

INTRODUCTORY OCEANOGRAPHY (GEO-SCI 103)

Fall, 2009

Section 1: TuTh 11:15-12:30 Thompson 104
(schedule number 33712)

INSTRUCTOR:

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TEACHING ASSISTANT:

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Office Hours: Monday & Wednesday 10:00-11:00, ***and by appointment***

REQUIRED IN-CLASS BOOK*: *Investigating the Ocean: An Interactive Guide to the Science of Oceanography* by R. Mark Leckie and Richard Yuretich (2003, Third Edition, McGraw-Hill; ISBN: 0-07-287963-7).

*available at the **Textbook Annex** for \$41.75

Please note: YOU MUST BRING "INVESTIGATING THE OCEAN" WITH YOU TO EVERY CLASS

SPARK: <https://spark.oit.umass.edu/webct/entryPageIns.dowebct>

OCEANOGRAPHY IS A GENERAL EDUCATION COURSE:

Welcome to Introductory Oceanography! There are a number of reasons why you are taking this class. Many of you are taking this course to fulfill your **Physical Science (PS) general education requirement**. Many of you are interested in the oceans and wish to learn more. Perhaps you will decide to major in the Earth or Life sciences and pursue advanced degrees in marine geology or marine biology. Perhaps you plan to go to law school and specialize in Environmental Law or the Law of the Sea. Or maybe your family gets its livelihood from the sea, or spends a lot of time near the coast for pleasure. Over the years perhaps you've developed many questions about the sea.

You have enrolled in a **general education** course designed to acquaint you with the fascinating features of the nearly 71% of our home planet covered by water. The ocean basins are vast regions still shrouded in mystery, where new discoveries are being made every year. **Our goal in Geo-Sci 103 is to provide you with a basic knowledge of just how the global ocean works, how it impacts and controls the habitability of our planet, and how vital it is to our very existence.** These are *broad themes that reflect the spirit and value of the general education curriculum* that is a part of *your UMass experience*. As citizens of our small world, we would argue that everyone *should* take a course like this! With jet service to almost anywhere in the world, financial markets electronically and politically linked for "real time" transactions 24-7, and global populations striving to live as well as we do here in the U.S., it's important for all of us to gain a holistic view of our integrated geosphere, atmosphere, hydrosphere, biosphere, and cryosphere. At the same time, we want to explore the notion of scientific thinking and analysis. We will discuss how researchers collect data, form ideas, and then test those ideas. We want you to understand the

scientific theories that help us understand Earth processes and history. For example, we are sure that the core of the Earth is solid. *Why?* No one has ever been there. Hurricane frequency and/or intensity are likely to increase in coming years, say climatologists. *Why?* The Labrador Current moving south along the New England coast is warmer now than it's been in 70 years. *Why? Will this impact the price of fish in the grocery store?* We are rapidly depleting our natural hydrocarbon reservoirs. *Can the ocean provide alternate sources of energy?* Scientific research can help evaluate the impact of human activity on our home planet and it can have a direct effect on public policy. The latter is also governed in large measure by how global change begins to affect our everyday lives.

In addition to a broad introduction to the science of oceanography, the scientific principles upon which it is based, and the importance of the ocean in our daily lives, there are other benefits of this PS General Education course. Specifically, the **pedagogy** used in this course and the policies implemented here are relevant to the *real world*. For example, meeting deadlines, arriving to class on time, preparing for classes and exams, thinking critically, plotting and analyzing data, synthesizing concepts, working in groups, considering diverse perspectives, communicating effectively (see below), and writing well are **tangible life skills** that will serve you well while you are here and after you leave UMass.

LEARNING GOALS

- To demonstrate that **science is accessible** to a largely non-scientific audience by gaining exposure, familiarity, confidence, and interest in our home planet and our place in it.
- To grasp **fundamental concepts** about how Earth works as an integrated system comprising the geosphere, hydrosphere, atmosphere, cryosphere, and biosphere.
- To relate **common experiences** to our understanding of the world around us and to gain clearer perspective of our collective **human impact** on the Earth system.
- To ask **how we know what we know**.
- To explore **scientific inquiry as a process** that reveals the details and splendor of our natural world.
- To challenge ourselves to become better **stewards** of our home planet.

