CEE 788/888
Coastal Hydrodynamics and Sediment Processes
Fall 2017

Instructor: Dr. Navid Tahvildari
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Lectures: W 7:10-9:50 pm Room: Goronto 221

Office Hours: By appointment

Course Description:
This course discusses the hydrodynamics in the nearshore environment and the impacts of coastal forces on sediment transport. The specific topics to be covered include water waves (review of linear wave theory, wave transformation, wave dissipation mechanisms, nonlinear properties of waves, wave-averaged motions, radiation stresses, wave setup), tides, storm surge, nearshore circulation (longshore current, undertow, and rip currents), low frequency motions, and the impacts of these forces on sediment transport (fluid-sediment interaction, wave and current boundary layers, modes of sediment transport, longshore and cross-shore sediment transport, beach evolution, equilibrium beach profile). An introduction to wave processes over cohesive sediments, and field studies and data analysis techniques will also be discussed.

Learning Objectives:
- Define key processes in the coastal environment
- Formulate linear wave propagation in the nearshore
- Define tides and storm surge
- Describe field methods and analysis techniques
- Describe fluid-sediment interaction
- Categorize the modes of sediment transport
- Formulate wave and current boundary layers, and wave-induced motions that affect sediment transport
- Apply cross-shore and longshore sediment transport formulations to predict beach evolution

Primary References:
(A) *Coastal Processes with Engineering Applications,* Robert G. Dean and Robert A. Dalrymple, 2004, Cambridge University Press.
(B) Class Notes

Additional References:
(C) *Beach Processes and Sedimentation* (*2nd Edition*), Paul D. Komar, 1997
(D) *Coastal Bottom Boundary Layers and Sediment Transport,* Peter Nielsen, 1992, World Scientific.
(E) *Mechanics of Coastal Sediment Transport,* Jørgen Fredsøe and Rolf Deigaard, 1992, World Scientific.
(F) *Introduction to Nearshore Hydrodynamics,* Ib A. Svendsen, 2006, World Scientific.

(G) *Water Wave Mechanics for Engineers and Scientists*, Robert G. Dean and Robert A. Dalrymple, 1991, World Scientific.
(H) *Coastal Engineering Manual*, 2008, U.S. Army Corps of Engineers.

Lecture Notes:
Notes and other course materials will be available on Blackboard: www.blackboard.odu.edu

Prerequisites: Fluid Mechanics, Engineering Mathematics

Homework:
- Four homeworks will be assigned and will be due two weeks after assignment.
- Refer to the file entitled "CEE Department Homework Format" for general guidelines on how to properly prepare your homework.
- Late homework will have a 10% penalty each day after the due date and will not be graded after three days.
- Completed assignments must be submitted to Blackboard in **PDF format**. Spreadsheets or codes should not be submitted and will not be graded.
- Group work is accepted but blind copying is not allowed.

Exams:
A mid-term and a final exam will be given in class for on-campus students and will be administered by proctors for distance learning students.
Note to distance students: Look for an email from the Center for Learning and Teaching regarding the process of designating a proctor.

CEE 888 Project:
Ph.D. students should register in CEE 888 and are required to complete a term project. Refer to Project Guidelines for details.

Course Grade:
CEE 788 students: Homework 30%, Mid-term exam 30%, Final exam 40%
CEE 888 students: Homework 20%, Term project 20%, Mid-term exam 25%, Final exam 35%

Tentative Course Outline:

Wk	Date	Topics	Text
1	Aug. 30	Introduction to coastal processes, Examples of coastal engineering projects, Coast classification, Overview of beach profile and planform evolution	A(1)
2	Sep. 6	Long- and short-term processes, Tides, Storm Surge	A(3), B
3	Sep.13	Review of linear wave theory, Wave transformation, Wave breaking, Random waves	A(5), B
4	Sep.20	Wave-averaged motions, Radiation stresses, Wave setup	A(5), B
5	Sep.27	Longshore currents, Undertow	A(5), B
6	Oct. 4	Nearshore circulation, Rip currents, Low frequency motions	A(5),

			B
7	Oct. 11	Field measurement techniques, Data analysis methods	A(6)
	Oct. 18	**Mid-term Exam, in Class**	
8	Oct. 25	Sediment characteristics, Fluid-sediment interaction	A(2)
9	Nov. 1	Basic concepts of sediment transport, Bed load formulations, Suspended load transport	B
10	Nov. 8	Wave Boundary layers, Combined wave and current boundary layers, bed forms	B
11	Nov. 15	Cross-shore sediment transport, Closure depth, Equilibrium beach profile	A(7)
12	Nov. 22	Thanksgiving Holiday- **NO CLASS**	A (8)
13	Nov. 29	Longshore sediment transport, Planform evolution, Models for longshore sediment transport, Introduction to cohesive sediments	
14	Dec. 6	Review, CEE 888 Final Project Presentations (if applicable)	
15	Dec. 13	**Final Exam 7:00-10:00 pm**	

Americans with Disabilities Act (ADA) Policy Statement

Old Dominion University is committed to ensuring equal access to all qualified students with disabilities in accordance with the Americans with Disabilities Act. The Office of Educational Accessibility (OEA) is the campus office that works with students who have disabilities to provide and/or arrange reasonable accommodations. If you experience a disability which will impact your ability to access any aspect of my class, please present me with an accommodation letter from OEA so that we can work together to ensure that appropriate accommodations are available to you. If you feel that you will experience barriers to your ability to learn and/or testing in my class but do not have an accommodation letter, please consider scheduling an appointment with OEA to determine if academic accommodations are necessary. The Office of Educational Accessibility is located at 1021 Student Success Center and their phone number is (757)683-4655. Additional information is available at the OEA website: http://www.odu.edu/educationalaccessibility