Indian Institute of Technology
Course Details Report

Course No: OE5600

Course Name: Advanced Wave Dynamics

Course Type:

Theory

Description:

This course introduces various approaches to describe the random nature of ocean waves. The focus will be on characterization of various sea types. The course would deal with stationary processes before moving on to non-stationary processes. The linear wave analysis will include both long crested and short crested sea states. Salient nonlinear spectral analysis will also be taught.

Course Content:

Introduction to wave generation, SMB and CEM approaches of wave estimation.
Elements of probability theory and random processes - Sea as a stationary random process – Description of random sea waves – Statistical and Spectral analysis - Short term and Long term wave statistics – Directional Spectra – Design wave spectrum – Extreme value prediction.
Non-stationary waves: Wavelet transforms and principal component analysis; Univariate and multivariate spectral analysis of signals; Hilbert transform; Bi-spectral analysis of nonlinear waves.
Laboratory wave simulation, measurement & analysis: Wave groups, Breaking waves, Stokes 2nd order & Shallow water waves such as Cnoidal and Solitary waves.
Multi-Directional waves – simulation and analysis using Fourier Method, MLM & MEM – single point measurement and array of gauges.

Text Books:

1. Y.Goda, Random Seas and Design of Maritime Structures, World Scientific Publishing Company, 2010. ISBN 10: 9814282405.

Reference Books:

1. Chakrabarti S K: Offshore Structure & Modeling, World Scientific, 1994.
2. Ochi M K.: Ocean Waves - The Stochastic Approach- Cambridge University Press, 1998.