Syllabus
Sedimentology & Stratigraphy, Geology 415, 4 Credits
Fall Quarter 2016
Lectures: MW 9:00-10:50am & F 9:00-9:50am
in ES218

Instructor:	Brady Foreman
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Office Hours:	Monday (2-3pm), Wednesday (11am-12 pm) and by appointment

Contacting me: e-mail is best or talking to me before/after class

Textbook: Nichols, G. 2009. Sedimentology & Stratigraphy. Third Edition: Wiley-Blackwell, 419 p.
ISBN: 978-1-4051-3592-4
- I will also assign journal articles

Prerequisites: Geol 212 (Historical Geology); Geol 306 (Mineralogy); Geol 310 (Geomorphology)

Course Description: Sedimentary rocks contain a wealth of information on past environments, climate, biology, tectonics, and sea level. Stratigraphy is essentially a history of geomorphic processes occurring on short timescales (seconds to days) to long timescales (thousands and millions of year) as well as a record of the forces that shaped and altered Earth's landscapes and seascapes.

This class has three main parts. First, we will cover the generation, transport, and deposition of sediments, and link these processes with their depositional products (i.e., sedimentary rocks). Second, we will examine terrestrial and marine environments on Earth and how their respective geomorphic processes impart patterns on the deposition of sedimentary rocks. Third, we will cover the spatiotemporal relationships amongst these depositional environments (i.e., stratigraphy) and the interpretation of major events in Earth's history.

In a nutshell:
Classification of Sedimentary Rocks → Identification of Geomorphic Process & Environment → History of Earth's Surface

Student Learning Outcomes: By the end of the course you will be able to:
1) describe and classify sedimentary rocks

2) link characteristics of sedimentary rocks to the geomorphic and biologic processes that formed them
3) construct facies associations and identify depositional environments
4) measure stratigraphic sections using Jacobs staff & brunton compass
5) interpret patterns in stratigraphy

Attendance: Highly, highly recommended. I will present some different and additional information than that which is in the book. Also we have several reading and discussion sessions. If you aren't in class for those it will be very difficult to do well in the class. Attendance is required for lab. The labs can take several hours to setup time and materials/samples will be reused for subsequent labs, so make-up labs are not really feasible. Unless there is a serious emergency/life event all labs need to be completed within the week they are assigned.

Lectures: A mixture of whiteboard note taking, in-class demonstrations, powerpoints, and videos. You are responsible for taking good notes on the information. If you are absent you need to get the notes from a classmate. Powerpoints and videos will be illustrative, and will be available on Canvas. I prefer whiteboard note taking because it creates a structure and order to the information. It keeps us moving at the same pace, allows you time for reflection, and prevents me from moving on too quickly before your questions are answered. Moreover, the repetition and added physical act of writing will aid in information retention.

Labs: There are five labs and one lab exam. Labs will start with a short introduction by me. In some cases there will be a demonstration or an example that we work through together. The remaining time will be for you to work in groups. *Each person turns in an individual lab* ***due the following week at the start of lab***. The labs may take longer than the allotted 2 hours.

Reading Reflections: Approximately once a week we will be discussing journal articles that are pertinent to the subject matter that week. You are expected to come to class having read and thought about the material. This is a reading-heavy class. I truly believe in scouring the literature, consuming, and digesting articles for ideas, inspiration, and raw data.

Lab Manual: Uploaded to Canvas.

Lab Equipment: Hand lens, millimeter ruler, laboratory handouts

Required Field Trips: There is one required field trip. It will occur on exposures of the Chuckanut Formation near Bellingham.

Field Trip Safety: Safety is my number one priority on our field trips. I cannot stress this enough. I have been on field trips where students have died and there are

numerous horror stories of injury out there. There are two major concerns on our field trip, traffic and falling rocks. We will have a safety discussion before departing.

Grading: Two semi-cumulative exams, a lab exam, five labs, reading reflections (and associated discussions) and a presentation. The course is designed to build your knowledge so you need to know the foundation presented at the beginning to fully appreciate the end concepts.

