Course: GEOL / MSCI 557  
Title: COASTAL PROCESSES  

Instructor:

Dr. George Voulgaris  
office:  EWS 309, tel: 777-2549  
e-mail: gvoulgaris@geol.sc.edu  
Office Hours: Tue & Thu 13:00 – 15:00  

I. Course Description
This course is designed to introduce students to the study of the “physical” processes that occur in the coastal environment. Emphasis is placed on the marine forces that control sediment movement and morphology changes. These forces, acting on a coastal ocean environment are waves and currents with the latter being generated by waves, winds and/or tides. Waves provide the forcing for sediment entrainment while currents are the sediment transporters. Topics to be covered include: tides; wave theory; wave and current measurements, wave hindcasting and forecasting; sediment transport; beaches and bars; sediment budget.

The course is suitable for upper level undergraduate students and graduate students. Although a quantitative course in nature; it does not require more than basic numerical abilities. Different requirements and expectations apply to graduates and undergraduate students.

II. Goals and Learning Outcomes

Goals
The goal of the course is to make aware the students of the most important physical processes that act in the coastal environment and the role they play in shaping the coastline. After completion of the course the student will be able to (i) identify the most important relevant processes for a particular coastal environment (i.e., inner shelf, beach, tidal inlet, estuary); and (ii) apply quantitative formulations as relate to an environmental and/or engineering study relevant to that environment.

Learning Outcomes

(1) Identify dominant physical processes (waves, tides, winds) on a particular coastal environment.

(2) Being able to analyze tidal records and predict tides.

(3) Being able to predict waves and account for wave propagation toward the shoreline

(4) Be able to estimate physical forcing and circulation patterns developing in the nearshore in response to a particular physical forcing.

(5) Being able to understand coastal erosion processes and the role physical forcing plays on driving those.

(6) Review current engineering methods for coastal defense.
III. Attendance

Attendance is highly recommended as it will enhance performance. Class rolls might be taken randomly in an attempt to provide bonus points.

IV. Reading Material

Text Book

- The material delivered through notes and power point presentations is mostly based on the book of: Robert G. Dean and Robert A Dalrymple, 2002. Coastal processes with Engineering Applications. Cambridge University Press, 475pp. No book required for a student to succeed, although access to it will be helpful.

Suggested Reading Material


List of Additional References

Fluid Mechanics, Open Channel Flow and Boundary Layer Flow


Fluvial Sediment Transport


Water Wave Mechanics


Coastal Sediment Transport

V. Performance Evaluation

1. Term Paper & Presentation (for graduate students only)

All graduate students are required to create and present one term paper is required. The paper must be prepared in the format of Journal of Coastal Research (see http://www.peertrack.net/JCR/JCR_Author_Instructions.pdf), contain at least 10 pertinent references, and not exceed 8 pages, excluding tables and graphs. Term paper topics are selected by the students but must be pre-approved by the instructor. The paper will be submitted to the Instructor and it will also be presented in the class using Power Point. Paper is due on November 29th at the beginning of the class. Paper copies are required.

2. Term Paper Peer Review (for graduate students only)

The graduate students will carry out peer review of the papers of their colleagues. The rigorous character of the review report and its quality will be evaluated.

3. Grading and Test Schedule

The homework load will be different for the undergraduate and graduate students that take this class. Homework exercises will consist of at least 2 problems during the semester. Graduate students will have to answer ALL questions while undergraduate students will have to answer 60% or less of the questions present (the exact number will be indicated on each homework/test).

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<thead>
<tr>
<th></th>
<th>Undergrad.</th>
<th>Graduates</th>
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<tbody>
<tr>
<td>Final Exam (Take Home Exam, Due by December 10th, 2015 at the university scheduled final exam time. Paper copies only are accepted)</td>
<td>45 pts</td>
<td>30 pts</td>
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<tr>
<td>Homework exercises</td>
<td>35 pts</td>
<td>25 pts</td>
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<tr>
<td>End-of-term paper and presentation (Nov. 29th, at scheduled class time)</td>
<td>0 pts</td>
<td>25 pts</td>
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<td>Class Participation</td>
<td>20 pts</td>
<td>20 pts</td>
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<td><strong>Possible maximum score</strong></td>
<td><strong>100 pts</strong></td>
<td><strong>100 pts</strong></td>
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Final numerical grade will be based on a grading scale as follows:

- A = 90-100
- B+ = 84-89
- B = 79-83
- C+ = 74-78
- C = 69-73
- D+ = 63-68
- D = 57-62
- F <= 56

**Note 1:** All decimal points are rounded to the nearest integer (e.g., 70.51 becomes 71; 70.498 becomes 70).
Note 2: Not grade adjustment (i.e., curving) is carried out in this class. This class is highly applicable and potential employees and graduate schools need to be able to assess the real capacity of the students independently of their year of graduation. Curve shifting does not allow this.

