Marine Sediments, Spring 2011
MSCI/GEOL 553

I. COURSE LOGISTICS

Instructor: Howie Scher, hscher@geol.sc.edu, PSC 519
Office hours T & W 3:30-4:30 and by appointment

Class Schedule: T/Th 2:00-3:15pm in PSC 201

Course webpage: http://www.blackboard.sc.edu

Texts:

There is not a textbook for this course. Rather, readings will come from a variety of sources:

- Reserves at Thomas Cooper (see separate list)
- Textbook chapters on Blackboard
- Peer reviewed articles of original research (pdf's on Blackboard)

Recommended texts (particularly for graduate students)

Elements of Style; Strunk and White

A Rulebook for Arguments. Anthony Weston - Hackett Pub. (2009) - Paperback - 88 pages - ISBN 0872209547

Marine Geology, James Kennett, 1977

COURSE DESCRIPTION: This course will cover the sources, classification, and distribution of marine sediments. The origin and transport vectors of marine sediments in the ocean will be covered, as will the processes influencing marine sediments. Much of the course will be devoted to deep-sea sediments. A series of lectures in April given by Dr. Dave Barbeau will cover sedimentation and sequence stratigraphy on the continental shelves.

Many of the concepts in this course will be examined using various data visualization techniques. We will be using GeoMapApp (www.geomapapp.org) to work with global scale grids as well as large marine sediment data. GeoMapApp is an earth science exploration and visualization application that is continually being expanded as part of the Marine Geoscience Data System (MGDS) at the Lamont-Doherty Earth Observatory of Columbia University. The application provides direct access to the Global Multi-Resolution Topography and other global scale datasets.

It is expected that students have a basic grasp of the Earth System. The fundamental underpinnings of Marine Science and Geological Sciences are plate tectonics, the planetary energy balance that drives atmospheric and ocean circulation, biogeochemical cycles, and geological time. Where necessary I will provide short reviews of this material in lecture or assigned reading format.

II. GRADING

There are two grading schemes; one for graduate students and one for graduate students.

Undergraduate students

Midterm	40%
Final	40%
Problem sets	15%
Group discussions	5%

Graduate students

Midterm	35%
Final	35%
Problem sets	15%
Research project	10%
Group discussion	5%

III. COURSE FORMAT AND ORGANIZATION:

1. Exams
The midterm and final will both be take home exams and will involve answering questions about marine sediments and sedimentation using various approaches such as spatial analysis (e.g., with GeoMapApp), graphing data sets, and quantitative methods. Short answer and essay questions will cover material from lectures, assigned readings, and problem sets.

The midterm and final are both open book/note take home exams. All texts, problem sets, data sets, readings, notes, handouts and Internet resources that were covered in the course can be used.

2. Problem sets
Six problem sets will be assigned that will require loading large datasets into GeoMapApp and interpret spatial patterns in the context of marine sediments and sedimentation. Specific expectations for undergraduates and graduate students will be communicated to you. Additional problems sets may be assigned at the discretion of the instructor.

3. Research project
Graduate students will complete a research project that involves analyzing published marine sediment datasets. Students may wish to focus on a regional dataset related to their own thesis topic. Published datasets may be found in geological repositories such as Pangaea (www.pangaea.de) and the national geophysical data center (www.ngdc.noaa.gov).

4. Group discussions
Several articles from the literature will be assigned and will be discussed in group format. Two discussion leaders, one graduate and one undergraduate will be selected at random to lead the discussion. This means that everyone should come prepared to lead the discussion.

Undergraduates will be responsible for leading one discussion and graduate students will lead two discussions.

IV. LEARNING OUTCOMES

By the end of the semester students will have acquired the following:

- An understanding of the sources, formation, classification and distribution of marine sediments
- Knowledge concerning physical and chemical processes involving marine sediments
- Familiarity with experimental approaches in marine sedimentology
- A basic understanding of the anatomy of a robust scientific argument
- Experience with manipulating large datasets in spreadsheets
- A working knowledge of the data visualization program GeoMapApp
- Improved oral and written communication skills
- Improved ability to work collaboratively

A note on collaboration

As Marine Science is an interdisciplinary course; marine scientists often work collaboratively on projects. I expect that many of you will choose to work in small groups on assignments for this course. Please review the definitions below and come talk me if you are unclear about how these apply to working together on projects.

