Advanced Topics: Ocean and Estuarine Acidification ESCI 6590
Department of Physical and Environmental Sciences
Spring 2019

A. COURSE INFORMATION
Course number/section: ESCI 6590.002
Class meeting time: MW 2:00-3:15 PM
Class location: CS 108
Course Website: https://bb9.tamucc.edu/

B. INSTRUCTOR INFORMATION
Instructor: Dr. Xinping Hu
Office location: Science Lab #2 104
Office hours: TR 2:00-4:30PM
Telephone: 361-825-3395
e-mail: xinping.hu@tamucc.edu
Appointments: Email to make appointments

C. COURSE DESCRIPTION
Catalog Course Description
This course focuses on introducing the concept of acidification of marine ecosystems (estuaries and oceans) and biological and ecological responses to the acidification; the geological past will also be examined in the context of current ocean acidification. Numerical simulations using software CO2SYS and interpretation of open-access global databases on global ocean and estuarine acid-base dynamics will be introduced in this class.

Extended Course Description
This course is open to a broad audience of graduate students in the College of Science and Engineering, who are interested in understanding the mechanisms of ocean and estuarine acidification as well as its biological and ecological consequences in the changing ocean. Primary audience will be students in programs with background of chemistry, biology, and environmental science.

Ocean and estuarine acidification is an emerging threat to the marine and coastal environments. Knowledge gained in this class is useful for graduates that will be employed by governmental agencies and environmental entities focusing on resource managements and risk mitigations.

D. PREREQUISITES AND COREQUISITES
Prerequisites
CHEM 1411 and CHEM 1412 or their equivalents.

Corequisites
None
E. **REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES**

Required Textbook(s) and Materials
Not required


Optional Textbook(s) or Other References

Special issues of the journal *Oceanography*, review articles in various journals, as well as most recent research papers will be provided.

Supplies
None

F. **STUDENT LEARNING OUTCOMES AND ASSESSMENT**

Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

By the end of this course, students should be able to:

1. Name the drivers for ocean and estuarine acidification and other controlling mechanisms including physical, biological, and geological factors;
2. Use software to explore the mechanisms of ocean and estuarine acidification;
3. Interpret open-access ocean and estuarine water chemistry data and make predictions on future changes;
4. Differentiate biological and ecological responses to ocean acidification and identify “victims” and “beneficiaries” to ocean and estuarine acidification through literature synthesis and analysis.

G. **INSTRUCTIONAL METHODS AND ACTIVITIES**

Traditional lectures via board demonstrations and PowerPoint presentations, reading and classroom discussions, and student homework. Homework will consist of assigned readings and numerical simulation using both the CO2SYS model and field data.
H. MAJOR COURSE REQUIREMENTS AND GRADING

Student learning outcomes will be examined through classroom participation to discuss recent progress on ocean and estuarine acidification research (SLO1 and SLO4), using CO2SYS to address questions on the status of ocean and estuarine acidification and future changes in homework and exams (SLO2 and SLO3). **Finally, a term paper that focuses on one of the student-identified ocean and estuarine acidification “hotspots” is required to demonstrate changes in the acidification and ecosystem responses (SLO3 and SLO4).**

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation</td>
<td>10</td>
</tr>
<tr>
<td>Homework</td>
<td>20</td>
</tr>
<tr>
<td>Mid-Term Exam</td>
<td>25</td>
</tr>
<tr>
<td>Final Exam (take home)</td>
<td>25</td>
</tr>
<tr>
<td>Term Paper and Presentation</td>
<td>20</td>
</tr>
</tbody>
</table>

