OE 5030: WAVE HYDRODYNAMICS

Course Content:

Conservation of mass, moment and Energy. Euler Equation – Bernoulli's Equation. Potential and Stream function. Classification of Ocean Waves. Linear wave theory: Governing Equation, Boundary Conditions and solutions, Dispersion relation, Constancy of wave period. Wave Kinematics : Wave celerity, water particle velocities, accelerations, displacements and pressures. Approximations for deep and shallow water conditions. Integral properties of waves: Mass flux, Energy and energy flux, Group speed, Momentum and momentum flux. Wave Transformations: Shoaling, bottom friction and damping, refraction, reflection and diffraction. Wave Breaking: Type of breaking, Surf similarity parameter. Keulegan-Carpenter number, Ursell Parameter, Scattering parameter, Reynolds Number. Wave Loads: Non breaking wave forces on slender structures – Morison equation; Diffraction theory, source distribution method-Introduction to non-linear wave theories-Strokes, Cnoidal and Solitary wave theory. Mass transport velocity. Introduction to Random waves both spectral and statistical approaches -and directional waves.

Laboratory:
1. Wave Length, Profile and group velocity;
2. Wave profile trajectories – progressive and standing waves.
3. Pressure variations as a function of wave height, water depth and wave period.
4. Wave reflections.
5. Force measurements.

Text Books:

1. **Ippen, A.T.,** Estuary And Coastline Hydrodynamics, Mcgraw-Hill Book Company, Inc., New York, 1978
2. **Dean, R.G. And Dalrymple, R.A.,** Water Wave Mechanics for Engineers and Scientists, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1991
3. **Sarpkaya, T. And Isaacson, M.,** Mechanics Of Wave Forces On Offshore Structures, Van Nostrand Reinhold Co., New York, 1981.

Reference books:

1. **Shore Protection Manual Volume I And II**, Coastal Engineering Research Centre, Dept, Of The Army, Us Army Corps Of Engineers, Washington Dc, 1984
2. **Weigel, R.L.**Oceanographical Engineering, Prentice Hall Inc, 1982
3. **Sorenson, R.M.**, Basic Coastal Engineering, A Wiley-Interscience Publication, New York, 1978.
4. **Sarpkaya, T. And Isaacson, M.,** Mechanics Of Wave Forces On Offshore Structures, Van Nostrand Reinhold Co., New York, 1981.
5. **Sundar.V.**, Ocean Wave Mechanics-Applications In Marine Structures, Ane Books Pvt Ltd, 2016.
6. **Sorenson, R.M.,** Basic Coastal Engineering, A Wiley-Interscience Publication, New York, 1978.

Prerequisite:

Nil