The USC student code of academic responsibility will be enforced.

General Rules:

- As we are all here to gain knowledge, classroom behavior must foster a respectful and scholastic environment for everyone’s benefit.

- Cell phones, pagers and other electronic devices must be turned OFF when in class. If one is found to be on, on vibrate, etc., you might be asked to leave class. There is no text messaging, web-browsing, etc. during class. Failure to adhere to this rule may result in your being dismissed from class.

- No newspapers or reading materials not related to the class are allowed on your desk.

- Any disruptive behavior may result in your being asked to leave the class, and/or a referral to the Office of Student Conduct.

Intellectual and academic honesty and respectable and non-disruptive behavior is expected by all students. Each student is required to read the University Policies on “Academic Responsibility – The Honor Code (STAF 6.25)” and on “Student Code of Conduct (STAF 6.26)”. The student discipline system, which is detailed in there will be enforced.

VI. Lecture Schedule

Note: The lecture schedule shown below is nominal. However based on class progress the material covered might be expanded or reduced as the objective of the class is to make students understand the material achieving the goals and learning outcomes for all students.

<table>
<thead>
<tr>
<th>Meeting #</th>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>Aug. 20, 2015</td>
<td>Introduction / Overview of Coastal Processes</td>
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<tr>
<td>2 - 3</td>
<td>Aug. 25, 27, 2015</td>
<td>Sediment Characteristics &amp; Analysis</td>
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<tr>
<td>4 - 5</td>
<td>Sep. 1, 3, 2015</td>
<td>Coastal Processes in the Mediterranean (Visiting Lecturer from University of Athens, GR)</td>
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<td>6 - 7</td>
<td>Sep. 8, 10, 2015</td>
<td>Long &amp; Short Term changes in Sea Level (Sea Level Rise - Tides – Storm Surges)</td>
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<td>8 - 9</td>
<td>Sep. 15, 17, 2015</td>
<td>Wave Hydrodynamics (Wave Generation)</td>
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<td>10 -11</td>
<td>Sep. 22, 24, 2015</td>
<td>Wave Hydrodynamics (Wave Propagation)</td>
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<td>12 -13</td>
<td>Sept. 29, Oct. 1, 2015</td>
<td>Waves on Beaches</td>
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<td>14 – 15</td>
<td>Oct. 6, 8, 2015</td>
<td>Nearshore Circulation</td>
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<td>Date(s)</td>
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<tr>
<td><strong>Oct. 13</strong>, <strong>15, 2015</strong></td>
<td>Exercises on Wave Generation, Propagation</td>
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<td><strong>Oct. 22, 2015</strong></td>
<td>Fall Break – No Class</td>
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<tr>
<td><strong>Oct. 27</strong>, <strong>29, 2015</strong></td>
<td>Sediment Transport (currents, waves)</td>
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<td><strong>Nov. 3</strong>, <strong>5, 2015</strong></td>
<td>Sediment Transport (combined flows) &amp; Bedforms</td>
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<td><strong>Nov. 10</strong>, <strong>12, 2015</strong></td>
<td>The Concept of Equilibrium Profile - Shoreline retreat – Beach Nourishment</td>
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<td><strong>Nov. 17</strong>, <strong>19, 2015</strong></td>
<td>Tidal Inlets &amp; Tidal Inlet Stability</td>
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<td><strong>Nov. 24, 2015</strong></td>
<td>Estuaries</td>
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<td><strong>Nov. 26th, 2015</strong></td>
<td>Thanksgiving Break – No Class</td>
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<td><strong>Dec. 3rd, 2015</strong></td>
<td>Term Paper Due – Presentations</td>
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<td><strong>Dec. 5th, 2015</strong></td>
<td>Last Day of Class - Review</td>
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<td><strong>Dec. 10, 2015</strong></td>
<td>FINAL EXAM as per registrars schedule</td>
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