

Course syllabus

Department of Civil Engineering, Indian Institute of Technology Madras

CE7710 - ADVANCED STRUCTURAL DYNAMICS

Credit Distribution: C:9 L:3 T:0 P:0 E:0 O:6 TH:0

Course Type: Theory

Description: The course aims to develop knowledge of various aspects of structural dynamics applications in civil engineering

Course Content: 1. Computational Structural Dynamics: Numerical solution of equations of motion by modal superposition principles, convolution and time step integration; Extraction of natural frequencies and modes by subspace iteration, Lanczos method; Complex modes, Frequency domain approaches, Fast Fourier transforms, Modal synthesis in Frequency domain, sub structuring techniques, general dynamic reduction, Guyan reduction. Examples and case studies. 2. Wave Propagation: In one and two dimensions, Applications to civil engineering problems; dynamics of a mass on elastic half-space; dynamic soil structure interaction, application to seismic response of buildings. 3. Multi supported base excited systems: Mathematical formulation, Seismic applications in building and bridges 4. Other topics: Dynamic response of liquid storage tanks; Wind induced vibration of structures; Design for extreme dynamic loads such as impact, blast and seismic loading; Non-linear vibration.

Textbooks: NIL

Reference Books:

1. Humar, J.L., Dynamics of Structures, 3rd Ed., CRC Press, 2012.
2. Chopra, A.K., Dynamics of Structures: Theory and Applications to Earthquake Engineering, Prentice Hall, 2001.
3. Craig, R.R., Kurdila, A.J. and Craig, R.R., Jr., Structural Dynamics: Introduction to Computational Methods, John Wiley & Sons, 1982.

Prerequisite: NIL

Prepared in January 2021