

GEOL 862 – RESOURCE AND SUSTAINABILITY

Course Syllabus – Winter 2025

This is your course syllabus. Please download the file and keep it for future reference.

LAND ACKNOWLEDGEMENT

Queen's University is situated on traditional Anishinaabe and Haudenosaunee Territory.
See: <http://www.queensu.ca/encyclopedia/t/traditional-territories>

INCLUSIVITY STATEMENT

Queen's students, faculty, and staff come from every imaginable background – small towns and suburbs, urban high rises, Indigenous communities, and from more than 100 countries around the world. You belong here: <https://www.queensu.ca/inclusive/>

COURSE INSTRUCTOR

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GEOL 862 (W 3-0-0.5)

COURSE DESCRIPTION

This course addresses the role of mineral exploration and mining industries in providing wellbeing for people and ecosystems; includes discussions of the global distribution of, and demand for, water, energy and mineral resources, and the major geological, technological, economic, environmental, social and governance issues. It culminates with the design of solutions based on sustainable management. The format includes **3 hours** per week of lectures, panel discussions and seminars, along with a **1- hour tutorial** to address students' questions and assist in the preparation of the deliverables.

PRE-REQUISITE KNOWLEDGE

Although no prerequisite is required, this course is designed for learners with some background in science, engineering, and interested in global issues associated with the sustainable provision of earth resources to society.

COURSE OBJECTIVES AND LEARNING OUTCOMES (CLOs)

This course aims to provide students with a holistic framework to understand the geological, technological, environmental, economic and social issues related to the provision of earth resources and focusing mainly on the critical metals required for evolving society.

The learning outcomes of this course are:

- (1) Identify the relationship among technical issues such as distribution of water, mineral, and energy resources to sustain the global provision of these natural resources, with focus on critical minerals
- (2) Address issues within the context of UN Sustainable Development Goals (e.g., population growth, social justice, wealth distribution, and environmental concerns) by applying the technical knowledge from CLO (1).
- (3) Evaluate the attributes related to non-renewable character of minerals and mine life-cycle systems (e.g., geological, technological, environmental, social, economic, and human issues) for strategic and sustainable resource planning.
- (4) Examine examples of policies and legislative frameworks that address the complexity of sustainable mineral resource provision within a global context to understand the challenges in mineral exploration worldwide.
- (5) Analyze the criteria and indicators used to evaluate the sustainable global provision of resources to identify their limitations and propose new approaches.
- (6) Propose innovative approaches for mineral exploration and mining activities using knowledge integrated from (CLO 1-3) and research on new technologies.
- (7) Reflect on the role/responsibility of the geologists and engineers in contributing to sustainable provision of mineral resources globally by taking into consideration the geological, technological, social, and political contexts.

ASSESSMENT WEIGHTING ALIGNED WITH CLOs AND HOLISTIC FRAMEWORK

Although many of the CLOs relate to various assignments, in the table below it is identified the ones that will be mostly aligned to specific assignments in the context of the holistic framework. **The assessment weighting for various assignments is shown in Table 1 to a total of 80% while 20% relates to participation in the course**, by attending the lectures and engaging in the discussions during the lectures, seminars' presentations and debates.

Table 1: LEARNING OUTCOMES ALIGNED WITH HOLISTIC FRAMEWORK AND ASSIGNMENTS

Holistic Framework*	Course Learning Outcomes	Aligned Assessment	Allocation of Grades
Foundational Knowledge	CLO # 1: Identify the relationship among technical issues such as distribution of water, mineral, and energy resources to sustain the global provision of these natural resources with focus on critical metals	Assignment #1	10%
Integration	CLO # 6: Propose innovative approaches for mineral exploration and mining activities using knowledge integrated from CLO(1-3) and research on new technologies.	Assignment #2	10%
Human Dimension	CLO # 7: Reflect on the role/responsibility of the geologists and engineers in contributing to sustainable provision of mineral resources globally by taking into consideration the geological, technological, social, and political contexts.	Participation: including self-evaluation and feed-back discussions	20%
Caring	CLO # 2: Address issues within the context of UN Sustainable Development Goals (e.g., population growth, social justice, wealth distribution, and environmental concerns) by applying the technical knowledge from CLO(1).	Assignment #3 A	10%
Learning How to Learn	CLO # 3: Evaluate the attributes related to non-renewable character of minerals and mine life-cycle systems (e.g., geological, technological, environmental, social, economic, and human issues) for strategic and sustainable resource planning.	Assignment #3 B	25%

Holistic Framework*	Course Learning Outcomes	Aligned Assessment	Allocation of Grades
Application	CLO # 4: Examine examples of policies and legislative frameworks that address the complexity of sustainable mineral resource provision within a global context to understand the challenges in mineral exploration worldwide.	Assignment #4 A	10%
	CLO # 5: Analyze the criteria and indicators used to evaluate the sustainable global provision of resources to identify their limitations and propose new approaches.	Assignment #4 B	15%

(*) Chen, Y. (n.d.). *Holistic Framework for Globally Engaged Curriculum*. Global Engagement.
<https://www.queensu.ca/ctl/resources/global-engagement/developing-globally-engaged-curriculum#Holistic>

ASSESSMENT DESCRIPTIONS

This course assignments will involve mainly literature review and case studies. The case studies will be presented in the form of reports, seminars and debates. Detailed information on each assignment will be provided on onQ site (see the assignment folder).