SPARK:

SPARK is the UMass-Amherst Learning Management System (LMS), designed to provide course information and management via the web. Only students enrolled in Geo-Sci 103 will have access to the course website. **Everyone must have an active OIT (Office of Information Technology) computing account.** Access the OIT guide for new students at <http://www.oit.umass.edu/guides/new.html>. For general OIT information, use <http://www.oit.umass.edu/guides/students.html>. Go to the following URL if you need help with SPARK: <http://www.oit.umass.edu/spark/students/index.html>.

SPARK will be used for several major functions: 1) view PowerPoint lecture notes; you can also print these pages if you wish, 2) provide an up-to-date calendar, and 3) access to grade information, including exams and in-class exercises. The grade information will allow you to track your progress in the course. In addition, SPARK will be used to provide updates to the syllabus and post special announcements. To access SPARK, go to <https://spark.oit.umass.edu/webct/entryPageIns.dowebct>, then click on **Go to the SPARK log in page**.

COURSE STRUCTURE AND POLICIES: (please read carefully)

1. Class Meetings - Our class meetings will be **interactive**. Although traditional lectures will be used to convey the basic information necessary to understand the topic being addressed, much of the time will be spent discussing issues, doing exercises, and interpreting data so you can learn by doing. Your participation is crucial to your success in the course! **Attendance is mandatory**. Although all the factual material is in the textbook and PowerPoint slides, class time allows us the opportunity to highlight the important points, look at the interrelationships among the different parts of the science, discuss current events and discoveries, and clarify questions you may have with the readings. Taking your own notes really helps in learning, too, and over the years there has always been an excellent correlation between class attendance and grades (see Excused Absences below). **Classes are 75**

minutes long and we will need all of that time to consider the subject of the day. Please be prompt, but if you are unavoidably delayed or must leave early **please use the back entrances to the auditorium**. Courtesy during class is important. Pay attention to what we are doing. Please come to class prepared to engage in the material.

2. **Lectures and Readings** - There is no way possible to examine all the scientific material related to the oceans in 14 weeks of classes, and still have time for discussion and inquiry. For this reason we need an abbreviated textbook ("*Investigating the Ocean*"). The goal of the readings is to prepare for the subject under discussion. The reading assignments in the textbook will parallel the lecture material. If you keep current with the readings, then you will get more out of the course and you'll also have an easier time preparing for the exams. "*Investigating the Ocean*" also contains the in-class exercises and/or homework assignments that we'll be doing this semester. ***You must bring this book to every class!*** On most days, we will do one or more of the exercises in this book and we will collect at least 10 of these completed exercises during the semester (see In-Class Exercises below). In order to do well in this course, you will be expected to attend all lectures, take good notes, actively participate in the in-class exercises and discussion, and *read the assigned material*. It is to your advantage to read the material before class. **The exams will be based on the material presented in class** (including videos and in-class exercises, see #3 and #7 below) **and on the assigned readings**.
3. **Daily In-Class Exercises and/or Take-Home Assignments** - Throughout the semester, **problem solving exercises and follow-up classroom discussions** will be a daily component of our active-learning environment. You must be in class to participate and benefit from these exercises and discussions. Some of the exercises will be collected, others will not. However, please note, there will be **no make-ups** (see Excused Absences below) and **no papers will be accepted after that class has ended**. The concepts covered in these in-class materials will be included on the exams (see #2 above). **At least 10 exercises will be collected during the semester** (to be determined), and each collected exercise is worth ~2% of your final grade (each exercise will be checked and assigned 0, 1, or 2 points). **Full credit** for each exercise will be earned by successful completion of all requested information. The exercises collectively will be worth **20% of your grade**. There is likelihood that more than 10 exercises will be collected. Participating in class and turning in all the exercises is equivalent to earning a 100% on one of the exams (i.e., collectively, the in-class exercises have the same value as one exam).
4. **Films and videos** - there will be numerous good films and videos during the semester. You will be responsible for the subject matter covered in these films.
5. **Examinations** - **FOUR EXAMS** will be given during the semester (see attached schedule). The exams will account for a total of **60% of your grade** in the course. The **lowest score will be dropped**. The three highest scores are **each worth 20%** of your grade. The exams will consist of multiple-choice questions, some of which will pertain to diagrams or illustrations that we have discussed in class. All exams will be administered as 2-stage "**pyramid exams**". You will have a set period of time to take the exam, turn in your scantron sheet, then retake the exam with open book, open notes, and discussion among other people in the class (graded 75% for the "solo" effort and 25% for the "group" effort). **Exam results will be posted on SPARK.**

