Geology (GEOL) 501

Quaternary Geology (Revision 1)

Status:	Replaced with new revision, see the **course listing** for the current revision
Delivery mode:	**Individualized study online**. Delivered via Brightspace.
Credits:	3
Area of study:	Science
Prerequisite:	**GEOL 200** or equivalent. If you are concerned about not meeting the prerequisite for this course, contact the course coordinator before registering.
Precluded:	None
Faculty:	**Faculty of Science and Technology**
Notes:	To take this graduate-level course, you must apply and be approved to one of the graduate programs or as a non-program **Centre for Science** graduate student. Minimum admission requirements must be met. Undergraduate students who do not meet the admission

requirements will not normally be permitted to take this course.

Coordinator: **Dr. Ken Munyikwa**

Overview

Geology 501: Quaternary Geology acquaints you with methods used to extract information on Quaternary environmental change from geological proxy records. The Quaternary Period refers to the last circa 2.6 million years of earth's history. It is a geological period characterized by fluctuation in global climate between ice ages and warmer periods. GEOL 501 examines external and internal forces (relative to the earth) that act as causative agents for climate variations, as well as the earth's response patterns to climate changes. In particular, you will be introduced to the role played by surface processes and materials as archives of environmental change. Accordingly, you will become familiar with techniques employed in reconstructing environmental changes through the use of proxy data. The use of dating techniques to establish temporal scales for the geological processes will also be highlighted.

Outline

- Unit 1: The Quaternary Record
- Unit 2: Geomorphological Evidence
- Unit 3: Lithological Evidence – Terrestrial Records
- Unit 4: Lithological Evidence – Lacustrine, Marine Isotope, and Ice-Core Stratigraphy
- Unit 5: Biological Evidence – Records of Terrestrial Origin
- Unit 6: Biological Evidence – Records of Aquatic Origin
- Unit 7: Dating Methods – Radioisotopic Dating Techniques

- Unit 8: Dating Methods – Non-Radiogenic Dating Methods
- Unit 9: Approaches to Quaternary Stratigraphic Correlation
- Unit 10: Global Environmental Change During the Quaternary

Learning outcomes

Upon successful completion of this course, you should be able to

- reflect on the causative agents of climate variations during the Quaternary period.
- assess geomorphological evidence and methods that can be used to reconstruct Quaternary environments.
- critique methods and evidence used to reconstruct Quaternary environments from lithological records.
- review the role played by aquatic evidence in reconstructing paleoenvironments.
- assess the role played by biological evidence of terrestrial origin in Quaternary studies.
- evaluate how to extract biological evidence of aquatic origin in Quaternary studies.
- deconstruct the principles and applications of radioisotopic methods used in Quaternary studies.
- review the principles and applications of non-radiogenic dating methods.
- validate stratigraphic principles used in Quaternary geology.
- reflect on the records that can be used to describe the glacial and interglacial cycles of the Quaternary.

Evaluation

To **receive credit** for GEOL 501, you must achieve a course composite grade of at least **B– (70 percent)** and a grade of at least B– (70 percent) on each assignment, the midterm paper, and the final examination.

The weighting of the composite grade is as follows:

Activity	Weight
Assignment 1	10%
Assignment 2	10%
Midterm paper	20%
Assignment 3	10%
Assignment 4	10%
Assignment 5	10%
Final exam	30%
Total	**100%**

The **final examination** for this course must be requested in advance and written under the supervision of an AU-approved exam invigilator. Invigilators include either ProctorU or an approved in-person invigilation centre that can accommodate online exams. Students are responsible for payment of any invigilation fees. Information on exam request deadlines, invigilators, and other exam-related questions, can be found at the **Exams and grades** section of the Calendar.

Materials

Digital course materials

Links to the following course materials will be made available in the course:

Lowe, J. J., & Walker, M. J. C. (2014). *Reconstructing Quaternary environments* (3rd ed.). Taylor & Francis.

Important links

- **Important Dates and Deadlines**
- **MSc ESS Contact Information**
- **MSc ESS Program Regulations**

Athabasca University reserves the right to amend course outlines occasionally and without notice. Courses offered by other delivery modes may vary from their individualized study counterparts.

Opened in Revision 1, July 21, 2025

Updated July 7, 2026