George Mason University
Graduate Course Approval/Inventory Form

Please complete this form and attach a copy of the syllabus for new courses. Forward it as an email attachment to the Secretary of the Graduate Council. A printed copy of the form with signatures should be brought to the Graduate Council Meeting. Complete Coordinator Form on pg. 2, if changes in this course affect other units.

Please indicate:  ___X___ NEW  ____ MODIFY  ____ DELETE

Local Unit: Environmental Science & Policy  Graduate Council Approval

Date:

Course Abbreviation: EVPP  Course Number: 563

Full Course Title: Coastal Morphology and Processes

Abbreviated Course Title (24 characters max.): Coastal Morphology & Process

Credit hours: 4

Program of Record:

Repeatable for Credit?  ___ D=Yes, not within same term  Up to hours
                   ___ T=Yes, within the same term  Up to hours
               ___ X_ N=Cannot be repeated for credit

Activity Code (please indicate):  ___ Lecture (LEC)  ___ Lab (LAB)  ___ Recitation (RCT)
                                ___ Studio (STU)  ___ Internship (INT)  ___ Independent Study (IND)
                                ___ Seminar (SEM)

Catalog Credit Format  4:3:3  Course Level:  GF(500-600)  ___X__ GA(700+)

Maximum Enrollment: 20

For NEW courses, first term to be offered: Fall ‘04
Prerequisites or corequisites: Previous courses in geology, oceanography, marine science, or physical geography or permission of instructor

Catalog Description (35 words or less) Please use catalog format and attach a copy of the syllabus for new courses.: Study of global coastal geomorphology and processes, with emphasis on U.S. Atlantic and Gulf coasts (beaches and barrier islands, estuaries, deltas, cheniers, and rocky coasts). Topics include plate tectonics, sea-level changes, sediment supply, waves, tides, storm impacts, and human activities (coastal development and structures, shoreline erosion, wetland loss, oil spills). Lecture and extended weekend field labs to mid-Atlantic coast.

For MODIFIED or DELETED courses as appropriate:

Last term offered:  Previous Course Abbreviation:  Previous number:

Description of modification:

APPROVAL SIGNATURES:
GEORGE MASON UNIVERSITY  
Course Coordination Form 

Approval from other units:

Please list those units outside of your own who may be affected by this new, modified, or deleted course. Each of these units must approve this change prior to its being submitted to the Graduate Council for approval.

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Graduate Council approval: ______________________________________________ Date: ____________
Graduate Council representative: __________________________________________ Date: ____________
Provost Office representative: ____________________________________________ Date: ____________
COASTAL MORPHOLOGY & PROCESSES  
(EVPP 563)

Professor: Dr. Randolph A. McBride  
Office: 3055 David King Hall  
Office hours:  
Voice: 703-993-1642; e-mail: rmcbride@gmu.edu

REQUIRED TEXTS:  

Note: Additional readings may be needed and will be placed in class or available on my office door.

COURSE DESCRIPTION: This course will focus on global coastal geomorphology, with an emphasis on U.S. Atlantic and Gulf coasts. Primary environments to be discussed include barrier islands, estuaries, wetlands, deltas, cheniers, cliffed coasts, and glaciated coasts. Factors affecting coastal morphology will be examined, such as eustatic and isostatic changes, fluctuations in sediment supply, wave and tidal energy, hurricane impacts, cold-front passages, and human activities. Important environmental issues will also be addressed including sea level rise, shoreline erosion, wetland loss, coastal development and protection, and pollution (e.g., oil spills). Major weekend field labs are an essential element of this class.

GOAL: Examine form/process relationships along different coasts (both in the classroom and in the field) so students will have a familiarity with primary coastal environments worldwide.

PREREQUISITES: Introductory geology courses or permission of instructor

COURSE REQUIREMENTS: Attendance at lectures, reading of textbook chapters and xeroxed journal articles, participation in class-led discussions & debates, completion of written exams and field exercises, participation in major field lab(s), submittal of handwritten field books, oral presentation in the field, and preparation of a four-stage term paper (Note: term papers will be compiled into a class field guidebook as individual chapters).