What determines your final grade

Exam #1	20%
Exam #2	20%
Lab Exam	20%
Lab 1	5%
Lab 2	5%
Lab 3	5%
Lab 4	5%
Lab 5	5%
Reading Reflections	5%
Discussions	5%
Presentation	5%
	100%

Academic Honesty: I don't grade on a curve because I believe everyone has the ability to master the material and his or her grade should reflect it. The grade on your transcript is a representation of the work you put in and the knowledge and skills you accumulated. But getting a good grade won't mean much when you show up to graduate school or your post-college job and know less about the subject than your peers. Most people won't see your grade. They will see your knowledge, your preparedness, work ethic, and geologic skills. Thus you should obtain your grade through studying.

Quick Guidelines

1) You are academically honesty if you can look me in the eye and say "this is my work" and/or "this exam represents what I know".
2) Minimize copy and paste to minimize dishonesty (if you are doing a lot of Ctrl-C, Ctrl-V you are entering the danger zone).
3) When working in groups don't look at what the other person wrote. Instead discuss it with them and write down your interpretation.

Western Washington University's policy can be found here:
http://www.wwu.edu/depts/registrar/acad_dishonesty.shtml

Below is WWU's description of academic dishonesty
From http://catalog.wwu.edu/content.php?catoid=7&navoid=1014

"*Academic dishonesty is not qualitatively different from other types of dishonesty. It consists of*

misrepresentation by deception or by other fraudulent means. Academic dishonesty compromises the instructor's ability to fairly evaluate any student's work or achievement. It includes, but is not limited to, the following:

a. *Giving, taking, or receiving unauthorized information to/from another person during any type of assignment or test.*
b. *Obtaining or providing without authorization questions or answers prior to the time of an assignment or test.*
c. *Using unauthorized sources for answers during any assignment or test.*
d. *Taking part in or arranging for another person to complete an assignment or to take a test in place of another.*
e. *Giving or receiving answers by use of signals or electronic communication during a test.*
f. *Altering answers on a scored test and submitting it for a higher grade.*
g. *Collaborating with others in a required assignment without the approval of the instructor.*
h. *Stealing class assignments or portions of assignments, including electronic files, and submitting them as one's own.*
i. *Not crediting participants for their part in a group project or claiming credit for work not done on a group project.*
j. *Plagiarism, which is presenting as one's own in whole or in part the argument, language, creations, conclusions, or scientific data of another without explicit acknowledgment. Examples include, but are not limited to:*

1. *Using another person's written or spoken words without complete and proper citation.*
2. *Using information from a Website, CD-ROM or other electronic source without complete and proper citation.*
3. *Using statistics, graphs, charts and facts without acknowledging their source.*
4. *Submitting a paper purchased from a term-paper service.*
5. *Paraphrasing, which is imitating someone else's argument using other words without acknowledging the source.*
6. *Claiming credit for someone else's artistic work, such as a drawing, script, musical composition or arrangement.*
7. *Using someone else's lab report as a source of data or results.*
8. *Using one's own or substantially similar work, produced in connection with one course, to fulfill a requirement in another course without prior permission. A student may use the same or substantially the same work for assignments in two or more courses only with written permission from the instructors of all the classes involved.*
9. *Submitting the results of a machine translation program as one's own work."*

Academic Support: Western is committed to equal opportunity and non-discrimination in all programs and activities. Requests for accommodation or assistance should be directed to Disability Resources for Students located in Old Main 110; additional information is available at:
http://www.wwu.edu/depts/drs/
Telephone: 650-3083
Email: drs@wwu.edu

Flexibility Clause: This syllabus is subject to change. Some material may require additional time to cover or garner more questions from you the students. I will notify you in class of any major changes in exams, labs, and the field trip.

Timeline of Course:

Week 1
09/21 – Introductions, Class Overview, Syllabus, Source-to-Sink, Geologic Intuition
09/23 – Sedimentary Basins & Weathering - Ch. 1, 6, & 24

Week 2
09/26 – Grain Size and Siliciclastic Rocks (practice ID exercise) - Ch. 2
09/28 – *Lab 1: Siliciclastic Rock Classification*
09/30 – Chemical & Biochemical Rocks (practice ID exercise) - Ch. 3 & 15

Week 3
10/03 – *Lab 2: Carbonate Rocks*
10/05 – Sediment Transport & Facies Analysis - Ch. 4 & 5
10/07 – Sediment Transport & Facies Analysis - video

Week 4
10/10 – Discussion of readings - discussion papers
10/12 – *Lab 3: Sedimentary Structures* (how to use a jake staff)
10/14 – **Exam #1**

