.		