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GEO 443.01: Principles of Sedimentary Petrology

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Geosciences 443 – Sedimentary Petrology
Autumn, 2015

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Introduction: The primary objective of the course is to develop skills in the characterization and analysis of sedimentary rock compositions, textures, and fabrics and the interpretation of physical, chemical, and biological influences on the sedimentary rock record. We will undertake analysis of sediment and sedimentary rock in outcrop, hand specimen and thin-section, and we will be introduced to various laboratory techniques for analyzing sedimentary rock compositions, textures and fabrics.

The chief outcome of this class is the development of skills related to describing the compositions, textures, and fabrics of sedimentary rocks and interpreting these attributes from the standpoint of sediment depositional and environmental processes, provenance, and tectonic setting. Specific outcomes include: 1) recognition and interpretation of sediment textures in clastic and non-clastic sediments and sedimentary rocks; 2) identification and interpretation of grain compositions in siliciclastic sedimentary rocks using standard petrography; 3) identification and interpretation of allochemical and orthochemical constituents of non-clastic sedimentary rocks; 4) recognition of basic fossil types and their interpretation from thin-section analysis; 5) understanding the basic application of XRD, SEM, and SEM-EDS techniques in sedimentary petrology.

This class is designed to provide a platform for developing skills pertinent to the applied description and analysis of sedimentary rocks. You will have access to hundreds of rock and thin-section samples. Simply put, the more time you spend studying the rock materials presented in this class, the stronger your petrological skill set will become. Presently, there is a high demand for sedimentary petrologists, particularly in the energy industry. This class will provide you with the basic skills needed to work in this capacity.

The *tentative* course schedule and assigned readings are below:

Date	Lecture/lab topic	Assigned Reading
Aug. 31	Sedimentary basin settings; Sedimentary textures – grain shape, sorting and size distribution	Boggs, Ch. 1 Boggs, Ch. 2 Farrell et al., 2012
Sept. 2	Siliciclastics overview: sedimentary transport and structures; Biogenic structures	Boggs, Ch. 3
Sept. 7	NO CLASS – LABOR DAY	
Sept. 9	Sed and biogenic structures, cont.; intro to siliciclastic conglomerates and sandstones <i>Lab #1 assigned – sedimentary textures</i>	Boggs, Ch.6
Sept. 14	Siliciclastic sandstones, cont.; <i>work on lab 1</i>	
Sept. 16	Review of optical mineralogy; <i>lab #2 assigned – Siliciclastic conglomerates and sandstones</i>	
Sept. 21	Continue discussion as needed; <i>work on labs 1 and 2</i>	
Sept. 23	<i>Lab #1 due</i> Diagenesis of siliciclastic sandstones	Boggs, Ch.4, 5, & 8
Sept. 26-27	Saturday-Sunday field trip to Dillon, Montana; camp Sat. nite	

Sept. 28	Diagenesis of siliciclastic sandstones, cont.	
Sept. 30	<i>Go over lab #1; lab #2 due</i> Chemical sedimentary rocks; <i>lab #3 assigned – chemical sedimentary rocks</i>	
Oct 05	Chemical sedimentary rocks; work on lab #3	Boggs, Ch.9
Oct 07	Chemical sedimentary rocks, cont.; <i>review lab #2</i>	
Oct 12	Organic-rich sedimentary rocks	
Oct 14	Organic-rich sedimentary rocks, cont.; <i>lab #3 due</i>	
Oct 19	Mudrocks I: clay mineralogy; <i>lab #4 assigned - mudrocks</i>	
Oct 21	Mudrocks II: clay mineralogy, cont.; <i>review lab #3</i>	Boggs, Ch.13&14
Oct 26	XRD analysis of mudrocks	
Oct 28	Mudrocks and XRD analysis, cont.; work on lab#4	
Nov 02	Mudrocks and XRD, cont; work on lab#4	
Nov 04	Mudrocks wrap-up; <i>lab#4 due</i>	Boggs, Ch.7&9
Nov 09	Review of lab #4 and all other class material to date	
Nov 11	MIDTERM EXAM - through mudrocks	
Nov 16	Limestones I: overview <i>Lab #5 assigned - Carbonates I</i>	Boggs, Ch. 10
Nov 18	Limestones cont.	
Nov 23	Limestones, cont. Work on lab#5	
Nov 25	NO CLASS – THANKSGIVING HOLIDAY	
Nov 30	Dolomites; <i>lab#5 due</i>	
Dec 02	Dolomites and evaporates; <i>review lab #5</i>	Boggs, Ch.11
Dec 07	Final student presentations	
Dec 09	Final student presentations	Boggs, Ch.12
Dec 16	FINAL EXAM ; Wednesday, Dec. 16, 8:00-10:00am	

Field Trip:

We will undertake a weekend-long field trip on Saturday and Sunday, September 26-27. The field trip will be run to southwestern Montana near Dillon, and we will camp out on Saturday night. We will leave Missoula 8am on Saturday and return Sunday by 7pm.

Class Projects:

In addition to regular labs, a midterm, and a final exam, this class will involve an independent research project. From the GEO443 sample collection, each student must select a) one modern sand sample; b) one rock sample with accompanying polished thin-sections. Over the course of the semester, you will be asked to undertake a formal petrographic description of your samples and develop an industry-style written report and accompanying poster presentation that describes your results and interpretations. You will be asked to give a 10 minute oral presentation at the end of the semester summarizing these results, using your poster as the platform for presentation.

Grading System:

This class includes 5 individual assigned labs that constitute the heart of the course material. Approximately every second week, a new lab will be assigned and the previous lab will be reviewed.

Final grades for this course will be based on the following: 1) 5 individual laboratory assignments (~45% of final grade); a midterm exam (~20% of final grade); your term research project (assigned sand and rock samples; ~15% of final grade); and a comprehensive final lab exam (~20% of final grade)

Penalty for late work:

Late assignments drag down the entire class and make it difficult to move forward with the material at a constant pace. Therefore, late assignments will not be accepted. Unexcused late assignments turned in after the due date at class time will not be graded and will automatically receive a zero.

Office Hours:

Commonly in a class of this nature, questions arise that require the input of the instructor in the laboratory. To this end, we will use some class time to work on laboratory assignments. All students are expected to use such time to work on the class labs and/or enhance their hand specimen identification and petrographic skills – class attendance at these 'lab sessions' is not optional. Hendrix will keep formal office hours from 1-2PM on Mondays, Wednesdays, and Fridays, and is also available via appointment.

Reading:

Most of the reading for this class will come from the book *Petrology of Sedimentary Rocks* by Sam Boggs, Jr. This is an excellent guide to the composition and diagenesis of sedimentary rocks. I recommend you keep it at the end of the semester and make it part of your permanent library. In addition, some supplemental reading will be assigned as reading and other reference material will be available via the course web site throughout the semester.

Course Web Site:

Please be aware that all of the course content will be posted on moodle. Generally, I will post materials for each lecture about 24 hours ahead of the class meeting. Please feel free to download and/or print out the slides for each lecture and bring them to class as a starting point for taking notes.

An important note about academic misconduct:

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. The Code is available for review online at http://www.umt.edu/vpsa/policies/student_conduct.php