Week 5
10/17 – Alluvial Fans & Rivers - Ch. 9
10/19 – Rivers & Soils - Ch. 9
10/21 – Chuckanut Fm (presentation example & discussion) - readings
10/23 – *Lab 4: Chuckanut Formation Field Trip* (Sunday)

Week 6
10/24 – Deltas - Ch. 11, 12
10/26 – Deltas & Trace Fossils - Ch. 11, 12
10/28 – Estuaries & Beaches - Ch. 13

Week 7
10/31 – Shallow & Deep Marine - Ch. 14, 16
11/02 – Deep Marine - Ch. 16
11/04 – Discussion & Strat Column/Sea Level Exercise - discussion papers

Week 8
11/07 – Inverse Problem & Discussion - discussion papers
11/09 – **Lab Exam**
11/11 – Veteran's Day, no class

Week 9
11/14 – *Lab 5: Turbidite Stratigraphy*
11/16 – *Lab 5: Turbidite Stratigraphy* & Discussion - discussion papers
11/18 – Post-Deposition Processes & Hydrocarbons - Ch. 18
Week 10
11/21 – Stratigraphic Correlations - Ch. 19-23
11/23 – Thanksgiving, no class
11/25 – Thanksgiving, no class
Week 11
11/28 – **Exam #2**
11/30 – **Final Presentations**
12/02 – **Final Presentations**

FINALS WEEK
12/05 – 10:30AM to 12:30PM Final Presentations (Monday)

Outline of Major Assessments for Geol 415 – Sedimentology & Stratigraphy

Course Outcomes

1. Understand classification of sedimentary rocks.
2. Understand the link between sedimentary structures and sediment transport processes.
3. Understand facies associations and links to depositional environments.
4. Understand how to use a brunton compass and Jacob staff.
5. Understand transmission of geomorphic processes into stratigraphy and recovery of tectonic, climatic, and eustatic signals from stratigraphy.

Objectives (SWBAT)

1.1. Identify unknown siliciclastic, chemical, and biochemical rocks.
2.1. Rank grain size, bedforms, and sedimentary structures in order of increasing/decreasing fluid energy conditions.
2.2. Predict sedimentary structures given changes in fluid flow conditions and bedforms.
2.3. Calculate paleoslopes from measured input parameters.
3.1. Draw typical vertical and horizontal spatial trends in sub-environments and rock types in different depositional systems.
3.2. Identify vertical patterns in lithofacies and link them to movement and evolution of the depositional system.
4.1. Measure a stratigraphic section and support an depositional environmental interpretation from the data.
5.1. Reconstruct topographic and depositional evolution of an active sedimentary system.
5.2. Formulate and propose feasible tests of hypotheses regarding the causes of depositional patterns with experimental and field datasets.

Geology Program SLOs Addressed

Geology 415 (Sedimentology & Stratigraphy) provides information for the following degree/program outcomes:

	B.A. Geology	B.S. Geology	B.S. Geophysics	GUR
Outcomes	1. Earth has a history of biological and physical change over billions of years. 2. Earth's surface is affected by dynamic processes on a range of timescales. 5. Earth scientists use repeatable observations and testable ideas to understand and explain our planet. 7. (Students) Have developed their observational, analytical, and quantitative skills.	1. Earth has a history of biological and physical change over billions of years. 2. Earth's surface is affected by dynamic processes on a range of timescales. 5. Earth scientists use repeatable observations and testable ideas to understand and explain our planet. 7. Have developed their observational, analytical, and quantitative skills. 9. Will be able to apply physics, chemistry, and mathematics concepts to the study of Earth. 10. Graduates (alone or in teams) will be able to present geological information clearly.	1. Earth has a history of biological and physical change over billions of years. 2. Earth's surface is affected by dynamic processes on a range of timescales. 5. Earth scientists use repeatable observations and testable ideas to understand and explain our planet. 7. Have developed their observational, analytical, and quantitative skills. 9. Will be able to apply physics, chemistry, and mathematics concepts to the study of Earth. 10. Graduates (alone or in teams) will be able to present geological information clearly.	1. Analyze and communicate ideas effectively in oral, written, and visual forms. 3. Use quantitative and scientific reasoning to frame and solve problems.