

GEOSC 297D: THE COASTAL ENVIRONMENT (3 CREDITS)

Spring 2003: ~45 class periods, two 3 hour coastal trips

Description

In this 3-credit course, students will study the global variability in coastal types and will examine the physical and natural processes that are responsible for coastal development and change. We will focus on ocean coasts with an emphasis on the Atlantic coast of North America, and also on the Great Lakes coastline. We will also examine the interaction of humans with the coastal environment (coastal engineering, flood & erosion hazards, impacts on the natural environment, and coastal zone management). The course may include up to two short (half-day) field trips later in the semester to local sites of interest on Lake Erie.

Instructor: Dr. Tony Foyle, Assistant Professor of Geology
Lecture Time and Location: MWF 10:00 – 10:50 in 1XX-Science; occasionally 110-Science
Contact Information: Hammermill 24; 898-6277; amf11@psu.edu
Office Hours: Hammermill 24: MWF 11:00 – 12:00, & by appointment
Text: **Coastal Problems:** Geomorphology, Ecology, and Society at the Coast, 1st Edition, by Viles and Spencer (1995). Plus selected readings (from US Army Corps of Engineers' Coastal Engineering Manual (2001), Part I Chp 2 (~20p) and Part IV Chps 1 (~40p) and 3 (~90p) at <http://bigfoot.wes.army.mil/cem001.html>, NOAA Decision Analysis Series #21 (2000); Living with the Lake Erie Shore, by Carter et al (1987); Heinzctr.org; epa.gov; nhc.noaa.gov/HAW/index.htm; Duke University Program for the Study of Developed Shorelines, etc).

COURSE GRADING SCHEME

• 2 in-term lecture examinations	32%	320 pts	EXAMS = 52%
• 1 final comprehensive lecture examination	20%	200 pts	WORK = 53%
• 5 take-home short homework projects	15%	150 pts	
• 3 three-page essays	18%	180 pts	
• 1 "Stake Holder" Meeting	06%	060 pts	
• 2 local field trips	05%	050 pts	
• ~8 pop quizzes	04%	040 pts	
• TOTAL	100%	1000 pts	
• Extra-credit: news media clips (or web pages) on current coastal issues, note-card surveys, class participation, sand, PCKAs, RATs, MSEs	05%	50 pts	

Letter grade scores for the course will be based on the following scale. The instructor reserves the right to lower (but not raise) the scale: **A** =93-100%, **A-** =90-92, **B+** =87-89, **B** =83-86, **B-** =80-82, **C+** = 77-79, **C** =70-76, **D** =60-69, **F** =0-59.

PRELIMINARY LECTURE SCHEDULE

TOPIC

CLASS READING ASSIGNMENT

INTRODUCTION:

Course Outline, PCCKA
Definition of the coast and Importance
US Coastline: Maine to Alaska @ <http://bigfoot.wes.army.mil/cem001.html>
HW #1: Coastal Population Growth
Global History of Usage, Occupation, & Research
Preview of Coastal Problems
Geometry and Terminology
Ocean City Coastal Change Exercise
Overview of the Role of Biology/Ecology

2 WEEKS (1/13 – 1/27)

V&S Chp 1; NOAA Chp 2
USACE Pt1-Chp2; NOAA 4.1
Due 1/22
USACE site
V&S Table 8-1 & 8-2
USACE Fig IV-1-2, V&S Fig1
Handout; Coasts in Crisis 18
V&S 44-48, reefs-mangroves

FRAMEWORKS I: PLATE TECTONICS & COASTAL CLASSIFICATION

Plate Margin Types predestine coastal types
Coastal Classification: Erosional Coasts and Accretional Coasts
3-page Essay #1: Coastal Tourism: advantages & disadvantages on NC's Outer Banks

1 WEEK (1/27 – 2/3)

V&S 19-21; SA98-99
NOAA 4.1; USACE IV-I-1 (1-7,10-24)
Due 2/3

FRAMEWORKS II: SEA LEVELS - HISTORICAL & FUTURE CHANGES

Long-Term Sea Level Changes
Quaternary Oceanic Records
Great Lakes Records, Geologic Evolution
Future Global Changes in Sea Level
Charleston Drowning Exercise

NOAA 3.0, 3.5.0-3.5.2 & case; USACE IV-I-25 to 38; DKL
V&S 21-24 & 54-58, O&F '97
LWS 12-19, 29, USACE web
NJDEP; Heinzctr.org; NOAA 4.1.2, SA28-35
Lab Manual

1 WEEK (2/3 – 2/10)

FRAMEWORKS III: PHYSICAL COASTAL PROCESSES

MIDTERM EXAM 1

HW #2: Hurricane Hazards

Ocean Vs Large Lake Processes
Waves
Tides
Hurricanes and Northeasters (Case Study: Georgia)
Storm Surges, Seiches, & ENSO (www.nhc.noaa.gov)
Littoral Sediment Budgets (Case Study: Presque Isle)

3 WEEKS (2/10 – 3/3)
2/12
Due 2/17
LWS 20-24
V&S 24-41,51; LWS 28-33
V&S 41-44, 46
NOAA 3.3.0-3.3.3; USACE IV-I-19 & Figs 12, 13, 14
V&S 51-53; LWS 24-28; SA39-43
Coasts in Crisis 12 & 14; Komar

