CE 599: Shallow Water Hydrodynamics

Instructor

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Topics

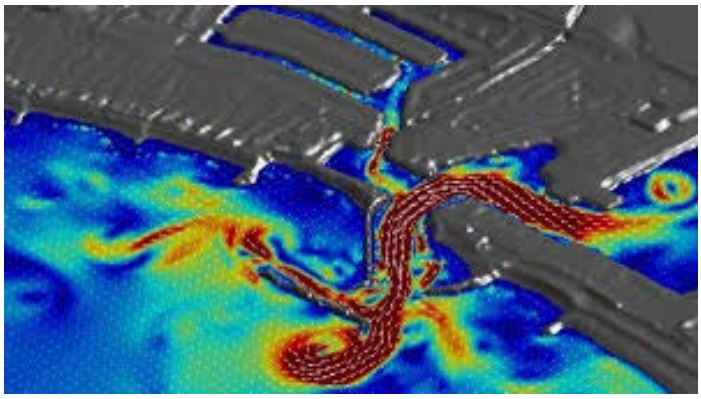
Mechanics of wave motion; linear and nonlinear long wave theories; small parameter perturbation approaches for approximate equation models; wave evolution in variable depths; nearshore waves and circulations; nearshore instabilities; long wave and coastal numerical modeling

Textbook

Dean, R. G. and Dalrymple, R. A., Water Wave Mechanics for Engineers and Scientists
Additional assigned readings from published research literature

Grading

Midterm (30%), Homework (30%), Final Exam (40%)



CE 599 Shallow Water Hydrodynamics

Week 1:
Introduction and review of governing equations. Scaling the boundary value problem for water waves. Inviscid irrotational flow. Linearized, free surface motion.

Week 2:
The basic linear wave in constant depth; one horizontal dimension. Solutions by superposition.

Week 3:
Long wave theory. Introduction to perturbation methods for nonlinear problems.

Week 4:
Weakly dispersive shallow water waves. Boussinesq and Korteweg-deVries equations. Solitary and cnoidal waves. Kadomtsev-Petviashvili equation and short-crested waves.

Week 5:
Evolution of shallow water waves in variable depth. Evolution of the spectral wave field.

Week 6:
Waves, currents, wave-averaging - basic concepts. Wave-averaged equations for mean flows:

Week 7:
Wave breaking

Week 8:
Cross-shore momentum balance - setup, undertow.

Week 9:
Long-shore momentum balance - longshore current.

Week 10:
2D horizontal flows - rip currents, beach cusp circulation.

Week 11:
Instability of the longshore current - shear waves.

Week 12:
Coastal Modeling: 2D

Week 13:
Coastal Modeling: 2.XD

Week 14:
Coastal Modeling: 3D

Statement for Students with Disabilities
Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

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