

STRUCTURAL HEALTH MONITORING

I Semester: M. Tech (STE)								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BSTB07	Professional Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
<p style="color: blue;">COURSE OBJECTIVES:</p> <p>The course should enable the students to:</p> <ol style="list-style-type: none"> 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 <p style="color: blue;">COURSE OUTCOMES (COs):</p> <p>CO 1: Know the causes of Distress in structures, factors effecting structural health, need of regular maintenance of structures.</p> <p>CO 2: Understand the concept of structural health monitoring and various methods applied for monitoring of structures and structural safety</p> <p>CO 3: Understand the importance of structural audit and Assessment of Health Structure, Collapse and Investigation, Investigation Management, SHM Procedures</p> <p>CO 4: Know The Importance of Static field testing, Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement</p> <p>CO 5: Understand the Dynamic Field testing, stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition systems, Remote Structural Health Monitoring. Introduction to Repairs and Rehabilitations of Structures impedance (EMI) technique, Adaptations of EMI technique</p> <p style="color: blue;">COURSE LEARNING OUTCOMES (CLOs):</p> <ol style="list-style-type: none"> 1. Understand deterioration and distress in structures. 2. Identify the condition of structures. 3. Identify the type of deterioration and method of correction. 4. Understand the general causes of distress 5. Evaluate causes and prevention methods for structural health monitoring. 6. Understand the concepts for structural health monitoring. 7. Understand various measures in structural health monitoring. 8. Understand the safety of structures in structural health monitoring 9. Identify the importance of structural audit. 10. Analyze structural health monitoring 11. Analyze inspection and testing of concrete 12. Identify symptoms and diagnosis of distress 13. Understand the damage assessment 14. Understand the procedure of structural health monitoring. 15. Importance of Investigation Management. 16. Understand Simulation and Loading Methods in static field. 17. Understand the sensor systems in structural health monitoring. 18. Recognize the importance of Static Response Measurement. 19. Understand health monitoring of structures by Dynamic Response Method. 								

<p>20. Analyze Data Acquisition Systems in dynamic field testing methods. 21. Understand building instrumentation. 22. Recognize the behavior of sensors. 23. Understand piezo– electric materials and other smart materials in structural health monitoring.</p>		
UNIT-I	STRUCTURAL HEALTH	Classes: 09
<p>Definition, Principles, significance of SHM, Factors affecting Health of Structures, Causes of Distress, Regular Maintenance. Factors affecting Health of Structures, Causes of Distress, Regular Maintenance.</p>		
UNIT-II	STRUCTURAL HEALTH MONITORING	Classes: 09
<p>Concepts, Use of Sensors, Building Instrumentation, Various Measures, Structural Safety in Alteration.</p>		
UNIT-III	STRUCTURAL AUDIT AND STATIC FIELD TESTING	Classes: 09
<p>Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures. State-of-Art damage identification and pattern reorganization methods. Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement</p>		
UNIT-IV	DYNAMIC FIELD TESTING	Classes: 09
<p>Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.</p>		
UNIT-V	INTRODUCTION TO REPAIRS AND REHABILITATIONS OF STRUCTURES	Classes: 09
<p>Case Studies (Site Visits), piezo-electric materials and other smart materials, electro–mechanical impedance (EMI) technique, Adaptations of EMI technique</p>		
Text Books:		
<ol style="list-style-type: none"> 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, 2000 		
Reference Books:		
<ol style="list-style-type: none"> 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 Giurgutiu, “Structural Health Monitoring with Wafer Active Sensors”, Academic Press Inc, 2007. 		
Web References:		
<ol style="list-style-type: none"> 1. http://nptel.ac.in/courses/112104160/3 2. http://nptel.ac.in/downloads/112104160/ 		
E-Text Books:		
<ol style="list-style-type: none"> 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. 		