MNS 357: Diversity of Marine Phytoplankton
Spring 2017

Course unique number: 53780
Class meetings: Tues. 9-10:30 a.m. (lecture), 1-4 (lab)
Location: Video Classroom (lecture) & L232 (lab)
Instructor: Dr. Deana Erdner
E-mail: derdner@utexas.edu
Office: L205
Office hours: Monday 9-12, open door throughout the week

T.A.: Yida Gao
Email: yida.gao@utexas.edu
Office: L218
Office hours: Wednesday 2-3 p.m.

Course readings:
Assigned readings will consist of excerpts of chapters and figures from a number of sources including relevant journal articles and the following books. The books will be placed on reserve in the Marine Science Resource Center.


We will use Carmelo R. Tomas’s *Identifying Marine Phytoplankton* and Harold G. Marshall’s *Identification Manual for Phytoplankton of the United States Atlantic Coast* for species identification and will have multiple copies of each available in the lab.

Course description:
This is an introductory level course that will cover the taxonomy of the major phytoplankton groups, their physiology, and their role in marine ecosystems. You will be introduced to sampling methods, identification techniques, and a variety of modern analytical tools used to study phytoplankton physiology such as flow cytometry, fluorescence microscopy and cell staining. The class includes a combination of field sampling, lectures, and lab work/identification.

Course objectives:
The overall objective of this course is to familiarize you with the different groups of phytoplankton, their structural and physiological differences, and their role in overall ecosystem function. At the end of this course, you should have an understanding of:

- The role of phytoplankton in global ecosystems
- How to sample phytoplankton, both qualitatively and quantitatively
- The diversity of phytoplankton and how to identify them
Course website:
The Canvas webpage for this course is accessible through http://canvas.utexas.edu/.

Prior to each class:
Prior to each class, it is essential that you complete the assigned reading for that day. Also, pdf files of supporting material may be posted to Canvas, and you will also find links to various web resources on the site, updated throughout the semester. New and class reminders will be posted as well, so you should plan to check the site regularly. The lecture slides will not be posted to Canvas before class, but they will be added afterward as a resource. I encourage you to take notes in class, with a pen/pencil – study shows that taking notes by hand results in better performance on quizzes (Mueller & Oppenheimer 2014; http://www.nytimes.com/2014/06/03/science/whats-lost-as-handwriting-fades.html?_r=2).

Class Grading:
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<table>
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<tbody>
<tr>
<td>Attendance &amp; Participation</td>
<td>5%</td>
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<tr>
<td>Lab/field journal</td>
<td>10%</td>
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<tr>
<td>Lab reports</td>
<td>20%</td>
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<tr>
<td>Bug Collection</td>
<td>10%</td>
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<tr>
<td>I’m not flat</td>
<td>10%</td>
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<tr>
<td>Dichotomous key</td>
<td>5%</td>
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<tr>
<td>Quizzes</td>
<td>20%</td>
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<tr>
<td>Final exam</td>
<td>20%</td>
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Attendance & participation (5%):
This course has a small enrollment and relies on group activities as well as individual observation. Class attendance and participation together account for 5% of your grade, however they are two different things. Simply showing up in class is attendance, not participation. For your participation grade, you are expected to actively contribute to group efforts and to be engaged during class discussions and individual activities.

Class participation is not limited to your participation during lectures alone. Students must contribute to field collections, field measurements, microscopic analysis and identifications. Particularly in the case of the microscope work, each student must examine each of the samples and record their observations. While it may be tempting to “split” the work with another student, i.e. examine different samples and swap notes, this negates many of the class objectives. The use of microscopy data other than your own constitutes plagiarism and will be handled as stated in the Academic Dishonesty Policy.

Regular attendance at all class meetings is expected. Studies have shown a significant positive correlation between class attendance and final grades (Street 1975, Gunn 1993), so we encourage students to attend and participate actively in all of the class sessions. Getting your physical self to class but then checking out mentally (e.g. sleeping, texting, checking InstaGram) does not count as attendance. Absence for religious observances is allowed as per the Holy Days policy.

Lab/field journal(10%):
Students will need a lab notebook to record their data and observations; this notebook is one of your assignments for the course. Because it is used to record your field and lab observations, it
should generally be completed during lab. Think of this like a journal or daily log of the observations and measurements from field trips and all in lab observations. These should include data collected as well hand sketches of all plankton identified. Lab notebooks will be taken up before spring break (to provide feedback) and at the final exam (to be graded).

Lab reports (2 @ 10% each):
We will have two experimental labs – pigment separations and growth physiology – that will require a lab report. The details regarding report content and format will be provided at or before the time of the lab experiments.

Bug Collection (10%):
Analogous to an entomology class, one of your goals for the semester is to “collect” as many phytoplankton specimens as you can. A collection needs to be recorded as an image, either from the microscope or the IFCB dashboard. All specimens must be identified to genus, with accompanying higher-level taxonomy according to Adl et al. (2012). We will keep a “master list” of all the taxa observed in lab, and species from this list will be chosen for the final exam. Your grade will be based on the number of species collected (as compared to the average number of species collected) and the correctness of your identifications. In addition to a grade, there will be 1st and 2nd place prizes awarded for the largest bug collections.

