

OE5970: STRUCTURAL HEALTH MONITORING

Course content:

Structural Health monitoring: Introduction-Necessity of monitoring health of civil engineering and marine structures- Challenges in implementation of SHM scheme in real time scale- various factors that influence the implementation- issues concerning concrete and steel structures- advantages of SHM along with the long-term and short-term benefits, both in economic and safety perspectives. Static and vibration-based health monitoring- Long-term and short term monitoring- triggered monitoring- static and dynamic monitoring- shear model, lumped mass model- elemental modal stiffness- using modal strain energy- using Eigen characteristics Damage identification and assessment-Damage detection in linear systems- reliability of damage identification and detection- Mode shape analysis using signal processing- Mode shape curvature- Statistical pattern recognition-crack detection Sensor technologies used in SHM- Embedded and ultra-sonic sensors- sensor technologies for civil and marine structural Structural Health monitoring: Introduction-Necessity of monitoring health of civil engineering and marine structures- Challenges in implementation of SHM scheme in real time scale- various factors that influence the implementation- issues concerning concrete and steel structures- advantages of SHM along with the long-term and short-term benefits, both in economic and safety perspectives. Static and vibration-based health monitoring- Long-term and short term monitoring- triggered monitoring- static and dynamic monitoring- shear model, lumped mass model- elemental modal stiffness- using modal strain energy- using Eigen characteristics Damage identification and assessment-Damage detection in linear systems- reliability of damage identification and detection- Mode shape analysis using signal processing- Mode shape curvature-Statistical pattern recognition- crack detection Sensor technologies used in SHM- Embedded and ultrasonic sensors- sensor technologies for civil and marine structural systems- sensor layout and details of SHM scheme- component-level monitoring- wireless sensor networking. Non-destructive evaluation-Visual inspection- condition assessment- methods of NDT and NDE tools- NDE evaluation and correctness assessment Case studies of deployment of SHM- case-studies of SHM deployment in offshore structures in Lab scale- WSN design and reliability assessment- use of Artificial Intelligence in health monitoring- case study of real-time monitoring of Railway bridge in Rome, Heritage building in Siracusa, Italy

Text books:

1. Daniel Balageos, Clauss-Peter Fritza, and Alfredo Guemes. 2013. Structural Health monitoring, ISTE, U.K.
2. Wieslaw Ostachowicz and Alfredo Guemes. New trends in Structural Health Monitoring. Springer

Reference Books:

1. Madsen, HO, Krenk, S. and NC Lind, NC. (2006). Methods of structural safety, Dover.
2. Chandrasekaran, S. 2016. Offshore structural engineering: Reliability and Risk Assessment, CRC Press, Florida.
3. Chandrasekaran, S, and A.K.Jain. 2016. Ocean structures: Construction, Materials, and Operations, CRC Press, Florida..
4. Srinivasan Chandrasekaran. 2018. Structural Health Monitoring, Video course under MOOC, NPTEL portal https://onlinecourses.nptel.ac.in/noc18_oe05/preview

Prerequisite:

Consent of teacher