Texas A&M University - Corpus Christi  
College of Science and Technology  

Course Syllabus  
CMSS-6327.001 Physical Oceanography  
ESCI-5490.001 Advanced Topics: Physical Oceanography  
Spring 2012  

INSTRUCTORS:  

Alberto M. Mestas-Nuñez (lead)  
Office: HRI-104  
Phone: 825-3636  
E-mail: alberto.mestas@tamucc.edu  
Office hours: TR 3-5 or by appointment  

Frank Kelly  
Office: to be arranged  
Phone: 949-9773  
E-mail: fjkelley@stx.rr.com  

CLASS MEETING:  

Time: TR 9:30-10:45 AM  
Classroom: CS-108  

TEXTBOOKS:  

Class Textbook (available free online in pdf format):  
http://oceanworld.tamu.edu/resources/ocng_textbook/PDF_files/book_pdf_files.html (pdf version). (Note: there is an earlier 2005 web based version available there as well)  

Secondary Class References (not required):  
Physical Oceanography  
General Oceanography  
Garrison, Tom S., Oceanography: An invitation to Marine Science, 5th ed. or newer, Brooks Cole  
COURSE DESCRIPTION

Succinct review of the basic concepts of Physical Oceanography followed by general presentations and discussions in three selected areas, global ocean circulation, circulation along the Gulf of Mexico continental shelf and atmosphere-ocean interaction and impact on climate. A significant portion of the class will be based on student guided reading assignments. Prerequisites: Direct interest in Physical Oceanography, other background should include introductory college physics and basic mathematical knowledge of calculus and simple differential equations, or approval of class lead instructor.

I. COURSE AUDIENCE

PhD Students in the Coastal and Marine Science System Science program are the primary audience for this course. Secondary audience includes graduate students (Masters) in Environmental Science and other graduate students interested in Physical Oceanography.

II. COURSE OBJECTIVES

At the conclusion of this course the student should be able to:
1. enumerate and discuss fundamental concepts in Physical Oceanography including:
   - Historical setting
   - Physical setting
   - Atmospheric Influences
   - Oceanic Heat Budget
2. identify and discuss the important thermodynamic and dynamic processes influencing the ocean
3. identify a few of the major currents and water masses in the ocean, and discuss what governs the distribution of their properties, e.g., temperature, salinity, dissolved oxygen, nutrients, etc.
4. identify and discuss forcing mechanisms of ocean currents
5. identify the equations that describe the above processes; discuss how they are derived and their limitations; understand the concept of scaling the equations to determine the important terms for a particular application.
6. identify the sources of information about physical variables, the types of instruments and platforms used for the measurements, the accuracy and limitations of the measurements and the existence of historical data
7. recognize the differences between common physical oceanography modeling approaches
8. read, evaluate, and report on journal articles related to the General Ocean Circulation including deep ocean circulation
9. read, evaluate, and report on journal articles related to the Physical Oceanography of the Gulf of Mexico (GOM) Continental Shelf
10. read, evaluate, and report on journal articles related to Ocean-Atmosphere Interactions and Impact on Climate including Equatorial dynamics, El Niño-Southern Oscillation (ENSO), and the role of the ocean in weather and climate.

III. COURSE TOPICS

Introduction of basic concepts in Physical Oceanography including physical properties of ocean waters. General application of conservation principles and equations that describe
fluid flow. Class topics in global ocean circulation, GOM continental shelf circulation, atmosphere-ocean interaction and physical oceanography topics selected by the students.

IV. INSTRUCTIONAL METHODS AND ACTIVITIES

Traditional lectures via board demonstrations and power point presentations, general class discussion of selected topics, series of reading assignments followed by classroom discussions, student projects.

V. EVALUATION AND GRADING

All written assignments below will be 5-10 pages, double spaced, times new roman 12 pt font, using a consistent citation format.

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Grade Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral presentation on Basic Physical Oceanography Topic (~10 minutes plus 5 min for questions)</td>
<td>20%</td>
</tr>
<tr>
<td>Ocean Circulation Written Assignment*</td>
<td>20%</td>
</tr>
<tr>
<td>Shelf Circulation Written Assignment*</td>
<td>20%</td>
</tr>
<tr>
<td>Ocean-Atmosphere Written Assignment*</td>
<td>20%</td>
</tr>
<tr>
<td>Student Selected Topic Oral Presentation (~10 min plus 5 min for questions)</td>
<td>20%</td>
</tr>
<tr>
<td>Total:</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade Percentage X</th>
<th>Letter Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>X ≥ 85.0%</td>
<td>A – Excellent</td>
</tr>
<tr>
<td>70.0% ≤ X &lt; 85.0%</td>
<td>B – Good</td>
</tr>
<tr>
<td>55.0% ≤ X &lt; 70.0%</td>
<td>C – Satisfactory</td>
</tr>
<tr>
<td>40.0% ≤ X &lt; 55.0%</td>
<td>D – Passing</td>
</tr>
<tr>
<td>X &lt; 40.0%</td>
<td>F – Failing</td>
</tr>
</tbody>
</table>

*Addendum for CMSS 6327 students: Students enrolled in CMSS 6327 will be expected a higher level of synthesis in their written assignments than the ones in ESCI 5490. CMSS 6327 students will cite a minimum of seven peer reviewed articles compared to five required for ESCI 5490 students. In addition, CMSS 6327 students will also be required to give brief oral presentations of their papers to the class and the assignment final grade will take this oral presentation into account.