I’m not flat (10%):
In general, when we view cells under a microscope, they appear 2-dimensional. This is because they most often settle onto the side with the largest surface area. As a consequence, many species have a 3-dimensionational shape that is not easily predicted from their shape on a slide under a compound microscope. You will be expected to use a combination of microscope observations (both compound and stereo), IFCB images, and online resources to understand the 3-dimensional shape of two different phytoplankton species, and recreate them using modeling clay. These 3-dimensional models must be to scale (10µm=2cm for cells ≤20µm longest dimension, 10µm=1cm for cells ≥20µm longest dimension) and “anatomically” correct. They must be accompanied by a short description of the species, including scientific name, classification, and typical dimensions, along with sources used.

Dichotomous key (5%):
Evolutionary relationships amongst phytoplankton groups and species are distinguished using a variety of characteristics such as pigments, cell coverings, and life cycles. As we learn these characteristics, we will together synthesize all of this information to create a dichotomous key for the phytoplankton. A dichotomous key is defined by the availability of two choices at each identification step. Additional details on dichotomous keys will be provided in a separate handout.

Quizzes (2% each)
There will be 10 quizzes given over the course of the semester. These quizzes are low stakes – each one is worth only 2% of your grade. Having quizzes during the semester helps to identify those areas that may need additional review. As an added bonus, research (from our very own University of Texas) shows that frequent quizzes improve overall performance in classes.

Quiz dates are marked with a “Q” on the course schedule. No credit will be given for a quiz that is missed because of an unexcused absence. If a quiz is missed and a valid non-academic excuse (e.g. illness) is provided to the instructor, the missed quiz will not be counted towards the final grade; instead, the scores of the remaining quizzes will be averaged to determine the final grade.

Final (20%):
The final will take the form of a practical - identifying phytoplankton from images or slides. You will be expected to identify the genus of each specimen, along with their appropriate phylum/division.

Useful online resources:
- AlgaeBase http://www.algaebase.org/
  - Use for ecological info, but not for taxonomy, they use a different scheme
- Tree of Life – the algae http://tolweb.org/notes/?note_id=52
- Port Aransas IFCB http://toast.tamu.edu/ifcb7_new_data/web/dashboard.html
- Martha’s Vineyard, USCGC Healy, Salt Pond IFCB http://ifcb-data.whoi.edu/mvco
- Microscope microscopec.mbl.edu
- Dinoflagellate Atlas http://dinos.anesc.u-tokyo.ac.jp/
- Guide to Diatoms of the South China Sea http://life.xmu.edu.cn/diatom/diatomphoto/mainmenu.htm
- PhycoKey: http://cfb.unh.edu/phycokey/phycokey.htm

Re-grading policy:
Requests for re-grading will be considered for one week after the corrected assignment is returned. Requests must be submitted in writing (paper or email) before the end of one calendar week after they are returned. The instructor will provide an answer within one calendar week after the request is received.

Grading policy:
Late assignments will be assessed a 10% penalty per day late (including weekend days). For example, an assignment turned in 5 days late can get a maximum score of 50% if everything is perfect. The failure to turn in an assignment will result in a grade of Incomplete for the course. When you submit your assignments via email, please cc: yourself and also request a return receipt so that you can be sure that they were received.

We will be using the plus/minus grading system. The cutoffs for the various letter grades is as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>95-100%</td>
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<tr>
<td>A-</td>
<td>90-94%</td>
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<tr>
<td>B+</td>
<td>87-89%</td>
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<tr>
<td>B</td>
<td>83-86%</td>
</tr>
<tr>
<td>B-</td>
<td>80-82%</td>
</tr>
<tr>
<td>C+</td>
<td>77-79%</td>
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University email notification policy:
In accordance with University policy regarding e-mail, information concerning this class may be communicated via email, and it is expected that e-mail messages will be received and read in a timely manner. E-mail will be sent to your official e-mail address, which can be updated in UTDirect. It is the responsibility of every student to keep the University informed of changes in his or her official e-mail address. Consequently, e-mail returned with "User Unknown" is not an acceptable excuse for missed communication. Students are expected to check e-mail on a frequent and regular basis, recognizing that certain issues may be time-critical. It is strongly recommended that e-mail be checked daily. Undeliverable messages returned because of either a full inbox or use of a "spam" filter will be considered delivered without further action required of the instructors or teaching assistant.