Field Trip I: Presque Isle (may need to postpone)

3-page Team Essay #2: Adverse effects of El Nino on the California coast

Park Guide 21
Due 2/24

SPRING BREAK

3/10 – 3/17

SELECTED COASTAL MANAGEMENT AND POLICY ISSUES

Human Influence on the Coast
HW #3: Gas Hydrates: Energy Vs Climate
Who are the Players?
Coastal Problems, Hazards and Management Strategies
Case Study 1: Coastal Agricultural Land
Case Study 2: Coastal water needs of the booming SE USA
Case Study 3: Mediterranean Sea (Vs Great Lakes Basin)

2 WEEKS (3/3 – 3/17)
USACE IV-I-38 to 40; NOAA 4.0
Due 3/5
Klee Chp 2; LWS 186-194
Duke PSDS; www.Heinzctr.org
Klee handout 216-218
Foyle et al '02 handout
V&S 300-308

GEOMORPHOLOGY I: SANDY COASTS

General Truisms!

Barrier Islands: tides, waves, sea-level rise, and human impacts

Waves and Beach Erosion Exercise (Hawaii)

Challenges: Beach Protection

Case Study 1: NJ coastal development history and Long Beach

HW #4: Galveston, TX Vs Hurricane Hazards

3-page Essay #3: How your home (nearest) state deals with a major coastal issue

MIDTERM EXAM II

2 WEEKS (3/17 – 3/31)

V&S 59-75, 87-93

V&S 93-102; NOAA 4.1.4; R213

Handout

V&S 75-86; LWS 55-58

Handout; NOAA Chp 4 Case

Due 3/19

Due 3/18

3/28

GEOMORPHOLOGY II: BLUFF AND ROCKY COASTS

Bluff Coasts

Challenges: Bluff Recession

Case Study 1: The Lake Erie Coast @ Lorain OH Exercise

Rocky Coasts

Challenges: Cliff Protection

Case Study 2: Jump-Off Joe OR

Field Trip II: Lake Erie Bluff (may need to postpone)

1 WEEK (3/31 – 4/7)

PA CZM Handout

LWS 1-11, 20-40, 59-64, 116-130

V&S 110-144

V&S 144-150

V&S 153-155, S&B

LWS; PA CZM Handout

GEOMORPHOLOGY III: DELTAS, ESTUARIES, & WETLANDS

Deltas

Challenges: Sediment Supply; Overpopulation; Sea-Level Rise

Case Study 1: Ganges delta

Case Study 2: Mississippi

Estuaries

Challenges: PS and NPS Pollution; Physical/Hydrologic Modifications

Case Study 3: Chesapeake Bay

HW #5: Illegal Aquatic Immigrants

Wetlands

Challenges: Human Influences and Natural Processes

Case Study 4: NC Hurricane Damage '99

3 WEEKS (4/7 – 4/28)

V&S 162-163

V&S 293-300

NOAA Chp 4 Case; V&S 198-203, Coasts in Crisis 22

V&S 159-162; NOAA 4.2, 4.2.1, 4.2.2, 4.3, 4.3.1

Klee 142-145 Handout

DKL 8.7 & 8.8 Handout; NOAA Chp 4 Case

Due 4/11; Nature handout

V&S 156-158, 165-169, 176-181, 190-197

V&S 181-190

<http://earthobservatory.nasa.gov/Study/FloydIntro/>

THE FINAL WEEK:

Ocean Law

Review

"Stakeholder" Meeting on a local coastal-environmental issue

FINAL COMPREHENSIVE EXAMINATION

1 WEEK (4/28 – 5/2)

SA100-105

NOAA 5.0, 5.1.1, 5.1.2, Case, V&S?

On 4/22 or 4/24

> 5/5

Interesting Reading: **The Little Ice Age – How Climate Made History, 1300-1850** by B. Fagan (2000). Published by Basic Books. The story of how a mediaeval ice age affected global colonization, ocean exploration, and the development of nations.

Ship of Gold in the Deep Blue Sea by G. Kinder (1991). Published by Vintage Books. The story of the exploration for, and recent recovery of billions of dollars in gold from, the USS Central America that sank during the "perfect hurricane" off the coast of South Carolina in 1857.

In the Heart of the Sea: The Tragedy of the Whaleship Essex by N. Philbrick (2001). Published by Penguin. The story of the 1819 sinking of a Nantucket whaling ship in the south Pacific in 1819 that was the inspiration for Melville's *Moby-Dick*.

