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Web page with information and assignments
<http://www.coastal.udel.edu/faculty/jpuleo/Jack-Puleo.html>
and click on Courses

CIEG 680 LITTORAL PROCESSES (3 Credits)
Spring 2008

Class: Colburn Lab (CLB) 104 T,TH 2:00-3:15

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| Instructor: Dr. Jack Puleo |
| Ocean Engineering Lab 203 |
| 831-2440 jpuleo@coastal.udel.edu |
| Office Hours: M,W 0900-1000a Or just about any other time door is open |
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Required Text: Coastal Processes With Engineering Applications, Robert G. Dean and Robert A. Dalrymple, Cambridge University Press, 2002, ISBN:052160275

Recommended Text: Beach Processes and Sedimentation, 2nd Edition, Paul D. Komar, Prentice Hall, 1998, ISBN 0137549385 (a great book to have in your collection)

Course Description: The course describes processes occurring near the coastline with an emphasis on the response due to hydrodynamic forcing. While some hydrodynamics are covered, the course will only skim over linear wave theory and other hydrodynamic phenomena that you have already had or will see in your other classes. Specific topics to be covered include: sediment characteristics, long-term processes, field measurement techniques, equilibrium beach profiles, cross-shore and alongshore sediment transport, morphodynamics, beach nourishment, inlets and littoral barriers.

Course Objectives:

When you complete this course, you will be able to:

- a. Describe sediment characteristics, statistics and variability in grain size temporally, in the cross-shore and along the beach.
- b. Discuss long-term processes related to beach profile development and shoreline classification including barriers and spits.
- c. Discuss the morphological response to nearshore currents and low frequency motions at the shoreline.
- d. Describe field techniques that are used to measure the beach profile and planform variability over time.
- e. Perform even-odd analysis near coastal barriers to determine background versus barrier effect on planform shape.
- f. Perform EOF analysis on time-sequenced beach profiles to determine dominant modes of variability.
- g. Discuss equilibrium beach profiles: What processes govern the profile shape and the equations describing the profile. What processes govern beach slope?

- h. Discuss incipient sand motion and closure depth, the factors that control the magnitude of longshore and cross-shore sediment transport, and sediment transport related to hydrodynamic boundary layers
- i. Describe the processes that may be responsible for various morphologic features including sediment build up near structures, crenulate bays, beach cusps and sand bars.
- j. Discuss the effects of beach nourishment, variability on beach width, impact of hard engineering structures on the beach and morphology associated with tidal inlets.

What we will try to cover (OUTLINE):

Chapter 1: Overview

Chapter 2: Sediment Characteristics

Chapter 3: Long-Term Processes

Chapter 5: Waves and Wave-Induced Hydrodynamics (brief but necessary)

Chapter 6: Field Measurement Techniques and Analysis

Chapter 7: Equilibrium Beach Profiles

Chapter 8: Sediment Transport (and Boundary Layers)

Chapter 9: Miscellaneous Coastal Features

Chapter 11: Beach Fill and Soft Engineering Structures

Chapter 12: Hard Engineering Structures

Chapter 13: Tidal Inlets

(We won't have time to go into great detail in the latter few chapters)

GRADING

I believe you learn more by doing

“I hear, I forget. I see, I remember. I do, I understand.”

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| Midterm exam: | 25% |
| Final exam: | 30% |
| Homework: | 25% |
| Paper: | 20% |

Homework: Assigned weekly and generally consisting of problems from the textbook.

Homework will be returned in a timely manner giving you a quick assessment.

Paper: You are required to write a review paper on a topic of your choice. The paper does not need to be extremely lengthy but should give a good overview of the topic. Some possible topics include those below, but if there is something else you wish to write about please ok it with me first. **You must tell me your topic by March 11, 2008.**

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| Coastal erosion due to major storms | Sea cliff erosion | Origin of barrier islands |
| Use of beach sand composition to trace movements | Gravel beaches | Tidal inlets and processes |
| Beach placers | Sea level rise | Tsunami (general, recent, or prehistoric events in pacific northwest or other locale) |
| Wave runup | Littoral transport and its prediction | Erosion due to jetty construction |
| Computer models of shoreline change | Longshore sediment sorting | Factors affecting beach face slope |
| Equilibrium beach profiles | Cross-shore sediment sorting | Beach profile response due to water level variations |
| Video techniques to study beaches and bars | Origin of beach cusps | Large scale shoreline features |
| Origin of crescentic sand bars | Origin and maintenance of sand bars | Beach nourishment |
| Groins | Wave formed ripples | Sea walls |

