SEDIMENTOLOGY AND LITHOSTRATIGRAPHY

COURSE INFORMATION

Class Day and Time: T-Th 11-11:50
Labe Day and Time: Th 12-2:40
Class Location: CSL-422
Professor: Jillian Maloney
Contact: jmaloney@mail.sdsu.edu, 619-594-6394

Office Hours (and by appointment): T 1-2 & W 11-12
Office Hours Location: GMCS-117

COURSE OVERVIEW

Sedimentologic description and interpretation of the textures and structures of sediments and sedimentary rocks. Stratigraphic analysis of stratal succession, age relationships, and correlation on local and global scales.

In this course you will learn how to think like a geoscientist by making careful observations of sediments and sedimentary rocks and detailed interpretations including about the environment in which they formed. We will cover the properties of sediments, how sediment is transported and deposited, the structures and textures of sediment deposits, and the characteristics of sedimentary rocks formed in different environments.

Prerequisites: Geological Sciences 200 (not required but recommended for emphases in engineering geology and hydrogeology) and Geological Sciences 205 (not required but recommended for emphases in environmental geosciences and geophysics).

BROADER CONTEXT

This class is an upper-division course required for the Geological Sciences major (optional with Geophysics emphasis), which builds upon the goals and skills gained from lower-division preparatory and Major courses.

Geological sciences is the study of the earth, its past, present, and future. Geoscientists apply basic physical, chemical, and biological principles to understand how the earth was formed, how it evolved, and how it may change in the future. In addition to understanding the origin and evolution of our planet, geologists seek to discover, use, and manage earth’s resources in clean and environmentally responsible ways, and manage our water resources in a renewable way.

More than 70% of the rocks exposed at the earth's surface are sedimentary and so the ability to study those rocks is an important tool for every geoscientist. The study of sediments and sedimentary rocks is also important because:

1. Most of the world’s petroleum and natural gas is found in sedimentary rocks
2. Most groundwater is found in sedimentary rocks
3. The record of Earth’s past climate resides almost exclusively in sedimentary rocks.
4. Most fossils are contained within sedimentary rocks.
5. Sediments are involved in earth’s biogeochemical cycles
6. Sediments themselves are important natural resources
7. Sedimentary systems are important habitats for diverse ecosystems
COURSE MATERIALS


Additional class readings, notes, and activities will be posted on the Blackboard (blackboard.sdsu.edu) for this class.

LEARNING OUTCOMES

There are several course specific learning expectations for students that will guide the course content. I have divided the learning outcomes into overarching goals that we will build on throughout the semester and ancillary skills goals that we will accomplish through activities and assignments.

Overarching goals:

1. Analyze characteristics of modern sedimentary depositional environments as a response to physical processes.
2. Given an outcrop, one- or two-dimensional section, correlation diagram, or other representation of a stratigraphic section, interpret the depositional history of the sequence and its evolution through space and time (relative importance of sediment supply, subsidence, and/or base level in creating the sequence).
3. Given a tectonic setting, predict what types of sedimentary processes and depositional environments would result and what their stratigraphic signature would be.

Ancillary skills goals:

1. Make reproducible and accurate descriptions of sediments and sedimentary rocks including texture and structure.
2. Generate and test hypotheses about spatial patterns in modern sediment properties.
3. Reconstruct the processes that formed and modified sedimentary rocks based on acquired data.
4. Formulate and test a hypothesis about the nature and distribution of sedimentary environments or facies in space.
5. Interpret changes in a depositional environment through time (stratigraphic change) at a variety of spatial and temporal scales, based on data from sedimentary rocks and successions, and propose a defensible mechanism for those changes.
6. Communicate, orally and in writing, your interpretations of a sedimentary environment and defend your interpretation using data.
7. Communicate information and interpretations about a rock, outcrop, or sedimentary system using appropriate graphics (sketches, stratigraphic sections, facies maps, etc.)

PRIOR BACKGROUND

Based on your previous coursework, I will assume that you know the following:

1. The three main types of plate margins and, within this, the three types of convergent margins. You should be able to draw a reasonable cross section through these margin types and have a pretty good idea of the rock types that form in them.
2. You should know the difference between a chemical and clastic sedimentary rock.
3. You should be able to recognize a sandstone, shale, and conglomerate in hand specimen.
4. You should be able to recognize a limestone and a dolomite in hand specimen.
5. You should be able to identify quartz, feldspar (potassium and plagioclase), and micas in hand specimen.
6. You should know the difference between a rock and a mineral.
7. You should know what is meant by 'strike and dip.'
8. Given a reasonably simple geological map, you should be able to outline a geological history of the
mapped region.

If you are unfamiliar with these concepts, please refresh your understanding prior to the start of this class.