COURSE DESCRIPTION & OBJECTIVES

This course is designed for science and non-science majors who have an interest in the coastal zone. Study of the coastal zone involves some fascinating aspects of meteorology, geology (the main focus), chemistry, physics, biology, environmental science, and management. Completion of the course will enhance your scientific literacy and numeracy skills, and will give you an appreciation of how the different parts of the earth's marine, atmospheric, biospheric, and terrestrial environments are interconnected at the coastline. A basic knowledge of algebra is assumed. Our approach will use a combination of:

- (1) Regular class meetings to learn the facts and concepts and how to apply them to explain and predict coastal phenomena. (including an end-of-semester "stakeholder meeting") to explore issues in more detail.
- (2) Hands-on observation, analysis, and evaluation of data in occasional "lab-class" and field settings to augment and reinforce several of the ideas covered in lecture.
- (3) Take-home web-based projects on current coastal issues that will further develop your analytical and critical thinking skills. These assignments will require that you be able to understand and synthesize concepts from within and outside science, and will give you the opportunity to incorporate relevant ideas from other studies/classes.

By the end of the semester, you will become an "expert on the coast" by playing an **active role** in:

- (1) Examining the scientific, environmental, and societal aspects of the coastal zone.
- (2) Seeking out, critically evaluating, and utilizing coastal zone data and information.
- (3) Synthesizing and formulating educated opinions on coast-related issues.
- (4) Demonstrating your ability to learn, retain, and apply coast-related knowledge and concepts to the solution of specific problems/issues.

ACADEMIC INTEGRITY

Academic integrity is the pursuit of scholarly activity in an open, honest, and responsible manner. It is one of the guiding principles for all academic activity at Penn State and is one of the four Penn State Principles to which all students must abide. Any violation of academic integrity will receive academic and possibly disciplinary sanctions, including the possible awarding of an **XF** grade (which is recorded on your transcript and states that failure of the course was due to academic dishonesty). All acts of academic dishonesty will be recorded so that repeat offences can be sanctioned accordingly. For more information, see:

<http://www.pserie.psu.edu/faculty/academics/integrity.htm>

COURSE DESCRIPTION AND LEARNING OUTCOMES

This is a one-semester course. Your final grade will be fair and will reflect the amount of effort you (and for some exercises, your team-mates) put into the learning process. Your grade will reflect your ability to conduct specific assignments inside/outside of the classroom (to include 5 homework projects, preparation for and participation in several readings-based quizzes and one "stakeholder meeting," optional (extra-

credit)). These "Non-Exam" activities will contribute up to ~45% of your final grade. Your final grade will also reflect your ability to demonstrate facts and concepts learned in this course and how to apply these to various coastal issues (2 mid-terms, 1 final comprehensive exam, and several quizzes) which will contribute up to ~58% of your final grade.

Lecture pop quizzes and examinations will consist of multiple-choice, short-essay, and true/false questions, all designed to test your understanding of key concepts, ideas, and processes relating to the coastal environment. Pop quizzes will be a frequent occurrence as they are a useful tool for continuous assessment. Hence it is essential that you review lecture material prior to attending class! Unless indicated otherwise, all work is due in class (by hand and in person) on the due-date indicated and should reflect individual work done by you. Late turn-ins will cause the worth of the assignment to decrease by 20% for each day (or part of a day) it is late. Only documentable proof of legitimate curricular and extracurricular commitments/emergencies will alleviate the penalty for late turn-ins. Examinations will be given once only: If you miss an examination, only documentable proof of legitimate curricular and extracurricular commitments/emergencies will be considered. One justifiable absence from an exam is permitted: in such cases, the final exam grade (where appropriate) will be used as the grade for the missed exam.

With regard to attendance, Penn State policy states that *"a student should attend every class ... and should be held responsible for all work covered in the courses taken. A student whose irregular attendance causes him or her, in the judgment of the instructor, to become deficient scholastically, may run the risk of receiving a failing grade or receiving a lower grade than the student might have secured had the student been in regular attendance."* From my point of view, class attendance and participation (quizzes, readings, take-home projects, etc) is expected and highly recommended! Each student is responsible for all material covered in lectures, readings, and homework assignments. Topics covered in class (which may occasionally be covered in more detail than, or in a different order to, that presented in the text book) will be fair game for quizzes and exams. To benefit from class participation and to do well in this course, you must attend class.

This course covers a lot of new material quickly. To do well, attend all classes, take notes on the key points discussed in class and in the assigned pre-class readings, review and annotate your notes each evening after each class, participate in class discussions, and meet or otherwise communicate with the instructor if you have any questions on any matter related to the course. Study regularly and for at least 2 hours for each hour of class. Review online supporting materials from the various sources shown in the lecture outline to enhance your understanding of the material. Complete all home and in-class assignments (individual and team-based) punctually and thoroughly, and take charge of your learning. For group assignments, put in your best effort. Lastly, monitor your e-mail on a regular basis as there may be times when I need to contact the class outside of class periods (for example, to distribute an assignment).

The three-page essay assignments should be 1.5 or 2.0 spaced, single sided, and "typed up" with an 11pt Times font and 1" margins. The Title Page (extra) should have your name, your co-authors' names (if a team assignment), the title of the paper, and your estimate of your and your co-authors' contributions to the paper (in percent). The essay should incorporate an Introduction, a Discussion (which may have sub-headings such as Existing Conditions, Problems, Solutions, Environmental Concerns, etc.), and Conclusions. Numbered Figures and Tables should appear on separate (extra) pages and be referred to in the text. All references cited in your paper (no need for more than ten references) should have corresponding complete references in the Reference List.