Exams Dates (all exams, except the Final, will be held during class-time):

Exam 1: Thursday, Sept. 24

Exam 2: Tuesday, Oct. 20

Exam 3: Thursday, Nov. 5

Exam 4: Tuesday, Nov. 24 * PLEASE NOTE:** this is the week of Thanksgiving – make your travel plans accordingly ***

Please note: ***THERE WILL BE NO MAKE-UP EXAMS*** (SEE #7 BELOW)

- 6. Final Examination** - The **FINAL EXAM** will cover the last segment of the course plus additional questions from previous material; i.e., **the Final Exam is cumulative** and will be **worth 20%** of your grade in the course. The date, time, and place of the Final Exam will be announced later in the semester.

Please note: ***EVERYONE MUST TAKE THE FINAL EXAM.***

- 7. Exam Help Sessions** - Help sessions will be offered the evening before each exam. The time and location of each help session will be announced in class. In addition, the T.A. and I will also hold individual **Office Hours** (please utilize these options!).

Help Sessions (all will be held the evening before each exam):

Wednesday, Sept. 23, 7:00-8:30 pm, room to be determined

Monday, Oct. 19, 7:00-8:30 pm, room to be determined

Wednesday, Nov. 4, 7:00-8:30 pm, room to be determined

Monday, Nov. 23, 7:00-8:30 pm, room to be determined

- 8. Excused Absences** - If you must miss an exam or a class because of participation in **athletics, band,** or other legitimate reason, you must **notify me before the event** so that we can make arrangements for missed work. If you miss an exam or a class because of **illness**, you **must contact me as soon as possible** by phone (545-1948) or webmail/email (SPARK or mleckie@geo.umass.edu). If need-be, have a friend or parent contact me; **communication is essential**. If you do miss class, lecture material will be available online at SPARK.
- 9. Communication and Email/Webmail Best Practices** – Please use SPARK to communicate with our Teaching Assistant or me. When communicating with us, please use an appropriate **subject line** ('Re:' or 'ATTENTION' are not appropriate subject lines). Begin your message with some form of **greeting (salutation)** such as Dear Mark or Dear Professor Leckie. Also, don't forget to **sign your message with your name**. Please note: **I will not answer any email/webmail messages that lack a signature/name**. Be professional. This is not text messaging; it is more like communicating with your boss, not your buddy. For additional information about **email etiquette**, please see <http://owl.english.purdue.edu/owl/resource/636/01/>.
- 10. Final grades** - Your grade will be computed by counting the **highest 3 of the first 4 exams** (20% x 3 = 60%) and **adding these to the Final Exam** (20%), and the **in-class exercises** (20%). Remember, the lowest of the first 4 exams is dropped, but there are no make-up exams (unless you have an excused absence – see #8 above). There will be the possibility for **extra-credit**. Details will follow in a supplement to this syllabus.

11. Grade scale - Listed below is our tentative grade scale (see #9 above):

- A = 93-100
- A- = 90-92
- B+ = 87-89
- B = 83-86
- B- = 80-82
- C+ = 77-79
- C = 73-76
- C- = 70-72
- D = 63-69
- F = <63

TO SUMMARIZE: WHAT YOU CAN EXPECT

- A. You will get a broad introduction to the science of oceanography, the scientific principles upon which it is based, and the importance of the ocean in our daily lives.
- B. Class meetings will be interactive, with numerous in-class activities and exercises. Grades will be based on both individual and group exams, and your participation in these exercises.

