

## Earth Science 2281B - Geology for Engineers – January 2018

**Description:** Introduction to physical geology with emphasis on the engineering oriented aspects of the Earth Sciences. Topics include; minerals and rocks; mass movements; interpretation of aerial photographs, topographic and geologic maps; surficial processes and their manifestations; surface and ground water; structural geology and subsurface processes; and earth resources. 2 lecture hours, 3 laboratory hours (0.5 course)

**Instructor:** Rob Schincariol, Ph.D., P.Eng., P.Geo.

0174 Biological and Geological Building; 519-661-2111 ext. 83732; schincar@uwo.ca

T.A.'s: **TBD**

**Antirequisites:** Earth Science 1022a/b, 1081a/b, 1082a/b, or 1023/2123 a/b

**Prerequisites:** Register in second, third, or fourth year Civil and Environmental Engineering or permission of department

- *Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.*
- *Accessibility Statement: Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.*
- *Students who are in emotional/mental distress should refer to Mental Health@Western <http://www.uwo.ca/uwocom/mentalhealth/> for a complete list of options about how to obtain help.*

### Learning Outcomes

Upon successful completion of this course students will be able to:

- Identify major minerals, igneous, sedimentary, and metamorphic rocks through laboratory-based assessment.
- Perform selected engineering geology evaluations and identify typical weathering products within engineering materials.
- Apply knowledge of Earth dynamics and structural geology to assess relative risks of earthquake activity and the impact on engineering structures.
- Apply knowledge of mass wasting processes and weathering to assess the mechanics of slope movements, slope stability processes and risks.
- Explain surface and ground water flow dynamics with respect to effective water resource management and subsurface characterization within fluvial plains and coastal areas.
- Identify features of glacial deposits on topographic maps, air photos, and other imagery.
- Explain how glacial cycles create complex subsurface deposits which impact ground water flow and geotechnical evaluations.
- Create links between Canada's resource rich economy, including oil, gas, and mineral deposits, and geologic processes.
- Effectively communicate the nature of dynamic earth processes and relative risks associated with various engineering works.

### Required textbooks

Laboratory Manual in Physical Geology, 11<sup>th</sup> Edition, American Geological Institute, National Association of Geoscience Teachers, Pearson, 2017, ISBN-13: 978-0134446608

Laboratory Manual IS REQUIRED:

1. A large number of figures / tables used in lectures are from lab manual and will not be reproduced in the lecture notes.
2. **All** students are required to submit *worksheets* (questions, coloured maps / airphotos) directly from laboratory exercise manual. No black & white photocopies of required manual pages will be accepted.

### Course Outline

Lecture Topics	Laboratory Exercises
Jan. 09 – Course objectives and relevance to Engineering – Rock cycle; Earth Dynamics; Minerals	Jan. 10, 11 – No Lab
Jan. 16 – Igneous Rocks	Jan. 17, 18 – Mineral properties and Identification
Jan. 23 – Weathering, Sedimentary Rocks	Jan. 24, 25 – Igneous Rock Identification
Jan. 30 – Metamorphic Rocks; Geologic Time	Jan. 31, Feb. 01 – Sedimentary Rock Identification
Feb. 06 – Crustal Deformation and Structures	Feb. 07, 08 – Metamorphic Rock Identification, RQD, PN
Feb. 13 – Earthquakes – faults, seismology, case studies	Feb. 14, 15 – <i>Mineral and Rock Review Lab</i>
<b>Feb. 27</b> – Midterm exam; in-class; see Owl announcement for assigned room location.	<b>Feb. 28, Mar. 01</b> – Laboratory Exam (minerals and rocks); You will be allowed to bring in <b>ONLY</b> the identification charts from your lab manual (i.e. pages 90 to 98, 118, 136, 137, 164, 197)
Mar. 06 – Mass Wasting and slope processes	Mar. 07, 08 – Relative Age Dating, Topographic Maps, Air Photo Interpretation
Mar. 13 – Surface water and river processes	Mar. 14, 15 – Geologic Structures, Maps, Block Diagrams
Mar. 20 – Groundwater – movement, contamination	Mar. 21, 22 – Stream processes, mass wastage, floods
Mar. 27 – Glaciers – processes and landforms	Mar. 28, 29 – Groundwater processes, resources, risks
Apr. 03 – Energy and Mineral Resources	Apr. 04, 05 – Glacial processes and landforms
Apr. 10 – Energy and Mineral Resources; <i>lab pickup</i>	

### Required materials

For the mineral and rock identification laboratories you will require a 10x hand lens (magnifying glass). For the map exercises, you will require a millimeter ruler, coloured pencils, protractor, and calculator

**Lecture Material:** The text portion of the lecture presentation slides will be made available on OWL. Figures used in the lectures come from the lab manual, various web links, government sources, or consulting reports. Material with disclosure issues (e.g. consulting reports), will not be posted on OWL. You are expected to attend lectures and make additional notes to guide you through the lecture material. The main purpose of the lectures is to help you understand how Earth Sciences and Civil Engineering are closely linked. Case studies / consulting reports give you the real-world application demonstrating these links.

**Lectures: Tues 9:30 – 11:20 a.m. PAB 148**

**Laboratories:** Section 002 - Wed. 1430 to 1730 hrs., rm. 1015 BGS  
Section 003 - Thurs. 0830 to 1130 hrs., rm. 1015 BGS

**Exams and Mark Distribution:** Exams will be closed book (definitions; short answer; problem solving). A pencil, ruler, eraser, and basic calculator (basic math & geometry functions; but no extensive non-volatile memory capability).

*A calculator is to be used for calculations only and not storage of information - any recall of such stored information will be considered a scholastic offense (cheating). No other electronic devices will be allowed. Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:*

[http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf).

Midterm exam	30%	Feb. 27 (during normal class 9:30 to 11:20 a.m.; see Owl for exam room)
Lab exam #1	15%	Feb. 28, March 01 (on your normal registered lab day and time)
In lab assignments	10%	9 assignments
Final exam	45%	(30% lecture material; 15% lab exam #2; 3 hours total for both)

### **Laboratory Outline**

An assignment will be given for each laboratory session which will have two components. Assigned pre-lab reading and questions from the laboratory manual should be worked on prior to and during the scheduled laboratory time. During the lab additional questions will be handed out which must be completed, along with the lab manual assigned questions, and handed in by the end of the lab. These additional questions will be graded provided you have completed the questions assigned from the laboratory manual. While answers to questions will be provided on OWL you are to use these only to check your work – not copy. Handing in answers from previous years or other sources, including answers from colleagues working with you in the lab, will be considered a Scholastic Offence and handled according to normal policies see [http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf).

➤ *If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean's office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately. For further information please see the Policy on Accommodation for Medical Illness at: [www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_illness.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_illness.pdf)*

➤ *For work worth less than 10% (e.g. individual assignments) if accommodation is required for medical or non-medical reasons email the instructor. In these cases either an extension will be given or a re-weighting to other components of the course – at the instructors discretion – will be done.*