STRUCTURAL HEALTH MONITORING

(Professional Elective-I)

Course Code: 19CE2251	**L**	**P**	**C**
	3	**0**	**3**

The students will be able to:

CO 1. Understand the fundamentals of structural dynamic
CO2.Analyze the need and challenges of Structural Health Monitoring (SHM).
CO 3. Describe various methods of damage detection
CO 4. Apply the Structural Health Monitoring technique for building.
CO 5. Apply the Structural Health Monitoring techniques for bridge.

UNIT-I **(10-Lectures)**

NDT Evaluations : - Concrete strength assessment –Rebound hammer test – Ultrasonic pulse velocity tests, penetration resistance, pullout tests, core sampling and testing, chemical tests – carbonation, chloride, content and corrosion problem.
LO1 : Understand the procedure for strength assessment test.
LO2 : Understand the procedure for chemical attach tests.

UNIT-II **(10-Lectures)**

INTRODUCTION TO STRUCTURAL HEALTH MONITORING:

Factors affecting health of structures, SHM scheme, various steps in SHM, damage diagnostic methods, challenges in SHM, Experimental modal analysis, operational modal analysis and combined methods
LO1: Factors affecting SHM and schemes for SHM
LO2: Understand the challenges in SHM
LO3: Experimental modal analysis and operational modal analysis

UNIT-III **(10-Lectures)**

METHODS OF DAMAGE DETECTION:

Vibration Control & SHM Damage Diagnostic methods based on vibration response, Method based on modal frequency/shape/damping, Curvature and flexibility method, Modal strain energy method, Sensitivity method, Baseline-free method.
LO1: Learn the damage detection methods based on vibration
LO2: Apply the various techniques for damage detection in structures

UNIT-IV **(10-Lectures)**

HEALTH MONITORING SYSTEMS OF BUILDING STRUCTURES:

Numerical modeling– Use of sensors – Data acquisition techniques – Data Processing – Diagnostic techniques – Wireless sensor network – Rehabilitation techniques.

LO1: Learn the numerical modeling of buildings.

LO2: Understand sensors in SHM and data acquisition techniques.

UNIT-V **(10-Lectures)**

HEALTH MONITORING OF BRIDGES:

Measurement of Parameters, Sensors/Transducers technologies, Measurement & Health monitoring Techniques: Vibration signal analysis, Strain gage based Instrumentation, Destructive & Non-destructive testing, Load Test, etc.

LO1: Evaluate the measuring parameters,

LO2: Understand health monitoring techniques.

LO3 : Understand the suitability of various instruments used to extract the parameters.

Text books:

1. Charles R Farrar, and Keith Worden: Structural Health Monitoring: A Machine Learning Perspective, John Wiley & Sons , first edition, 2012-2013.

2. Nagayama, T. and Spencer Jr, B.F., 2007. Structural health monitoring using smart sensors.Newmark Structural Engineering Laboratory. University of Illinois at Urbana-Champaign.

References

1. Glisic, B. and Inaudi, D., 2008. Fibre optic methods for structural health monitoring. John Wiley &Sons.

2. Do, R., 2014. Passive and active sensing technologies for structural health monitoring. University of California, San Diego.