**COURSE ASSESSMENT AND GRADING**

The course assignments are designed to assess your mastery of the learning outcomes listed in this syllabus. Due
dates can be found in the course schedule in this syllabus and will be posted on Blackboard.

Midterm Exams (Take-Home) (2) – 20%
These assignments will ask you to apply concepts we learned in class in short format essays and reports. These may be based on lecture and lab material, reading assignments, field trips, or datasets and diagrams.

Quizzes (5) – 10%
Short-format, in-class quizzes will be used to assess learning outcomes.

Lab & Field Reports (10) – 40%
Lab reports will be based on field trips and activities conducted in class or lab period.

Project – 15%
This will be a hypothesis driven project that you will present in poster format at the end of the semester. You must submit a proposal outlining your research question and proposed methods mid-way through the semester. Details will be provided in class and on Blackboard.

Final – 15%
The final is cumulative and will assess your mastery of the learning outcomes listed in the syllabus.

**COURSE SCHEDULE**

**TABLE 1 - COURSE SCHEDULE WITH DATE, TOPIC, AND ASSIGNMENT**

<table>
<thead>
<tr>
<th>Week:</th>
<th>Tuesday 11:00-11:50</th>
<th>Thursday 11-11:50</th>
<th>Lab: Th 12:00-14:40</th>
<th>Assignments</th>
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<tbody>
<tr>
<td>1. Jan 19</td>
<td></td>
<td>Introduction</td>
<td>Lab 0 - Modern</td>
<td>Read: Ch. 1 &amp; 2 (Reading focus</td>
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<td>Sediments</td>
<td>questions posted)</td>
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<td>Faculty Candidate</td>
<td>Review: Sediment</td>
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<td>Talk 1pm</td>
<td>Transport &amp; Deposition files on</td>
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<td>Blackboard</td>
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<td>2. Jan 24 &amp; 26</td>
<td>Fluvial &amp; Alluvial</td>
<td>Fluvial &amp; Alluvial</td>
<td>Field Trip 1 – River/SIO</td>
<td>Read: Ch. 3 &amp; 4; Ch. 8.1 - 8.2</td>
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<td></td>
<td>Systems (Ch. 8)</td>
<td>Systems (Ch. 8)</td>
<td>outfall</td>
<td>Review: Sedimentary</td>
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<td>Textures &amp; Structures files on</td>
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<td>Blackboard</td>
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<td>3. Jan 31 &amp; Feb 2</td>
<td>Fluvial &amp; Alluvial</td>
<td>Eolian, Lacustrine, &amp;</td>
<td>Lab 1 – Bedforms</td>
<td>Read: Ch. 8.3-8.5 Due: Field Trip 1</td>
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<td></td>
<td>Systems (Ch. 8)</td>
<td>Glacial Systems (Ch. 8)</td>
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<td>Report</td>
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<td>Quiz 1: Sediment</td>
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<td>Transport &amp; Deposition</td>
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<tr>
<td>4. Feb 7 &amp; 9</td>
<td>Deltas &amp; Beaches (Ch. 9)</td>
<td>Deltas &amp; Beaches (Ch. 9)</td>
<td>SATURDAY FIELD TRIP – FEB. 11 to Imperial Sand Dunes</td>
<td>Read: Ch. 9.1-9.3 Due: Lab 1 Report</td>
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<tr>
<td>5. Feb 14</td>
<td>Deltas &amp; Beaches (Ch. 9)</td>
<td>Estuaries, Lagoons,</td>
<td>Lab 2 – Structures</td>
<td>Read: Ch. 9.4-9.6</td>
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<td>Week: &amp; 16</td>
<td>Tuesday 11:00-11:50</td>
<td>Thursday 11:11-11:50</td>
<td>Lab: Th 12:00-14:40</td>
<td>Assignments</td>
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<td>6. Feb 21 &amp; 23</td>
<td>Estuaries, Lagoons, Tidal-Flats (Ch. 9)</td>
<td>Estuaries, Lagoons, Tidal-Flats (Ch. 9)</td>
<td>Field Trip 2 – OB/SD River</td>
<td>Due: Midterm Exam 1</td>
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<tr>
<td>7. Feb 28 &amp; Mar 2</td>
<td>Continental Shelves (Ch. 10)</td>
<td>Continental Shelves (Ch. 10)</td>
<td>Lab 3 – Grain Size Analysis</td>
<td>Read: Ch. 9.4-9.6 Due: Lab 2 report</td>
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<td>8. Mar 7 &amp; 9</td>
<td>Deep Sea (Ch. 10)</td>
<td>Deep Sea (Ch. 10)</td>
<td>Field Trip 3 – Point Loma/Sunset Cliffs</td>
<td>Read: Ch. 10.3 Due: Project Proposal</td>
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<td>9. Mar 14 &amp; 16</td>
<td>Carbonate &amp; Evaporite Systems (Ch. 11)</td>
<td>Carbonate &amp; Evaporite Systems (Ch. 11)</td>
<td>Lab 3 – Grain Size continued</td>
<td>Read: Ch. 11 Due: Field Trip 3 report</td>
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<tr>
<td>10. Mar 21 &amp; 23</td>
<td>Lithostratigraphy</td>
<td>Lithostratigraphy</td>
<td>Lab 4 - Carbonates</td>
<td>Read: Ch. 12 Due: Midterm Exam 2</td>
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<tr>
<td>11. Apr 4 &amp; 6</td>
<td>Lithostratigraphy</td>
<td>Lithostratigraphy</td>
<td>Field Trip 4 – Torrey Pines Strat Column</td>
<td>Read: Ch. 12 Due: Lab 3 report</td>
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<tr>
<td>12. Apr 11 &amp; 13</td>
<td>Chronology</td>
<td>Biostratigraphy</td>
<td>Strat column continued in lab</td>
<td>Read: Ch. 15 &amp; 14 Due: Lab 4 report</td>
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<tr>
<td>13. Apr 18 &amp; 20</td>
<td>Sequence Stratigraphy</td>
<td>Sequence Stratigraphy</td>
<td>Lab 5 – Sequence Stratigraphy</td>
<td>Read: Ch. 13 Due: Field Trip 4 report</td>
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<tr>
<td>14. Apr 25 &amp; 27</td>
<td>Basin analysis, tectonics, and sedimentation</td>
<td>Basin analysis, tectonics, and sedimentation</td>
<td>Work on Class Presentations</td>
<td>Read: Ch. 16 Due: Lab 5 report</td>
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<td>15. May 2 &amp; 4</td>
<td>Class Presentations</td>
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<td>Final Project Due May 2</td>
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<td>May 5-12</td>
<td>Final – Tuesday May 9, 10:30-12:30</td>
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**ACADEMIC HONESTY**

