CEE 514 Coastal Engineering (Fall 2010, 3 Credits)

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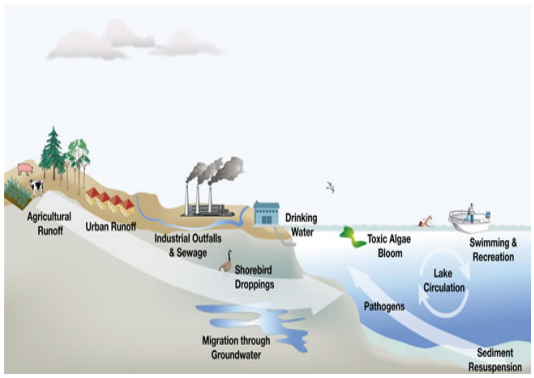
Course website:
http://www.cae.wisc.edu/~chinwu/CEE514_Coastal_Engineering/CEE514_UW_Madison.html
Class: MWF, 11:00 ~ 11:50 A.M., 1209 Engineering Hall
Office Hour, M & F: 12:00-1:00 P.M., or appointment at 1269D Engineering Hall

Description

This course is designed to introduce the *analysis*, *application*, and *design* used in the field of coastal engineering. We will cover several topics including coastal water level fluctuations, water waves, coastal processes, coastal structures, and coastal development/management. In this class we will learn physical processes that are important for coastal environment and apply engineering principles to solve the coastal engineering issues such as coastal flooding, shoreline erosion, navigation sedimentation, water quality pollution, and coastal habitat evanescence.



Outline

- **Introduction** – coastal engineering, environment, problems, resources
- **Coastal water level fluctuations** - storm surge, tides, seiches, seasonal and long-term fluctuations
- **Linear water waves** - kinematics, pressure, wave energy and power, group celerity
- **Irregular waves** - wave statistics and spectral analysis
- **Wind-generated waves** - wave hindcasting and forecasting
- **Wave transformations** - shoaling, refraction, diffraction, breaking, reflection, wave runup
- **Coastal structures** - forces, revetment, bulkhead/seawall, groin, and breakwater
- **Coastal processes** - cross shore and longshore currents, sediment transport, beach response and profiles
- **Engineering design and risk analysis**
- **Coastal management**

Tentative Schedule for Fall 2010, CEE 514 Coastal Engineering

Chapter 1: Introduction – (see Text S Chapter 1 and webpage)
Coastal engineering, environment, problems, resources

Chapter 2: Coastal water level fluctuations (see Text S Chapter 5 and Handouts, webpage)
Introduction, tides, Storm surges, seiches

Chapter 3: Linear water waves – (see Text S Chapter 2 and Handouts)
Introduction, small amplitude wave theory, wave classification
properties (kinematics, pressure, wave energy and power, group celerity)

Laboratory Measurements

Chapter 4 Irregular & Regular waves (see Handout Chapter 6)
Short-term and long-term wave analysis

Mid-term In-class or take home exam

Chapter 5 Wind-generated waves (see Text S. Chapter 6)
Wave hindcasting and forecasting

Field Measurements

Chapter 6 Wave transformations (see Text. S Chapter 4, Handouts)
Shoaling, refraction, breaking, reflection,
diffraction, wave runup, wave setup and setdown

Chapter 7 Coastal structures (see Text. S Chapter 7 and Handouts)
Forces, revetment, bulkhead/seawall, groin, and breakwater

Field Trip to Coastal Area (Milwaukee, Chicago, Duluth, Green Bay)

Chapter 8 Coastal processes – (see Text. S Chapter 8 and Handout)
Cross shore and longshore currents, sediment transport, beach response and profiles
Shoreline erosion/ Bluff erosion

Chapter 9 Engineering design and risk analysis (invited speaker)
Risk of flooding, Probability of flooding and storm events, Coastal design

Chapter 10 Wisconsin Hazard Mitigation/Coastal Management (Handout, invited speaker)
Wisconsin Coastal Zone Management

Project Presentations on Dec. 13 & 15 (Night)

Text

- Sorensen, RM (2006), Basic Coastal Engineering, 3rd Edition, Springer

References:

- Coastal Engineering Manual Outline, USACE, 2006: http://chl.erdc.usace.army.mil/cemtoc
- Kamphuis, JW (2000), Introduction to Coastal Engineering and Management, World Scientific Publishing
- Keillor,JP (1998), Coastal Processes Manual, University of Wisconsin Sea Grant Institute

Course Grade

- Homework: 50% (You can download at the web: http://courses.engr.wisc.edu/ecow/get/cee/514/wu/)
- Midterm: 20%
- Final Project: presentation 15%, and web page 15%

Possible Topics of the Final Project

- Energy generation by offshore wind farming or innovative devices
- Global warming and climate change in Great Lakes!
- Online (web) water level or wave in Madison lakes
- Sediment budget in Little Sand Bay in Lake Superior
- Rip currents in Great Lakes
- Storm surge forecasting – wind, water level, and waves
- Tsunami generation and run-up
- Wave barrier design and evaluation
- Wind wave measurements using modern instrument
- Wetland restoration in Cherokee Marsh – Coastal Engineering viewpoint

Other possible topics ~ let's discuss your ideas!