VI. ATTENDANCE AND OTHER COURSE POLICIES

Students are required to attend all class meetings. Participation is essential to do well in the class. Discussions and student input are considered an important part of the class. Excused absences are
limited to medical emergencies that can be certified in writing by a physician, participation in a TAMUCC sanctioned event or other similar circumstances justified in writing and specified in the TAMUCC graduate catalog for the ongoing academic year. Assignments are expected on time unless prior arrangements are made. Such prior arrangements will be granted only in exceptional circumstances as well. Submitting an assignment late without prior arrangement may lead to a grade of 0 or at least to a substantial penalty.

Academic honesty: Please review the University policies on academic integrity and honesty listed in the Graduate Catalog under the Academic Honesty section. This instructor will follow these guidelines if such infraction such as plagiarism or other dishonest conduct occurred as part of this class. These guidelines will be followed for both the evaluation of the gravity of the infraction and the determination of an appropriate penalty. Any student who has been penalized for academic dishonesty has the right to appeal the judgment or the penalty assessed. The Appeals Procedure will be the same as that specified for grade appeals. The grade appeals procedure may be found in the University Rules manual at http://www.tamucc.edu/provost/university_rules/.

VII. SPECIAL NEEDS

The university complies with the Americans with Disabilities Act in making reasonable accommodations for qualified students with disabilities. If you need disability accommodations in this class, please see the instructor as soon as possible and present the accommodation letter from TAMU-CC Services for Students with Disabilities Office. If you suspect that you may have a disability (physical impairment, learning disability, psychiatric disability, etc.) please contact the Services for Students with Disabilities Office (located in Driftwood 101) at 825-5816. It is important that you contact them in a timely fashion as it may take several days to review requests and prepare accommodations.

VIII. COURSE PROGRESSION

This is a tentative outline. It is the student responsibility to keep up with any changes to this outline.

(1) General Introduction to Physical Oceanography Principles. The classes for weeks 1-4 end with a consideration of specific examples illustrating the material in Stewart’s Chapters.

<table>
<thead>
<tr>
<th>Week 1</th>
<th>Class introduction and organization, introduction to Stewart chapters 1-6</th>
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<tbody>
<tr>
<td>Week 2</td>
<td>Discussion of Stewart chapters 1-6, introduction to Stewart chapters 7-9</td>
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<tr>
<td>Week 3</td>
<td>Discussion of Stewart chapters 7-9, introduction to Stewart chapters 10-12</td>
</tr>
<tr>
<td>Week 4</td>
<td>Discussion of Stewart chapters 10-12, introduction to Stewart chapters 13-17</td>
</tr>
<tr>
<td>Week 5</td>
<td>Student presentations/discussions on one of the class book final chapters (13-17) in some detail</td>
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(2) The rest of the semester will be focused on three general physical oceanographic research areas: (A) The General Ocean Circulation, with some emphasis on the North Atlantic and the Gulf of Mexico (GOM); (B) The Physical Oceanography of the GOM Continental Shelves,
along with Coastal Circulations in General; (C) Ocean-Atmosphere Interactions and Impact on Climate. Toward the end of the classes for weeks 6-14, brief discussions of various topics (to be determined) can of course take place as appropriate.

Week 6  Introduction to the General Ocean Circulation section of the class. Discussion of important references.

Week 7  Introduction to the Physical Oceanography of the GOM Continental Shelf. Discussion of important references.

Week 8  Introduction to the topic of Ocean-Atmosphere Interactions and Impact on Climate. Discussion of important references.

Week 9  Discussion, along with selected student reading assignments, for the General Ocean Circulation section of the class. Preliminary consideration of research topics for oral and written presentation.

Week 10 Discussion, along with selected student reading assignments, for the Physical Oceanography of the GOM Continental Shelf section of the class. Preliminary consideration of research topics for oral and written presentation.

Week 11 Discussion, along with selected student reading assignments, for the topic of Ocean-Atmosphere Interactions and Impact on Climate section of the class. Preliminary consideration of research topics for oral and written presentation.

Week 12 Specific summary discussion concerning crucial topics with respect to research papers and oral presentations for the General Ocean Circulation section of the class.

Week 13 Specific summary discussion concerning crucial topics with respect to research papers and oral presentations for the Physical Oceanography of the GOM Continental Shelf section of the class.

Week 14 Specific summary discussion concerning crucial topics with respect to research papers and oral presentations for the Ocean-Atmosphere Interactions and Impact on Climate section of the class.

(3) Student Presentations

Week 15 Written and oral presentations of assigned topics by students, as related to both general and individual research interests, are due.
IX. BIBLIOGRAPHY