The University adheres to a strict policy regarding cheating and plagiarism. These activities will not be tolerated in this class. Become familiar with the policy and what constitutes plagiarism (http://studentaffairs.sdsu.edu/srr/cheating-plagiarism.html). Any cheating or plagiarism will result in failing this class and a disciplinary review by the University. These actions may lead to probation, suspension, or expulsion.

Examples of Plagiarism include but are not limited to:

- Using sources verbatim or paraphrasing without giving proper attribution (this can include phrases, sentences, paragraphs and/or pages of work)
- Copying and pasting work from an online or offline source directly and calling it your own
- Using information you find from an online or offline source without giving the author credit
- Replacing words or phrases from another source and inserting your own words or phrases
• Submitting a piece of work you did for one class to another class

**TURNITIN**

Students agree that by taking this course all required papers may be subject to submission for textual similarity review to [Turnitin.com](https://turnitin.com) for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. You may submit your papers in such a way that no identifying information about you is included. Another option is that you may request, in writing, that your papers not be submitted to www.turnitin.com. However, if you choose this option you will be required to provide documentation to substantiate that the papers are your original work and do not include any plagiarized material.

**TECHNICAL SUPPORT FOR BLACKBOARD**

Student support for Blackboard is provided by the Library Computing Hub, located on the 2nd floor of Love Library. They can be reached at 619-594-3189 or hub@mail.sdsu.edu

**STUDENTS WITH DISABILITIES**

If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at (619) 594-6473. You can also learn more about the services provided by visiting the [Student Disability Services](https://www.sdsu.edu/student-affairs/disability-services) website.

To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that accommodations based upon disability cannot be provided until you have presented your instructor with an accommodation letter from Student Disability Services. Your cooperation is appreciated.

**STUDENT SERVICES:**

A complete list of all academic support services is available on the [Academic Success](https://www.sdsu.edu/student-affairs/academic-success) section of the [SDSU Student Affairs](https://www.sdsu.edu/student-affairs) website.

For help with improving your writing ability, the staff at the SDSU [Writing Center](https://www.sdsu.edu/student-affairs/writing-center) is available in person and online.

[Counseling and Psychological Services](https://www.sdsu.edu/student-affairs/counseling-and-psychological-services) offers confidential counseling services by licensed psychologists, counselors, and social workers. More info can be found at their website or by contacting (619) 594-5220. You can also Live Chat with a counselor [http://go.sdsu.edu/student_affairs/cps/therapist-consultation.aspx](http://go.sdsu.edu/student_affairs/cps/therapist-consultation.aspx) between 4:00pm and 10:00pm, or call San Diego Access and Crisis 24-hour Hotline at (888) 724-7240.

**DISCLAIMER**

I reserve the right to change parts of this syllabus throughout the semester. I will notify the class during lecture and on Blackboard of any updates.