Drop dates:
For the Spring 2017 semester, drop dates are as follows:

- Friday, Jan. 20 last day of the official add/drop period
  To drop a class after this date, you may need approval of the department chair and dean
- Wednesday Feb. 1 last day to drop a class for a possible refund
- Monday, Apr. 3 last day to drop a course with approval of the Dean, except for urgent and substantiated, nonacademic reasons; last day to change registration to/from the pass/fail basis

Holy days policy:
Students are excused from attending classes or other required activities, including examinations, for the observance of a religious holy day, including travel for that purpose. If you are absent from class or examination for the observance of a religious holy day, you will not be penalized for that absence, and you may turn in your assignment or take the examination within a reasonable time after the absence. A student who will be absent due to observance of a religious holy day must provide written notice fourteen days prior to the class absence. It must be personally delivered to the instructor and signed and dated by the instructor; sent certified mail with return receipt requested, or may be sent by email provided proper acknowledgment has been sent by the instructor. A student who fails to complete missed work within the time allowed will be subject to the normal academic penalties. For religious holy days that fall within the first two weeks of class notice must be given on the first class day.

Disability policy:
The University of Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, 471-6441 TTY.

Academic dishonesty:
Academic dishonesty will not be tolerated as such behavior harms the individual, all students, and the integrity of the University. Discussion of the course material with your classmates is
strongly encouraged. However, the final product (assignment, paper, etc.) must be your own. Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Policies on scholastic dishonesty will be strictly enforced. For further information, please visit the Student Judicial Services web site at [http://deanofstudents.utexas.edu/sjs/](http://deanofstudents.utexas.edu/sjs/).

We feel strongly that plagiarism is dishonest, both academically and professionally. Turning in an assignment that is not entirely your own work is plagiarism and will result in action commensurate with the policies stated in the University's Manual on Academic Honesty.

**Absence/Failing reports:** Instructors are required to submit Absence/Failing reports for those students whose progress is at or below a failing level at the time of the reports. These reports will be submitted before the end of the Q period to assist students in evaluating their progress in the course. The reports are based on your grade to date in the course; however, given that the reports cover only about the first one-third of the class, there is often not much graded material on which to base the reports. If you receive a report and are concerned, please contact Dr. Erdner.

**Emergency evacuation policy:** Occupants of buildings on The University of Texas at Austin campus are required to evacuate buildings when a fire alarm is activated. Alarm activation or announcement requires exiting and assembling outside. Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building. Students requiring assistance in evacuation shall inform their instructor in writing during the first week of class. In the event of an evacuation, follow the instruction of faculty or class instructors. Do not re-enter a building unless given instructions by the following: Austin Fire Department, The University of Texas at Austin Police Department, or Fire Prevention Services office.

**Lecture schedule:** The following is a projected lecture and lab schedule. Topics can vary if necessary:

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture topic</th>
<th>Lab topic</th>
<th>assignments</th>
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</thead>
<tbody>
<tr>
<td>Jan 17</td>
<td>Overview, Why taxonomy? Intro to the phytoplankton</td>
<td>Your microscope is your friend Intro to the IFCB</td>
<td>Discuss lab notebook expectations</td>
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<td>Jan 24</td>
<td>Evolution of the algae</td>
<td>Local collections – pier, WEC</td>
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<td>Jan 31</td>
<td>You are what you eat: Endosymbiotic theory</td>
<td>Observation time</td>
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<td>Feb 7</td>
<td>Guest lecture: Redrawing the Tree of Life (Brett Baker)</td>
<td>NO LAB; can do additional observations if needed.</td>
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<tr>
<td>Feb 14</td>
<td>Leaves are green because the ocean is blue: Pigments of algal groups</td>
<td>Pigment separations</td>
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<tr>
<td>Feb 21</td>
<td>Photosynthesis</td>
<td>Fluorescence microscopy</td>
<td>Pigment lab report due</td>
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<tr>
<td>Feb 28</td>
<td>Crunchy outside, chewy center: cell coverings</td>
<td>3-D phytoplankton modeling</td>
<td>I’m not flat due at end of lab</td>
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<td>Mar 7</td>
<td>Biochemicals et al.</td>
<td>Inoculate parent cultures for physiology</td>
<td>Lab notebooks due at end of lab (for feedback)</td>
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<td>Mar 14</td>
<td>SPRING BREAK</td>
<td>SPRING BREAK</td>
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<tr>
<td>Mar 21</td>
<td>Nutrient Physiology</td>
<td>Inoculate experimental cultures for physiology</td>
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<tr>
<td>Mar 28</td>
<td>Physiology - other</td>
<td>Review physiology results to date</td>
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<td>Apr 4</td>
<td>Circle of Life I</td>
<td>JOINT FIELD TRIP WITH TAMU Collections, FCM, sample processing</td>
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<tr>
<td>Apr 11</td>
<td>Circle of Life II</td>
<td>Field trip observations &amp; discussion</td>
<td>Physiology lab report due</td>
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<tr>
<td>Apr 18</td>
<td>Locomotion</td>
<td>Pier sampling</td>
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<tr>
<td>Apr 25</td>
<td>Dichotomous key</td>
<td>Finish up any observations</td>
<td>Bug Collections due Dichotomous Key due</td>
</tr>
<tr>
<td>May 2</td>
<td>Q&amp;A/final exam review</td>
<td>Q&amp;A/final exam review</td>
<td>Lab notebooks due after class; returned the next day</td>
</tr>
<tr>
<td>May ?</td>
<td>FINAL EXAM-check exam scheduling</td>
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