COURSE POLICIES

- a. Environment: The course will consist of an energetic, non-threatening environment where students will be called upon frequently. Questions and discussion are encouraged. That is how you learn.
- b. Attendance: You are responsible for material presented in class. You will do poorly in this class if you do not attend. Make every effort to be there.
- c. Classroom Procedures:
 1. Please come to class on time. Late arrivals disrupt the class.
 2. I will make every effort to have Learning Objectives for the day posted. It is my intention to make sure you will be able to meet those objectives by the end of class.
- d. Neatness: Anything you turn in is a reflection of you. Please make sure it is neat. Sloppy work will be returned ungraded. The forward thinking student realizes that these course notes and homework should be organized and retained for future use.
- e. Study Groups: "Safety in Numbers". I encourage the use of study groups for homework and exams. I do not mind if you do homework assignments together as long as each person turns in their own work. Carbon copies of an assignment will garner suspicion.

- f. Field trip: We will have a weekend field trip sometime in the spring to be lead by myself or Tony Pratt of DNREC. We will take a walk from the southern beaches up to Cape Henlopen. During this trip, we will try our hand at profiling and look at effects of structures on the beach and the recent nourishment at Rehoboth.

SYLLABUS (TENTATIVE)

| WEEK | LECTURE # | TOPICS | READING |
|----------------------------|---------------------|---|--------------------------|
| Week 1 (2-12, 2-14) | L1 | Overview and Terminology | DD chap1 |
| | L2 | Sediment characteristics | DD chap2 |
| Week 2 (2-19, 2-21) | L3 | Grain sorting on beaches | Komar 56-65 |
| | L4 | Long-term processes | DD chap3 |
| Week 3 (2-26,2-28) | L5 | Tides and linear waves | DD chap4 Komar chap4 |
| | L5a | Linear waves | DD chap5 Komar chap5 |
| Week 4 (3-4, 3-6) | L6 | Wave processes and other motions | DD chap5 Komar chap8 |
| | L7 | Longshore and cross-shore currents | DD chap 6 Komar chap7 |
| Week 6 (3-11, 3-13) | L8 | Field techniques, beach profile measurements, sediment continuity | DD chap 6 |
| | L9 | EOF's and even-odd analysis | |
| Week 7 (3-18, 3-20) | L10 | Constructive and destructive forces, Equilibrium Beach Profiles (EBP) | DD chap7 Komar chap 7 |
| | L11 | EBP | DD chap7 |
| Week 7 (3-25, 3-27) | MIDTERM EXAM | | |
| | L12 | MOVIE: "The Beach: A River of Sand" | Popcorn |
| Week 8 Spring break | | | |
| Week 9 (4-8, 4-10) | L13 | Refinements and Applications of EBP, Bruun rule | DD chap7 |
| | L14 | Boundary Layers | |
| Week 10 (4-15, 4-17) | L15 | Incipient motion, depth of closure | Chapter 8 210-218 |

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| | L16 | Longshore sediment transport and littoral drift applications | |
| Week 11 (4-22, 4-24) | L17 | Cross-shore sediment transport | Chap 8 |
| | L18 | Swash processes | |
| Week 12 (4-29, 5-1) | L19 | Coastal features, bars, cusps, sand waves | Chap 9 |
| | L20 | Sand bars, morphodynamical classification of coasts | Chap9 |
| Week 13 (5-6, 5-8) | L21 | Physical and analytical modeling of coastal processes Numerical modeling of coastal processes | Chap 10 |
| | L22 | Beach Nourishment | Chap 11 |
| Week 14 (5-13, 5-15) | L23 | Beach Nourishment | Chap 11 |
| | L24 | Breakwaters and groins | Chap 12 |
| Week 15 (5-20) | L25 | Tidal inlets | Chap 13 |
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| Week 16 | FINAL TBA | FINAL | |