I. COURSE CONTENT/SCHEDULE

<table>
<thead>
<tr>
<th>WEEK</th>
<th>TOPIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction and basic chemistry of marine CO₂ system</td>
</tr>
<tr>
<td>2</td>
<td>Marine CO₂ system, introduction to CO2SYS software (Jan 22, final day to register)</td>
</tr>
<tr>
<td>3</td>
<td>Ocean acidification in the geological past</td>
</tr>
<tr>
<td>4</td>
<td>Modern instrumentation and challenges, ocean CO₂ time-series</td>
</tr>
<tr>
<td>5</td>
<td>Estuarine acidification and controlling factors</td>
</tr>
<tr>
<td>6</td>
<td>Application of CO2SYS in ocean and estuarine acidification studies</td>
</tr>
<tr>
<td>7</td>
<td>Chemical and physical responses to acidification</td>
</tr>
<tr>
<td>8</td>
<td>Biological responses to acidification - cellular, species</td>
</tr>
<tr>
<td>9</td>
<td>Spring Break, No Class</td>
</tr>
<tr>
<td>10</td>
<td>Biological responses to acidification - communities</td>
</tr>
<tr>
<td>11</td>
<td>Synergistic responses of marine ecosystem to ocean acidification and other stressors</td>
</tr>
<tr>
<td>12</td>
<td>Ocean acidification on economy, mitigate schemes (Apr 5, last day to drop class)</td>
</tr>
<tr>
<td>13</td>
<td>Experimental schemes on ocean acidification research</td>
</tr>
<tr>
<td>14</td>
<td>Victims vs. beneficiaries of ocean acidification, past, present, and future</td>
</tr>
<tr>
<td>15</td>
<td>(April 30, Term paper due and in-class presentation, May 2, reading day)</td>
</tr>
<tr>
<td>16</td>
<td>Final Exam (May 8)</td>
</tr>
</tbody>
</table>

Note: Changes in this course schedule may be necessary and will be announced to the class by the Instructor. The assignments and exams shown are directly related to the Student Learning
Outcomes described in Section F.

J. COURSE POLICIES

Attendance/Tardiness
The student is expected to be on time and attend every class. If absent, it is the responsibility of the student to obtain missed information from a classmate. Missed information includes not only lecture notes, but also any possible information regarding syllabus changes. The student is expected to arrive on time prepared to take notes and work on in-class problems with pen or pencil, paper, calculator and colored markers/pencils.

Late Work and Make-up Exams
There will be no make-up exams for this class. Certain university-related circumstances may warrant a makeup exam with prior notification, documentation, and arrangements. Do not show up late to an exam; no student will be admitted to the exam after the first exam-taker has left.

Extra Credit
No extra credit.

Cell Phone Use
Before you enter the lecture hall turn OFF your cell phone! Beepers must also be turned off or put on silent mode. Electronic interruptions will NOT be tolerated.

Laptop Use
Laptops are to be used only for lecture material. Use of laptops for non class items will not be permitted.

Food in Class
Generally, food in class is not permitted during class. It is permissible to bring appropriate snacks during the 2 1/2 hour final exam. Coffee, sodas, energy drinks are permissible.

Missed Exam
See Late Work and Make-Up Exams above.

Participation
Students are expected to attend all classes and be prepared to ask and/or answer questions.

Others
It is the student’s responsibility to read and be aware of the contents of this syllabus and the course website on Blackboard. Announcements and changes are communicated in the classroom, Blackboard, and/or emails.

K. COLLEGE AND UNIVERSITY POLICIES
• **Academic Integrity (University)**
  University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a failing grade.

• **Classroom/Professional Behavior**
  Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

• **Statement of Civility**
  Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

• **Deadline for Dropping a Course with a Grade of W (University)**
  I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. **Please consult with your academic advisor, the Financial Aid Office, and me, before you decide to drop this course.** Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. Please consult the Academic Calendar ([http://www.tamucc.edu/academics/calendar/](http://www.tamucc.edu/academics/calendar/)) for the last day to drop a course.

• **Grade Appeals (College of Science and Engineering)**
  As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to
demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at http://www.tamucc.edu/provost/university_rules/index.html, and the College of Science and Engineering Grade Appeals webpage at http://sci.tamucc.edu/students/GradeAppeal.html. For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

- **Disability Services**
  The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call (361) 825-5816 or visit Disability Services in Corpus Christi Hall 116.

  If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

  http://disabilityservices.tamucc.edu/

- **Statement of Academic Continuity**
  In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.

L. **OTHER INFORMATION**

- **Academic Advising**
  The College of Science & Engineering requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. Meetings are by appointment only; advisors do not take walk-ins.
Please call or stop by the Advising Center to check availability and schedule an appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361) 825-3928.

GENERAL DISCLAIMER
I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.