METHOD OF INSTRUCTION: Lectures given by & discussions led by instructor/guest speakers during class times and during field labs, mini-lectures given by graduate students in class, student-led discussions and debates in class and in the field, reading of textbook chapters and journal articles outside of class, and an oral presentation by each student regarding their term paper locality and topic in the field. Portions of this class will emphasize the technique of active learning. In other words, student-centered learning instead of teacher-centered learning.

TECHNOLOGY: Students are required to communicate via e-mail and conduct web-based research. All registered GMU students are allocated a GMU e-mail account. If you don't know your e-mail address, go to the Johnson Center, activate it (or call 993-8870 or www.doiiit.gmu.edu), and check it regularly at numerous locations around campus.

TOPIC READINGS (D = Davis; W = Ward)

Introduction; forces, processes, & features; The Seafloor  
Prologue & 1 (D)

Plate tectonics and coasts  
1 (D)

Relative Sea level changes (Isostatic & eustatic)  
2 (D); 1 (W)

Transgressions & Regressions: mini-lecture  
Curray, 1964
Coastal processes: waves & sediment transport Ch. 3; pp. 67-84 (D); 1 (W)

Coastal processes: tides Ch. 3; pp. 85-89 (D); 1(W)

Storms Ch. 3 (D); 1 (W)

Estuaries (wetlands, marshes, & tidal flats) Ch. 4 (D); 2 (W)

Deltas; Mississippi River Delta & Chenier Plains Ch. 5 (D)

Low-profile, sandy beaches & barriers: barrier is. system Ch. 6 (D); 2 (W)

Genesis of barrier islands: the great debate Hoyt, 1967; Fischer, 1968; Otvos, 1970; Schwartz, 1971; Swift & Field, 1976

Cold coasts: glaciers & fiords

Rocky coasts and the Exxon Valdez oil spill in Alaska Ch. 7 (D)

Beach protection & preservation: hard vs. soft structures Epilogue (D)/Ch. 3, 4, & 5 (Ward)

IMPORTANT DATES:

February XX Bibliography for term paper due
February XX Detailed paper outline and revised bibliography due for term paper
March X Mid-term exam
March XX First complete draft of term paper due
April XX Final, fully-revised, camera-ready copy of term paper due
April XX Major field labs in coastal Virginia, Maryland, & Delaware. Will involve all day hiking in primitive conditions, staying at marine lab dormitory in Wachapreague, VA, and camping in tents at campground.
May XX Final exam

GRADING:

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<td>Midterm exam</td>
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<tr>
<td>Final Exam (comprehensive)</td>
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<tr>
<td>Field Guide Chapter (term project)</td>
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<td>Bibliography (3%)</td>
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<tr>
<td>Paper Outline &amp; Revised Bibliography (3%)</td>
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<tr>
<td>Field Oral Presentation (10%)</td>
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<td>Field Exercises &amp; Notebook for Field Lab</td>
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<td>Questions, Discussion &amp; Field Debate</td>
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Exams may cover lectures, mini-lectures, text readings, assigned articles, slides, overheads, videos, field lab information & localities, and any handouts. Misspellings are counted off on all exams. Exams must be taken as scheduled. Make-ups will not be given, unless for exceptional circumstances, and only if scheduled PRIOR to the exam date with a legitimate excuse (e.g., signed doctor’s excuse). Make-up exams will be all essay. Otherwise, any missed exams will be scored a “zero.”

GRADE SCALE:
A = 93- 100%
A- = 90 - 92%
Adherence to The GMU Honor Code is expected of all students.

MINI-LECTURES

Each graduate student will present one mini-lecture (~25-30 minutes) based on one or two scientific articles. The lecture should synthesize the most important information from the articles and include the following: lecture outline via overhead and critical figures/images via overhead transparencies or slides. Short video clips are also possible. Power point presentations are welcome. For each mini-lecture, all other students must prepare at least two questions based on the assigned readings. A certain number of these questions will be posed to the mini-lecturer during discussion time. The typed questions will be turned in at the end of lecture for that day.

