401008 MECHANICS OF WAVES

(ELECTIVE IV-OPEN ELECTIVE)

Teaching scheme:
Lecture: 4 Hrs/week

Examination Scheme:
Paper : 100 Marks
Duration : 3 Hrs.

Unit 1

Introduction, Generation, Decay, Classification, Measurement, Wave Forecasting: The Significant Wave, Simplified versus Elaborate Technique, Simplified Methods- SMB method, Hasselmann method, Darbyshire and Draper's Technique, Forecasting in Hurricanes, Numerical Wave Modeling (introduction only, no mathematical treatment): Phase resolving models, Phase averaging models

Unit 2: Wave Theories

Basic hydrodynamic equations, wave theories - Linear wave theory, Finite amplitude wave theories (introduction only, no mathematical treatment): Stokes, wave theory, Cnoidal wave theory, Solitary wave theory, Dean stream function theory, Trochoidal wave theory, Non-linear versus linear wave theory, Choice of wave theory

Unit 3: Random waves

Wave spectrum analysis, wave spectra and statistics, Theoretical spectra: Pierson-Muskowitz Spectrum, Bretschneider Spectrum, JONSWAP Spectrum, Scott Spectrum, Scott-Wiegel Spectrum

Wave statistics: Short term wave statistics, Tucker method, Long term wave statistics- Gumbel distribution, Weibull Distribution, Log Normal Distribution, Fretchet Distribution, Upper bound Type III u distribution,

Long Term Distribution of Individual Wave Heights

Unit 4: Wave propagation

Wave shoaling, wave refraction, wave diffraction, wave reflection, combined effects using numerical solutions, wave breaking, wave set up and set down, wave runup

Unit 5: WAVE FORCES ON SHORE-BASED STRUCTURES

Forces on Vertical Faced Structures: Non- breaking wave forces, breaking wave forces, forces by broken waves, forces on Seaward structures, forces on landward structures, oblique wave attack

Forces on sloping face structures: Single rubble mound, composite breakwater

Unit 6: WAVE FORCE ON SMALL DIAMETER MEMBERS

The Morison's equation, Total Wave Force On The Entire Member Length, Wave Forces Using Stokes (V) Theory, Calculation Of Wave Forces Using Dean's Theory, Wave Force On Inclined Members (introduction only-rigorous mathematical treatment to be avoided), Wave Slam, Limitations of the Morrison's Equation

Books:

Sarpkaya, T., Issacson, M. (1981). "Mechanics of Wave Induced Forces on Offshore Structures", Van Nostrand Reinhold.

U.S. Army Corps of Engineers. (2002). "Coastal Engineering Manual", U.S. Army Corps of Engineers, Washington, D.C.

WMO. (1988). "Guide to Wave Analysis and Forecasting", Pub. NO. 702, World Meteorological Organization, Secretariat of WMO, Geneva.

Dean, R. G., Darlymple R. A. (1991). "Water Wave mechanics for Engineers and Scientists", World Scientific

Sorensen, R. M. (1997). "Basic Coastal Engineering", Springer