



School of Science  
**GEOL 206**  
**Sedimentology and Stratigraphy**  
Term: Fall 2022  
Number of Credits: 3

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## Course Outline

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**INSTRUCTOR:** Dr. Chad Morgan

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**PHONE:** (867) 456-8570

**OFFICE LOCATION:** A2303

**OFFICE HOURS:** Tues 4:00-5:00 pm in T1090 (and by appointment)

**CLASSROOMS:** A2603 (lecture, Wed 4:00-5:20 pm, Fri 10:30-11:50 am); T1090 (laboratory, Wed 1:00-3:50 pm)

**DATES:** September 6, 2022 to December 2, 2022

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### COURSE DESCRIPTION

This course provides a comprehensive introduction to the fields of sedimentology and stratigraphy. Students examine the physical and chemical processes that govern sediment production, transport, and deposition in a variety of environments, and gain expertise in the identification and classification of sediments and sedimentary rocks using various classification schemes. The course also introduces different principles and methods for stratigraphic analysis and correlation. Students incorporate these methods with sedimentological data and observations to describe and interpret sedimentary facies, predict facies architecture, and resolve depositional histories. Students learn associations between tectonic settings and depositional facies, and the tectonic controls on the development of sedimentary basins are presented with a focus on basin development in Yukon and Western Canada.

### COURSE REQUIREMENTS

Successful completion of GEOL 105 (Physical Geology) and GEOL 106 (Historical Geology), or permission from the course instructor. Mineralogy (GEOL 200) must be previously completed or be taken as a co-requisite in the same term. Prior completion of GEOL 107 (Geological Field Methods and Mapping I) is an asset.

### EQUIVALENCY OR TRANSFERABILITY

This course has been recently re-developed, and its transferability is still being evaluated. Receiving institutions determine course transferability. Find further information at: <https://www.yukonu.ca/admissions/transfer-credit>

### LEARNING OUTCOMES

Upon successful completion of the course, students will be able to:

- analyze and characterize the physical processes responsible for sediment production, transport, deposition and lithification.

- properly classify, describe and interpret sedimentary rocks in outcrop, hand sample, and thin section; accurately measure and record stratigraphic sections in a field setting.
- identify and interpret physical and biogenic sedimentary structures.
- predict what types of sedimentary processes and depositional environments would characterize a particular tectonic setting, and what the resulting stratigraphic signature would be.
- 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.
- utilise different analytical methods and datasets (lithostratigraphy, chronostratigraphy, chemostratigraphy, magnetostratigraphy, etc.) to build and correlate stratigraphic sections.
- demonstrate understanding of the facies concept and be able to use facies associations and facies models to interpret depositional environments.

## **COURSE FORMAT**

### **Weekly breakdown of instructional hours**

This course consists of two 90-minute lectures and one three-hour lab period per week. The lecture schedule included in this course outline details the major topics covered and when those topics will be presented throughout the course. Please note that this schedule will likely be modified throughout the term, as some topics may not be finished within the predicted lecture time.

It is expected that this course will require 3-4 hours/week of homework and additional reading. It is important to note that the time required will vary by individual.

### **Delivery format**

Lectures for the Fall 2022 offering of this course will be delivered in-person. Lectures will be delivered in room A2603, and the lab section will be held in room T1090 on the Ayamdigut (Whitehorse) campus. Laboratory instructions and worksheets will be provided digitally on the Moodle course page.

## **EVALUATION**

Weekly lab assignments (10)	30% (3% each)
Final lab exam	15%
Midterm lecture exam	15%
Final lecture exam	25%
Term assignment	10%
Lecture assignments (2)	5% (2.5% each)
Total	100%

## **Assignments**

Weekly lab exercises will be due at the end of the week and can be handed in during the Friday lecture period. This will allow the instructor to provide ongoing feedback throughout the course and help ensure learning and improvement from one assignment to the next.

In addition to laboratory exercises, students will participate in two in class lecture assignments to help reinforce critical concepts. These exercises are intended to stimulate discussion and collaboration between students. Students must complete these learning assessments and submit them at the start of the following lecture.

One term assignment will also be administered over the course of the semester. This assignment will focus on getting students to engage with and appreciate the geologic landscape in their own area by picking a western Canadian stratigraphic unit to research and write a short overview for. This assignment will require presentation of findings/observations to peers using the course forums on Moodle as well as a written report submitted to the course instructor.

Late assignments will be graded based on the following scheme: a deduction of 10% per day up until a total deduction of 50% is reached, following that, assignments must be submitted prior to the date that the instructor hands back the graded assignment (set by the instructor).

## **Examinations**

This course has two lecture examinations, a midterm and a final, and one lab examination. The midterm exam is conducted during scheduled lecture time; the final exam is conducted during the final exam period scheduled by the Office of the Registrar. The midterm lecture exam is a 1.5-hour exam; the final exam is designed to take 3 hours. The lab final examination is scheduled during lab time. The lab final exam is designed to take 2 hours and will involve both timed sample-based questions and short answer questions to assess student learning.

Missed exams will be assigned a grade of 0% unless re-scheduling for a valid reason is approved and determined in advance of scheduled exam date. Any student who is absent from a test or exam for legitimate reasons will be eligible to write a deferred exam. Please note that excuses such as car trouble, vacation travel, oversleeping, and misreading the test schedule are not considered legitimate reasons and do not qualify the student for a deferred exam.