DEBATE

The class will be divided into at least two teams (team leaders will be graduate students) and each team will be assigned a particular viewpoint/scientific position regarding the genesis of barrier islands. Each team will synthesize their scientific position using several published articles. The teams will debate/discuss the genesis of barrier islands in the field. Each team will hand in a 2-3 page synthesis of their scientific position (group grade).

FIELD LAB

This course requires one or two major field labs (3.5 days) involving field exercises and oral presentations. Transport will be provided using GMU 15-passenger vans connected by CB radios (Note: private vehicles will not be allowed because they cause numerous logistical problems). The field lab will take place in coastal VA, MD, and DE and will involve staying at a marine lab dormitory and camping in tents at campground.

FIELD NOTEBOOK

An organized, legible field notebook must be kept for the field lab that chronologically outlines your itinerary (i.e., date, moon phase, time, field location, field conditions [weather, temp., wind direction & speed, wave height/energy, tidal height]) and includes field exercises and notes (e.g., brief field description, lectures, etc.) with simple, labeled field sketches (see example entry below). Field notebooks with waterproof pages are recommended in case it rains or dropped in water. Submit original, handwritten field books (DO NOT RETYPE NOTES) at the end of field lab for grade.

April 20, 1999 (full moon- spring tides)
Oregon Inlet, NC; 70°F w/ clear sunny skies, moderate E winds (15 knots), 1 m waves; spring low tide (-1m)

1230  Lunch on beach

1300  Walking on flood-tidal delta, take 4 pictures on Roll 3(frames 16-19); winds change to NW, seas calm; bars on flood ramp exposed (see simple sketch below). Susan McWilliams gives talk on Oregon Inlet w/ following points:

1400  Heading north along Outer Banks to Jockey's Ridge, NC (large sand dune)

FIELD GUIDE CHAPTER:

Each student will be responsible for writing a term paper (7-9 for undergrads; 12-15 for graduates) about a certain field locality or specific topic that is directly related to our field labs in April. A field locality or topic will be assigned to each student from the enclosed prepared list. When completed, the individual papers will be
compiled into a field guidebook that we use during our coastal field lab. There are *four stages* to the field guide chapter and each stage is worth a certain percentage of your grade: 1) initial bibliography (3% of grade), 2) paper outline & revised bibliography (3% of grade), 3) *1st* complete draft of field guide chapter (14% of grade), and 4) final, fully-revised, camera-ready copy (5% of grade). Grading of the field guide chapter will be based on adherence to the guidelines below and overall scholarly quality. **Ten points will be subtracted for each day the particular assignment is late.**

The purpose of the term project is threefold: 1) practice writing in the scientific style; 2) experience the difference between writing about something and seeing something in the field, and 3) provide a field guide book. The scientific writing style is concise, factual, non-verbose, and non-fiction. It should not contain jargon and should be presented in a logical fashion so that facts build upon facts. Scientific writing is no place for fanciful leaps of faith or implied truths. Facts rule! In terms of the audience, assume the reader has your working knowledge of geology, physical geography, geomorphology, and environmental science.

**Bibliography**

The bibliography must contain at least 5 bibliographic citations (10 for graduate students) from the following specific sources: journal articles, books, book chapters, government documents, theses/dissertations, and published field guides. Information from the World Wide Web (see handout about “Using the Internet for Geology Term Papers”) and other sources (e.g., National Geographic) are acceptable but must be in addition to the 5 or 10 citations mentioned above. Newspaper articles are unacceptable sources of information.

**Paper Outline & Revised Bibliography**

Submit a detailed outline of your paper in the correct format as described below including the following: official title, name, affiliation, all primary headings, potential secondary headings, text bullets, primary figures (especially the location diagram) and figure captions, and your revised bibliography. In other words, you should submit a complete skeleton of your paper (framework is there, only the sentences are needed).

**1st Complete Draft of Field Guide Chapter**

The first draft of your field guide chapter should follow the guidelines outlined below and include all the appropriate components and headings. You should consider this 1st draft a completely finished manuscript. I will review/edit your 1st draft and return it so you can make revisions/corrections/additions for the final camera-ready version.

1. Papers should be 7-9 *(12-15 for graduate students) typed pages in length* (excluding figures, tables, references, and appendices), double-spaced, 1” margins on all four sides, a simple 11 point font (e.g., Helvetica, times roman), and fully justified. All figures and tables should go on separate pages in sequential order at the end of the document after the reference section. Do not embed figures and tables within the text.

