Indian Institute of Technology
Course Details Report

Course No: OE3017

Course Name: Dynamics of marine structures

Course Type:

Theory

Description:

This course introduces basic knowledge of structure dynamics of single degree of freedom, multi degree of freedom and continuous systems as applied to marine applications

Course Content:

Equations of motion, D'Alembert's principle. Analysis of single degree of freedom systems (free and forced), Dynamic amplification factor and resonance, Viscous and structural damping, Impulse response system, Time & Frequency domain methods, Duhamel integral, Vibration isolation, Concept of Lagrange.

- Derivation of equation of motion for MDOF system based on energy technique, Modes of vibration, Normal modes, Natural frequencies, modal Participation factor, orthogonality applications, forced vibration using eigen functions expansions, concept of condensing the modes.
- Random vibrations: Concept of random vibration, corelation coefficient, autocorrelation, power spectral density function, frequency domain analysis of SDOF and MDOF system.
- Continuous systems: Vibration of cables, bar and beam – Sources of vibration – propeller excited, wave-induced and machinery, Hull girder vibration.
- Dynamic effects of earthquake, wind and moving loads, vehicular impacts. Calculation procedure for torsional vibration of propulsion systems – empirical methods. Wave load calculation on offshore fixed and flexible structure.
- Approximate methods, Rayleigh's quotient, Rayleigh Ritz and Galerkin methods.
- Example problems

Text Books:

1. L Meirovitch 1997, Principles of techniques of vibration, Prentice Hall, NJ
2. A K Chopra 2007, Dynamics of structures, Pearson Education India.
3. R W Clough and J Penzien 2015, Dynamics of Structures, CBS Publishing; 2nd edition.
4. S. S. Rao 2019, Vibration of Continuous Systems, Wiley-Blackwell. 5. E. V Lewis 1990, Principles of Naval Architecture, SNAME

Reference Books:

1.
L Fryba 2012, Vibration of solids and structures under moving loads, Springer
2.
R. D. Blevins 2006, Flow-Induced Vibration, Krieger Publishing Company
3.
M.Y.H. Bangash 2009, Shock, Impact and Explosion: Structural Analysis and Design, Springer.
4.
J. P. Den Hartog 1985 Mechanical Vibrations, Dover
5.
L. Meirovitch 2007, Methods of Analytical Dynamics, Dover.
6.
L D Lutes and S Sarkani, “Random Vibrations”, Elsevier Butterworth, Burlington, USA, 2004