GEOS 315 – SEDIMENTATION AND STRATIGRAPHY
Fall Semester, 2012

COURSE INFORMATION

Instructor: Dr. Samuel D. Matson
Contact Information: sammatson@boisestate.edu, (208) 426-3645
Website: http://earth.boisestate.edu/sammatson
Office Hours: Tuesdays 10:30 am – 12:30 pm and by appointment, 1162 Environmental Research Building

Assistant Instructor: Kyle Makovsky (kylemakovsky@u.boisestate.edu)

Course Text (required): Boggs, Sam Jr., 2012, *Principles of Sedimentology and Stratigraphy* (5th edition), Prentice Hall, ISBN: 0-321-64318-6
Course Website: http://blackboard.boisestate.edu
Course Dates: 29 August – 14 December 2012

Lecture Time/Location: WeFr 10:30 – 11:45 am, ERB 2104
Lab Time/Location: Fr 1:30 – 5:30, ERB 2100 and at various field locations

COURSE DESCRIPTION & PURPOSE

Sedimentary rocks cover roughly 75% of the Earth's surface, and are the source for the majority of the world's groundwater, hydrocarbon resources, and many mineral deposits. Further, most of our knowledge about Earth's history – including past climate, biological evolution and extinction, and uplift and erosion of mountains – also comes from sedimentary rocks. This course will focus on sedimentology and stratigraphy, which are two major facets of understanding the sedimentary rock record. Sedimentology is the study of sediment, with an emphasis on reconstructing the mechanisms through which it is/was transported and the environments in which it is/was deposited. Stratigraphy is the study of sedimentary strata, with an emphasis on their spatial and temporal relationships and the implications of those relationships for tectonic and/or environmental change through time.

One primary purpose of this course is to help you become familiar with the specific ways in which sedimentary rocks are studied, described, and interpreted in both the laboratory and in the field. More importantly, another purpose of this course is to teach you to observe, think, and communicate like a geoscientist. You will learn to make careful, detailed observations and measurements of sedimentary rocks, and to formulate testable hypotheses based on your observations. You will then learn to make logical and reasoned interpretations based on the data you collect, and to connect your interpretations to create a coherent, internally consistent model that explains the broader geologic context in which the sedimentary rocks formed. Finally, you will learn to clearly and accurately articulate your observations and interpretations to other geoscientists.

COURSE LEARNING OUTCOMES

Upon successful completion of this course, each student should be able to:

– use appropriate observations and terminology to describe, identify, and classify sedimentary rocks and structures in the field and in the laboratory

– delineate, measure, and describe stratigraphic units in the field, and use those data to develop an accurate and representative stratigraphic section.

– use features of sedimentary rocks (e.g., lithology, texture, fabric, structures) at macroscopic and microscopic scales to interpret depositional environments and diagenetic history.

– use an outcrop, stratigraphic section, and/or correlation diagram to interpret the depositional history of a stratigraphic sequence, and develop a coherent model describing the relative roles of sediment supply, subsidence, and/or base level in creating the sequence.

– formulate and clearly describe an original hypothesis focused on a sedimentary process, design an experiment to test that hypothesis, and analyze and interpret the results of the experiment.

– effectively communicate sedimentologic/stratigraphic data, observations, and interpretations through written and graphical representation.

COURSE ORGANIZATION AND GRADING CRITERIA

Your final grade will be based on points that you have earned on exams, in-class exercises and out-of-class homework, and 4 field-based projects. The weight of each of these assessments in your final grade is as follows:

Assessment Category	Percent of Grade
Exam 1	10%
Exam 2	10%
Exam 3	15%
In-Class Exercises & Homework	15%
Project 1: Castle Rock	5%
Project 2: Hull's Gulch	5%
Project 3: Military Reserve	5%
Project 4: Table Rock	35%
TOTAL:	100%

At the end of the semester, I will evaluate the total percentage you have earned on the assessments above and will determine your final letter grade as follows:

A	92 – 100%	B	82 – 87%	C	72 – 77%	D	62 – 67%
A–	90 – 91%	B–	80 – 81%	C–	70 – 71%	D–	60 – 61%
B+	88 – 89%	C+	78 – 79%	D+	68 – 69%	F	< 60%

Textbook Reading Assignments

Rest assured that while you have my empathy regarding the relatively high cost of the textbook for this course, I would not have required the book if it was not a valuable resource. *Make use of it!* The textbook reading assignments are listed in the course schedule. Please read the relevant text prior to coming to lecture and lab, as doing so will enhance what you take away from each class meeting and help you to formulate questions we can address in class.