2. Each page should be numbered sequentially in the upper right-hand corner (this means that every page you hand in should have a page number including the references, all figures and tables, and appendices).

3. Spelling errors are unacceptable (use your spell-checker and proofread your text before submittal) because points will be subtracted for misspellings.

4. Your paper should follow an outline of a scientific paper with primary headings and format as shown below:

**Morphodynamics of Oregon Inlet, Outer Banks of North Carolina**

Randolph A. McBride  
Department of Environmental Science and Policy  
George Mason University  
Fairfax, Virginia 22030
Abstract (½ page)
- Extremely concise overview of field locality or topic (250 words or less)
- Address primary points regarding morphology, processes, and environments
- Address primary human factors in field locality if applicable (e.g., jetties)

Introduction (#1 page; one or two paragraphs each)
- General introductory statement
- Specific objectives of field guide chapter (i.e., What are you going to do exactly?)
- Scope of paper (e.g., What specific aspects of Oregon inlet will be covered?)
- Literature review (very brief synthesis of most important articles regarding your field locality such as Jones, 1999; Williams et al., 2000)

Regional Setting (≥½ page)
- Briefly describe where your locality is using a clear location map (The map may include state boundaries, towns or cities, water bodies, highways and roads, national & state parks)
- Briefly describe physiographic region, local geology, climate if applicable

Detailed Field Locality Description (≥4 pages)
- Describe modern and/or ancient geomorphic features and the processes (e.g., tidal range, average wave height, tidal prism, longshore sediment transport) responsible for creating the features; compile a table that quantifies the processes; discuss geomorphic evolution of feature or landscape; discuss shoreline change (include figure)
- Describe coastal structures (e.g., jetties, seawalls, groins), human infrastructure (e.g., beach houses, hotels, highways) and activities (channel dredging)
- Include the most important figures that summarize field locality
- Must include a topographic map (scales: 1:24,000 or 1:64,000 or smaller); available at US Geological Survey in Reston (Sunrise Valley Road).
- Specific subheadings may include most or all of the following:
  - Geomorphology
  - Physical Processes (e.g., waves, tides, tidal prism, currents, winds, etc)
  - Shoreline Changes
  - Coastal Structures
  - Human Activities and Impacts

Conclusions (≥½ page)
- What do you conclude from all of the above? What are the primary geomorphic features, processes, and environments? What are the primary points that need reiterating (e.g., geomorphology, human activities, or policy)? What are the major coastal problems?

References
- All material cited in the text (e.g., George, 1998; Abston et al., 1987; McBride and Moslow, 1991) must be listed alphabetically in the reference section (all authors must be listed in the reference section). Follow a specific citation method shown below. Refer to the handout entitled “Using the Internet for Geology Term Papers” when citing material from the world wide web (www). All ideas not your own must be cited otherwise you have plagiarized. Some paragraphs might include a citation for every sentence (e.g., Regional Setting).

Book

Journal article
Paper or chapter in edited book or proceedings volume

Government Report

Theses and dissertations

Figures
All figures must be clear and readable (if you can’t read it, don’t include it!!!)
Each figure must be numbered sequentially starting with #1 and have a typed figure caption that describes the figure. A citation should occur at the end of the figure caption indicating the source of the figure. For example: Figure 1. Shoreline changes of Parramore Island, VA from 1871 to 1999 (Vidal and McBride, 1999).
Topographic maps should be given a figure number and referenced in the text.

Tables
All tables must be numbered sequentially starting with #1 and have a typed table caption. A citation should occur at the end of the table caption indicating the source of the table (Note: use same format as above for figure caption, except replace Figure 1 with Table 1).

Final Camera-Ready Copy
On April 16, 2003 your fully-revised field guide chapter is due. Two types of media are required: 1) a complete hard-copy, camera-ready version (text, references, figures, & tables) on plain white bond paper and 2) a digital copy on a 3.5” diskette (text and references only). The two types of media should follow the same above-mentioned guidelines under “1st Complete Draft of Field Guide Chapter.” The digital copy must be saved as a Word or WordPerfect file preferably using a PC platform running Windows98. The filename should be your last name and year (last name02.wpd or .doc).