V. On academic integrity

University of South Carolina Honor Code

"It is the responsibility of every student at the University of South Carolina Columbia to adhere steadfastly to truthfulness and to avoid dishonesty, fraud, or deceit of any type in connection with any academic program. Any student who violates this Honor Code or who knowingly assists another to violate this Honor Code shall be subject to discipline."

Forms of academic dishonesty:

Plagiarism: 1. The action or practice of taking someone else's work, idea, etc., and passing it off as one's own; literary theft.

Cheating: 1. To defraud; to deprive of by deceit. 2. To deceive, impose upon, trick. 3. To deal fraudulently, practice deceit.

Fabrication: 1. The use of invented information or the falsification of research or other findings.

Academic Misconduct: 1. An act that disrupts the educational process or provides a student with an academic advantage over another student.

Course Outline, important deadlines, and group discussion schedule

Day	Date	Topic	Reading	Article discussion	Due Today
	M, 1/10	First Day of classes			
1	T, 1/11	Classification and sampling of marine sediments.	OC Ch. 1 (reserves)		
2	Th, 1/13	Using maps to organize marine data; Introduction to GeoMapApp. MEET IN SUMWALT 241 computer lab.	Wessel, 2010; GeoMapApp cookbook		Produce a global map of sediment thickness and scientific ocean drilling locations, pdf of map due by end of class
	F, 1/14	Last day to drop/add			
3	T, 1/18	Water column processes & Earth system basics	Suggested: KKC Ch. 4 & 5		Problem set 1: NGDC surface sediments
4	Th, 1/20	Terrigenous sediments, sources and distribution	Lisitzin; Ch. 2-5		
5	T, 1/25	Discussion & terrigenous sediments, currents, and sortable silt	McCave et al., 1995	Pfuhl and McCave, 2004	
6	Th, 1/27	Terrigenous sediments and sediment provenance	Goldstein and Hemming, 2003		
7	T, 2/1	Discussion & Biogenic sediments; carbonate sediments	Tucker; Ch. 2	Hemming et al., 2007	
8	Th, 2/3	Distribution of carbonate sediments			Problem set 2: Antarctic bedrock geology from circum-Antarctic piston core tops
9	T, 2/8	Carbonate sediments in the geologic record	Tucker; Ch. 5 (pgs. 228-238)		
10	Th, 2/10	Biogenic sediments; siliceous sediments			Problem set 3: Mapping the CCD with marine sediment data
11	T, 2/15	No class; Howie on travel			
12	Th, 2/17	Organic matter in marine sediments			

13	T, 2/22	Hydrocarbon, methane hydrates, and impacts on global climate			
14	Th, 2/24	Bioturbation and the deep biosphere			
	M, 2/28	Stratigraphy and correlation of marine sediments			
15	T, 3/1	Discussion & marine sediments in the geological record	Berggren et al., 1995 (pgs. 129-138)	Channell et al., 2010	Problem set 4
16	Th, 3/3	Midterm			
	T, 3/8	Spring Break			----------
	Th, 3/10	Spring Break			----------
17	T, 3/15	Scientific Ocean Drilling	The Jessica Project; High Drama of a Bold Thrust Through the Ocean Floor, John Steinbeck. Life, issue April 14, 1964 pgs. 110-122		
18	Th, 3/17	Plate Tectonics and marine sediments		Volkor?	
19	T, 3/22	Reconstructing Earth's history with marine sediments	Zachos et al., 2001 & 2008		Problem set 5: The Peru-Chile Trench
20	Th, 3/24	Metaliferous and Hydrogenous sediments			
21	T, 3/29	Ferromanganese crusts and past ocean chemistry	Frank, 2006	Albarede?	Problem set 6: Ferromanganese crusts
22	Th, 3/31	Guest lecture: Dave Barbeau			
23	T, 4/5	Presentations			
24	Th, 4/7	Presentations			
25	T, 4/12	Guest lecture: Dave Barbeau			
26	Th, 4/14	Guest lecture: Dave Barbeau			
27	T, 4/19	Guest lecture: Dave Barbeau			

28	Th, 4/21	Guest lecture: Dave Barbeau			
	M, 4/25	Last day of classes			----------
	T, 4/26	Reading Day			----------
	4/27	Final Exam			----------