For missed exams, the student must contact the instructor within 48 hours of the missed exam by phone or email. For missed final exams, students must contact the Chair of the School of Science. Any deferred exams will be scheduled by the Chair.

## **TEXTBOOKS & LEARNING MATERIALS**

### *Required Textbook:*

Boggs S. 2012. Principles of sedimentology and stratigraphy. 5<sup>th</sup> ed. Upper Saddle River (NJ): Pearson. 600 pp.

*Suggested Further Reading Materials (Not required):*

Embry, A.F. 2009. Practical Sequence Stratigraphy. Canadian Society of Petroleum Geologists, 81 pp.

James, N.P. and Dalrymple, R.W. 2010. Facies Models 4. St. Johns, Newfoundland: Geological Association of Canada, 586 pp.

**COURSE WITHDRAWAL INFORMATION**

Refer to the YukonU website for important dates.

**ACADEMIC INTEGRITY**

Students are expected to contribute toward a positive and supportive environment and are required to conduct themselves in a responsible manner. Academic misconduct includes all forms of academic dishonesty such as cheating, plagiarism, fabrication, fraud, deceit, using the work of others without their permission, aiding other students in committing academic offences, misrepresenting academic assignments prepared by others as one's own, or any other forms of academic dishonesty including falsification of any information on any Yukon University document.

Please refer to Academic Regulations & Procedures for further details about academic standing and student rights and responsibilities.

**ACADEMIC ACCOMMODATION**

Reasonable accommodations are available for students requiring an academic accommodation to fully participate in this class. These accommodations are available for students with a documented disability, chronic condition or any other grounds specified in section 8.0 of the Yukon University Academic Regulations (available on the Yukon University website). It is the student's responsibility to seek these accommodations by contacting the Learning Assistance Centre (LAC): [LearningAssistanceCentre@yukonu.ca](mailto:LearningAssistanceCentre@yukonu.ca).

## LECTURE TOPIC OUTLINE

<i>Week</i>	<i>Date</i>	<i>Lecture</i>	<i>Lecture Topics</i>	<i>Recommended Resources</i>
1	Sept. 7	1	Course introduction and principles of stratigraphy	Ch. 1.1-1.3, Ch. 3
	Sept. 9	2	Sediment production, classification, and analysis	
2	Sept. 14	3	Sedimentation: Fluid flow and particle motion	Ch. 2
	Sept. 16	4	Sedimentary Structures	Ch. 4
3	Sept. 21	5	Clastic sedimentary rocks	Ch. 5, Ch. 8, Ch. 9, Ch. 10
	Sept. 23	6	Siliciclastic depositional environments	
4	Sept. 28	7	Siliciclastic depositional environments	
	Sept. 30	8	Carbonate sedimentary rocks	Ch. 6, Ch. 11
5	Oct. 5	9	Carbonate depositional environments	
	Oct. 7	Learning Assessment #1:		
6	Oct. 12	10	Carbonate depositional environments	Ch. 11
	Oct. 14	11	Organisation of the stratigraphic record: lithostratigraphy, facies, and the code	Ch. 12, Appendix C
7	Oct. 19	12	Geologic time, biostratigraphy, and geochronology	Ch. 14, Ch. 15
	Oct. 21	13	Chemo-, magneto-, and seismic stratigraphy	Ch. 13.2 & 13.4, Ch. 15.4
8	Oct. 26	Midterm exam review		
	Oct. 28	Midterm exam (in class)		
9	Nov. 2	14	Sequence Stratigraphy fundamentals	Ch. 13.3 & Embry, 2009
	Nov. 4	15	Tectonics and sedimentation	Ch. 16.3
10	Nov. 9	16	Basin analysis and characterisation	Ch. 16
	Nov. 11	Remembrance Day (no classes)		
11	Nov. 16	17	Basin analysis and characterisation	Ch. 16
	Nov. 18	Learning Assessment #2:		
12	Nov. 23	17	Hydrocarbon resources and Chemical sedimentary rocks	Ch. 7
	Nov. 25	18	Western Canada case studies 1: Cambrian strata of the WCSB (north and south)	
13	Nov. 30	19	Western Canada case studies 2: Yukon placer gold deposits	
	Dec. 2	Final exam review ( <b>Term assignments due</b> )		

## LABORATORY TOPIC OUTLINE

<i>Week</i>	<i>Topic</i>
2	Sediment grain size analysis: Glacial sediment from Schwatka Lake
3	Sedimentary rock description and measurement: Richtofen Formation, Whitehorse Trough [afternoon field trip]
4	Measuring and constructing stratigraphic sections: Tanglefoot and Tantalus formations, Carmacks [full day field trip]
5	Siliciclastic sedimentary rocks: Description and classification from hand samples and thin sections
6	Carbonate sedimentary rocks: Description and classification from hand samples and thin sections
7	Chemical and non-epiclastic sedimentary rocks: Description and classification from hand samples and thin sections
8	Lithostratigraphic correlation, contour mapping, and interpretation
9	Biostratigraphic correlation and interpretation: Index fossil identification and biozone definition/recognition and correlation
10	Sequence stratigraphy: Correlation using chronostratigraphic and lithostratigraphic approaches and applying Walther's law
11	Carmacks stratigraphic section correlation and report writing
12	Lab Final Exam Review (Carmacks stratigraphic section report due end of week)
13	Lab Final Exam