

1. Course number and title  
ORE 607 Water Wave Mechanics
2. Credits and contact hours  
3 credits, two 1.25-hour sessions per week.
3. Instructor's or course coordinator's name  
Justin Stopa
4. Textbooks  
Textbooks: None  
Reference books:
  - a. Coastal Engineering Manual – Part II, US Army Corps of Engineers, 2006 (PDF: <http://chl.erdc.usace.army.mil>).
  - b. Water Wave Mechanics for Engineers and Scientists, by R.G. Dean and R.A. Dalrymple, World Scientific Publishing Company, 1991.
  - c. Ocean Surface Waves: Their Physics and Prediction, by S.R. Massel, World Scientific Publishing Company, 1996.
  - d. Waves in Oceanic & Coastal Waters, by LH. Holthuijsen, Cambridge University Press, 2007.
  - e. Automated Coastal Engineering System, US Army Corps of Engineers, 1993.
5. Specific course information
  - a. Course content: Governing equations in free surface flow, deterministic and probabilistic wave theories, wave transformation, wave-induced dynamics, tides, ocean engineering operational sea state, and design wave criteria.
  - b. Prerequisite:
    - i. Differential equations
    - ii. Fluid mechanics
  - c. Designation: ORE required core course
6. Specific goals for the course
  - a. Specific learning outcomes include:
    - i. Understanding of kinematics, dynamics, propagation, transformation, and statistical properties of water waves.
    - ii. Ability to apply knowledge of mathematics, water wave theories, and mechanics to formulate and solve practical water wave problems in engineering design.
    - iii. Knowledge of historical development and the latest research in water wave mechanics.
  - b. Student outcomes: (1) Fundamentals. (2) Core program. (3) Option Area. (4) Problem Formulation. (6) Communication. (8) Teamwork. (9) Research and experimentation.
7. Brief list of topics to be covered
  - a. Wave Theories - linear, Stokes second-order, first and second-order cnoidal, and stream-function wave theories.
  - b. Wave Transformations - shoaling, refraction, diffraction, reflection, breaking, and runup.
  - c. Random Seas - uni-directional and directional wave spectra, Rayleigh distribution, scatter diagram, normal and extremal distributions.
  - d. Operational and Design Criteria - winds, wave hindcasting and forecasting, tides, tropical cyclone waves, storm surge, wave setup, and design wave conditions and water level.

- e. Data sources - spectral wave evolution, observations from buoys, satellites, and other in-situ sensors, and wind and wave reanalysis.