WHAT WE EXPECT

- A. Regular attendance, keeping-up with the readings in the text, active participation during class, and completion of the in-class exercises and take-home assignments.
- B. Courtesy during class. This means arriving to class on time, paying attention to what we are doing that day, and participating actively in class discussions and exercises. Cell phones and other personal electronic devices are not to be used during class time. Thank you!

How can I earn an "A" in this class? It is very feasible! If you always attend class, there are many opportunities to succeed.

- **Attend all classes** and engage in the material
- **Review your class notes** that evening; *what's not clear to you? write it down*
- **Review the previous class notes** while waiting for class to begin; *do you have any questions for me?*
- **Participate** in and complete all in-class exercises (**worth 20% of your grade plus extra-credit!**)
- **Study** for and take all 4 exams (**the lowest score is dropped!**)
- **Ask questions**, participate, get involved with the material
- **Seek help** with your questions: come to **Help Sessions**, and instructor and T.A. **office hours**

Date Topic "Investigating the Ocean"

THE GEOSPHERE

Continents and Ocean basins, Earthquakes and Volcanoes

Sept. 8	Course logistics and the syllabus; <i>why study the ocean?</i>	p. 90
Sept. 10	Navigation; where in the world are we?	p. 88
Sept. 15	Earth in 2, 3, & 4 dimensions: maps, structure, & history	p. 92, 94
Sept. 17	Continents and ocean basins	p. 96, 98, 100
Sept. 22	Plate tectonics: shifting continents & seafloor spreading	p. 102, 104, 106
Sept. 24	EXAM 1	

THE HYDROSPHERE & ATMOSPHERE

The Nature of Seawater, the Hydrologic Cycle, and Global Climate

Sept. 29	<i>What's so special about water and why is the ocean salty?</i>	p. 108, 110, 114
Oct. 1	Solar heating of Earth and the transfer of heat	p. 112, 116, 118
Oct. 6	Seawater density and ocean stratification	p. 128, 130
Oct. 8	Coriolis effect	p. 122
Oct. 13	NO CLASS (follow Monday class schedule)	
Oct. 15	Prevailing winds and global climate	p. 120, 124, 126
Oct. 20	EXAM 2	

OCEAN CIRCULATION, WAVES, & TIDES

The Motion of the Ocean and the Transfer of Energy

Oct. 22	Wind-driven circulation and upwelling	p. 132, 134, 136
Oct. 27	Thermohaline circulation and the global conveyor	p. 138, 140
Oct. 29	Waves	p. 142
Nov. 3	Tides	p. 144
Nov. 5	EXAM 3	

THE MARINE BIOSPHERE

The Pyramid of Life and Marine Ecosystems

Nov. 10	Primary productivity and the cycling of nutrients	p. 146, 148, 150, 152, 154
Nov. 12	Seasonality, food webs, and the trophic pyramid	p. 156, 158
Nov. 17	Pelagic and benthic ecosystems	p. 164
Nov. 19	Fertile oases: coastal ecosystems and coral reef ecosystems	p. 160, 162, 166
Nov. 24	EXAM 4 (*please note: this is the Tuesday before Thanksgiving recess)	
Nov. 26	HOLIDAY (Thanksgiving)	

THE COAST

Habitats, Natural Hazards, & Issues of Global Change

Dec. 1	Longshore drift and the formation of beaches	p. 168, 170, 172, 174
Dec. 3	Coastal environments and habitats	p. 160, 182
Dec. 8	Sea level rise and coastal hazards	p. 176, 178, 180
Dec. 10	Human impact and issues of global change	p. 184
TBA	Review and help session for cumulative final exam	
Dec. 18	FINAL EXAM (*please note: this is a cumulative exam): 8 am, Boyden Gym	