EXAMPLE TOPICS AND/OR LOCALITIES FOR FIELD GUIDE CHAPTERS
1. *Morphodynamics of tide-dominated barrier islands along the southern Delmarva Peninsula with special reference to Parramore Island, VA
2. Morphodynamics of tide-dominated tidal inlets along the southern Delmarva Peninsula
3. Morphodynamics of Wachapreague Inlet, VA
4. Morphology, processes, and classification of aeolian features (dunes) along coasts and beaches: specific examples from Parramore Island, VA
5. *Beach classification systems: primary morphologic features of open-ocean beaches
6. Pfiesteria-related outbreaks in estuarine systems of coastal Virginia and Chesapeake Bay (emphasize environmental conditions & coastal processes and de-emphasize biological impact)
7. *Relative sea level changes along the Delmarva Peninsula: past, present, and future
8. Geologic development, geomorphology, and shoreline change of Parramore Island, VA Morphodynamics of wave-dominated barrier islands along northern Delmarva Peninsula with special reference to Assateague Island, VA/MD
9. Meteorology and geomorphic impact of the 1962 Ash Wednesday storm on coastal Virginia
10. *Regressive versus transgressive barrier islands along the mid-Atlantic bight
11. *Geomorphic evolution of Chincoteague Island and the recurved spit at Fishing Point, VA (Cape Chincoteague)
12. Geomorphic evolution, coastal processes, and engineering structures at Ocean City inlet, MD and the downdrift impact on Assateague Island, MD
13. Geomorphic evolution, coastal processes, and engineering structures at Indian River Inlet, DE
14. *Geologic development, geomorphic evolution, and shoreline change of Cape Henlopen, DE
15. *Estuarine circulation and tidal processes in Chesapeake Bay versus Delaware Bay: the impact of physical processes on oil spill contingency planning

16. *Federal, state, and local laws regulating coastal development (setback lines) and coastal protection (hard & soft structures) in Virginia, Maryland, and Delaware (e.g., FEMA E-Zones)

Example paper format:

Human-Estuarine Processes Along the Southern Delmarva Peninsula, with Emphasis on the Pocomoke River Basin and *Pfiesteria*-related Outbreaks and Conditions

David A. Greene
United States Geological Survey
Reston, Virginia 20192

Abstract

Recent outbreaks of fish kills, fish lesions, and human health problems in the Pocomoke Sound region of the southern Delmarva Peninsula have been linked to the toxic dinoflagellate *Pfiesteria piscicida*. Certain estuarine water conditions affected by a variety of both natural and human-induced coastal processes appear to trigger drastic responses in this organism. The Pocomoke River watershed of the Southern Delmarva Peninsula contains several environmental characteristics, including relatively high water temperatures, increased salinity, low rates of flushing, elevated acidity, high nutrient levels, and isolated storm events, that make it a likely site for *Pfiesteria*-related events. This paper will examine the physical, chemical, biological, and anthropogenic conditions and processes of the Pocomoke watershed which may be contributing to *Pfiesteria* outbreaks and their resultant effects on living resources.

Introduction

Harmful algal blooms have increased in frequency and severity in many U.S. coastal states and worldwide, causing major fish kills and increased risks to natural resources, environmental quality, and human health (Anderson et al., 1993; Anderson, 1995; Boesch, 1996; Barker, 1997). These increases may be due to increased human activity, cyclic or longer-term variations in climate, other natural processes, or some combination of these factors (Anderson, 1995; Boesch, 1996). Harmful algal blooms are normally characterized by the sudden proliferation of particular species of toxic or harmful algae, resulting from a combination of poorly understood physical, chemical, and biological mechanisms and interactions (Anderson, 1995). Most of these events are attributed to a particular class of marine algae called dinoflagellates, which can stay dormant in an encysted form in bottom sediments for years and then suddenly be triggered into a toxic, free-swimming form under certain environmental conditions (Burkholder et al., 1992; Anderson et al., 1993; Anderson, 1995).

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References Cited