Exams

There will be three exams in this class – 2 midterms (each 10% of your final grade) and 1 final (15% of your final grade); the dates for the exams are listed in the course schedule. The exams are individual, "high stakes" assessments – i.e., you will not be permitted to work with your classmates on the exams. The exams will be based on material from both lecture and lab, and will consist primarily of short-answer and essay questions, diagram sketching, labeling, and interpretation, and hands-on application of course concepts.

In-Class Exercises and Homework Assignments

There will be several activities we do in class (i.e., in the "traditional classroom") or as homework assignments throughout the semester. The total number of these activities/assignments remains to be determined, but in total they will comprise 15% of your final course grade. Typically, these exercises will involve things like writing short responses to in-class questions, sketching diagrams, applying mathematical concepts, and/or making observations and measurements in longer "lab-type" activities. Their purpose is to create dialogue, and to give you an opportunity to apply course concepts and receive feedback in a relatively "low-stakes", formative environment.

Projects

A substantial portion (50%) of this course is project-based. We will do three introductory projects over a period of four weeks, and each of these projects is worth 5% of your final grade. Note that 35% (!) of your final grade is based on a single large project for which you will collect data over a period of 4 weeks. These projects are designed to build upon one another, and to give you multiple opportunities to practice the learning outcomes outlined above. Grading criteria and other specific information about each project will be distributed later in the semester.

COURSE POLICIES:

1) **Academic Dishonesty:** Academic integrity is essential to a positive teaching and learning environment, and scholastic dishonesty is considered unacceptable in any form. All students enrolled in University courses are expected to complete coursework responsibilities with fairness and honesty. Failure to do so by seeking unfair advantage over others or misrepresenting someone else's work as your own, can result in disciplinary action. As described in Article 4, Section 1 of Boise State University's Student Code of Conduct:

   A violation may include cheating, plagiarism, or other forms of academic dishonesty. All assignments submitted by a student must represent her/his own ideas, concepts, and current understanding or must cite the original source. Academic dishonesty includes assisting a student to cheat, plagiarize, or commit any act of academic dishonesty. Attempts to violate academic integrity do not have to be successful to be considered academic dishonesty. Academic dishonesty includes turning in substantial portions of the same academic work to more than one course without the prior permission of the faculty members.

   Within this course, a student responsible for scholastic dishonesty can be assigned a penalty up to and including an "F" for the course. If you have questions regarding the expectations for a specific assignment or exam, ask.

2) **Accomodations:** If you have any physical or learning needs that might impact your learning and evaluation in this course, please discuss these needs with your instructor **at the beginning of the term**. The University has a multitude of resources so don't hesitate to let your instructor help you. *To request academic accommodations for a disability, contact the Disability Resource Center, Admin 114, (208) 426–1583. Students are required to provide documentation of their disability and meet with a Disability Specialist prior to receiving accommodations. Information about a disability or health condition will be regarded as confidential.*

3) **Attendance:** Class attendance is essential. Much of the class is based on activities and discussion, which require full attention and participation. Please be prompt and ready to begin at the start times for lecture & lab.

4) **Communication:** If you have something important to tell your instructor (i.e. you'll be late, absent, etc.), send an email reminder. Telling your instructor after class and hoping he/she will remember is not a good option. You must notify your instructor(s) well in advance of any travel plans for university-sponsored events (athletics or other activities) that will interfere with the scheduled course activities.

5) **Late Work:** In certain situations, projects, homework, or in-class activities may be turned in past the due date but are subject to the following penalties:

   0–1 week overdue: –15%
   1–2 weeks overdue: –25%
   2–3 weeks overdue: –35%
   >3 weeks overdue: no credit

   Project 4 (Table Rock) is an exception to the above policy – it will be accepted up to one week past the due date (with a penalty of –15%), but will not be accepted after that time. To receive credit, late submission of any assignment must be discussed with your instructor in advance of the due date.

6) **Electronic devices:** Please show respect for your instructor and fellow students by turning off all cell phones or other mobile electronic devices before coming to class. No devices that allow communication of any kind may be used during examinations in this course. This includes, but is not limited to, cell phones, pagers, messaging devices, PDAs, computers with wireless network connections, and calculators with IR communications capabilities.

7) **Course Workload:** You should expect to spend at least 12 hours per week working to earn your 4 credits in this class. This includes lecture and lab, which account for 6.5 of those 12 hours. The remainder should be spent reading your textbook, studying your notes, working on assignments or coming to office hours. Reviewing your notes over a cup of coffee for just 30 minutes after each class will be tremendously helpful as a review, and for identifying concepts you do not understand or gaps in your notes. We will cover many topics, most of which will be new and unfamiliar to most of you. I will do my best to make the course content as clear and accessible as possible; you should do your part by reading your textbook and reviewing your notes day to day.

