ORE 607 Water Wave Mechanics

Designation
Core Course

Catalog Description
Governing equations in free surface flow, deterministic and probabilistic wave theories, wave transformation, wave-induced coastal currents, tides, ocean engineering operational sea state, and design wave criteria. Pre. Consent.

Prerequisites by Topics
Differential equations
Fluid mechanics

Textbooks
None

Reference books
1. *Coastal Engineering Manual* - Version 1.02*,* US Army Corps of Engineers.
2. *Water Wave Mechanics for Engineers and Scientists*, by R.G. Dean and R.A. Dalrymple, World Scientific Publishing Company, 1991.
3. *Handbook of Coastal and Ocean Engineering*, Vol. I, II, and III, Edited by John Herbich, Gulf Publishing Company, 1990.

Course Objectives
To familiarize students with water wave mechanics for ocean structure design and the use of measured and synthesized data to define operating and design wave conditions.

Topics Covered
1. Wave Theories. Linear, Stokes second-order, first and second-order cnoidal, solitary, and stream-function wave theories.
2. Wave Transformation. Shoaling, refraction, diffraction, reflection, breaking, and runup on beaches.
3. Random Seas. Uni-directional and directional wave spectra, Rayleigh distribution, scatter diagram, normal and extremal distributions.
4. Operational and Design Criteria. Winds, wave hindcasting and forecasting, tides, hurricane waves, storm surge, wave setup, design wave conditions and water level.
5. Wave Induced Coastal Currents. Radiation stress, harbor oscillation, cross-shore and long-shore currents.

Assessment
1 assignment and 3 design projects (50%)
Class participation (10%)
Final Exam (40%)

Usage of Engineering Tools and Computers
Automated Coastal Engineering System (ACES), Coastal Engineering Manual (CEM), Excel, and Matlab

Schedule
Two 1.25-hour sessions per week.

Contribution to Professional Component
Engineering Science: 2 credits
Engineering Design: 1 credit

Relationship to Program Outcomes
Program Outcome 2: Basic science, mathematics, & engineering
Program Outcome 3: Ocean engineering core
Program Outcome 5: Use of latest tools in ocean engineering
Program Outcome 6: Problem formulation & solution

Prepared by
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