COURSE SCHEDULE:

Wk	Dates	Lecture Topics	Lab/*Field* Topic	Text	Due
1	29 Aug	Introduction; Weathering; Basic(!) Fluid Mechanics	Sediment Description	Ch 1.1–1.2, Ch 2, 3	
	31 Aug	Physical Properties of Sediment			
2	5 Sep	Sediment Transport and Deposition	*Project 1: Castle Rock*	Ch 2, 4 Ch 12.1–12.3	
	7 Sep	Sediment Transport and Deposition			
3	12 Sep	Sedimentary Structures	*Project 1: Castle Rock (cont.)*	Ch 4	
	14 Sep	Sedimentary Structures			
4	19 Sep	Siliciclastic Petrology	*Project 2: Hull's Gulch*	Ch 5	
	21 Sep	Siliciliclastic Diagenesis and Petrography			
5	26 Sep	**EXAM 1**	*Project 3: Military Reserve*	Ch 16.1–16.5	
	28 Sep	Tectonics, Subsidence, & Sedimentary Basins			
6	3 Oct	Depositional Environments & Sedimentary Facies	*Boise Front Tour*	p 346–349, assigned articles	
	5 Oct	Intro to Stratigraphy of Western Snake River Plain			
7	10 Oct	Fluvial Environments	*Project 4: Table Rock*	Ch 8.1 Ch 1.4	
	12 Oct	Fluvial Environments			
8	17 Oct	Lacustrine and Deltaic Environments	*Project 4: Table Rock (cont.)*	Ch 8.4 Ch 9.2	
	19 Oct	Lacustrine and Deltaic Environments			
9	24 Oct	Beach and Nearshore Environments	*Project 4: Table Rock (cont.)*	Ch 9.3 Ch 10.2	
	26 Oct	Beach and Nearshore Environments			
10	31 Oct	**EXAM 2**	*Project 4: Table Rock (cont.)*	Ch 12	
	2 Nov	Stratigraphic Correlation			
11	7 Nov	Sequence Stratigraphy	Sequence Stratigraphy	Ch 12.4, Ch 13.2–13.3	
	9 Nov	Sequence Stratigraphy			
12	14 Nov	Carbonate Petrology	Sedimentary Petrography	Ch 6	
	16 Nov	Carbonate Diagenesis and Petrography			
13	21–23 Nov	**NO CLASS (Thanksgiving Break)**			
14	28 Nov	Carbonate and Evaporite Environments		Ch 11	
	30 Nov	Carbonate and Evaporite Environments			
15	5 Dec	Estuary, Lagoon, and Tidal Environments		Ch 9.4–9.6	PR4 due
	7 Dec	Estuary, Lagoon, and Tidal Environments			
16	12 Dec	Deep Marine Environments	Project 4 Gallery Walk-Through	Ch 10.3	
	14 Dec	Deep Marine Environments			
FINAL EXAM: Wednesday 19 December 2012, 7:30 – 9:30 am, ERB 2104					

STATEMENT OF TEACHING PHILOSOPHY

SAMUEL D. MATSON

As an educator, my primary objectives are threefold. First, I seek to convey to my students the value of a lifelong intellectual curiosity about the world around them. I believe that an understanding of science as inquiry-based is fundamental to quality education. ***I want my students to understand the fundamental importance of observation and of having questions, and to understand that science is a unique and powerful approach to answering those questions.*** *I enjoy sharing my passion for discovery with my students by incorporating my own interdisciplinary research interests into my teaching, and my experience as a student and researcher has taught me that interdisciplinary approaches to education are invaluable for creating new worldviews. Second,* ***I wish to give my students an opportunity to see the world – and their place in it – in an entirely different way****. I have come to see Geoscience as a particularly good vehicle for achieving this goal, since through the study of geology we enjoy a reality that is spatially and temporally beyond our everyday experience. Sharing this alternate worldview with my students is something I enjoy immensely and in turn, I hope to learn from the life experiences each of them brings to the classroom. Finally,* ***I wish to share with my students the importance of critical thinking and problem-solving as skills that extend beyond a college science course****. A fundamental goal I have for my teaching is to more directly encourage my students to move beyond the stage of analysis and interpretation, and on to action. That is, I want to help my students realize and implement concrete ways that they can apply their newfound knowledge to make positive changes both locally and globally.*

STATEMENT OF SHARED VALUES

Boise State University upholds the following values as the foundation for a civil and nurturing environment. Campus community members are expected to adhere to these common values.

1. Academic Excellence
2. Caring
3. Citizenship
4. Fairness
5. Respect
6. Responsibility
7. Trustworthiness