CASE STUDIES, SEMINARS AND DEBATE:

Assignment #1: Case Study Report: Targeting exploration for specific commodities taken in consideration geological, environmental, technological, economic and social attributes (INDIVIDUAL)

Assignment #2: Seminar 1: New technologies to mitigate environmental impact of mineral exploration and mining (TEAM, mark including both team and individual performance)

Assignment # 3 A, B: Seminar 2: Integration of STEM to address the UN sustainable development goals in the context of the provision of mineral or energy resources (PART A: TEAM; PART B: INDIVIDUAL)

Assignment #4 A, B: Debate 1: Critical analysis of the established policies and criteria to evaluate global provision of resources (PART A- TEAM; PART B- INDIVIDUAL)

Detailed information about these assignments and evaluation criteria will be provided in the weekly assessment sections on the course onQ site.

GRADING

All assessments in this course will receive numerical percentage marks. The final grade you receive for the course will be derived by converting your numerical course average to a letter grade according to the established [Grade Point Index](#).

Feedback on Assessments

The teaching team will provide feedback on graded activities. You can expect feedback on your assessments within seven days of the due date.

Accessing Your Final Grade

Your final grades will show on SOLUS. Official transcripts showing final grades will be available on the Official Grade Release Date. Please note that in official transcripts, a mark of IN (incomplete) is considered a grade, and your transcript is released with this grade.

COURSE MATERIALS

Required Textbook

No textbook is required. The case studies assignments will be conducted based on robust scientific and technological data from the literature, government and private sector reports, and contextualized when required with information from the recognized news venues.

Other Material

All other course lectures and assignments are accessible via onQ for GEOE 862

Suggested Time Commitment

This course represents a study period of one semester spanning 12 weeks. Learners can expect to invest on average **5-7 hours per week** in this course. Learners who adhere to the schedule below are more likely to successfully complete the course.

COURSE SCHEDULE

GEOE/L 862 Weeks	Lecture Content	Deliverables	Deliverables Due @
Week 1	PART 1A: Introduction to Major Global Issues and Concepts of Sustainability		
Week 2	PART 1B: Major Global Issues the provision of metals: Cu case study		
Week 3	PART 1B: Major Global Issues the provision of metals: Cu case study	Case Study Report: Targeting exploration for specific commodities taken in consideration geological, environmental, technological, economic and social attributes (INDIVIDUAL)	Assignment #1- Case Study INDIVIDUAL REPORT due: be uploaded in the onQ site @ 11 AM on Monday

GEOE/L 862 Weeks	Lecture Content	Deliverables	Deliverables Due @
Week 4	PART 2: The challenges of the resource industry in contributing to sustainable development focusing on critical minerals/ metals- discussion of the major constrains		
Week 5	Seminar 1- Case studies presentations	Assignment #2: Seminar 1: New technologies to mitigate environmental impact of mineral exploration and mining (TEAM, mark including team and individual performance)	Assignment #2- Seminar 1- PowerPoint slides due: be uploaded in the onQ site @ 11AM on Monday
Week 6	Seminar 1- Case studies- presentations and feedback	Team presentations continuous and feedback session	
READING WEEK			
Week 7	Part 3A: Analysis of UN Sustainable Goals and the provision of critical minerals/metals		
Week 8	Part 4: The role and challenges of the scientists, explorationists, engineers working in the fields related to the mineral resource industry (professional ethics, compliance and engagement)		
Week 9	Part 3 & 4: Integration of STEM and professional engagement to address the UN sustainable development goals in the context of the provision of mineral or energy resources- specific case studies.	Assignment # 3 A, Seminar 2: Integration of STEM to address the UN sustainable development goals in the context of the provision of mineral or energy resources (TEAM);	Assignment #3- Seminar 2- part A: PowerPoint slides due: be uploaded in the onQ site @ 11AM on Monday

GEOE/L 862 Weeks	Lecture Content	Deliverables	Deliverables Due @
Week 10	Part 3 & 4: Integration of STEM and professional engagement to address the UN sustainable development goals in the context of the provision of mineral or energy resources	Assignment #3: PART B: INDIVIDUAL INTERVIEWS and feedback	
Week 11	PART 5 A: The way forward and possible solutions: Criteria and indicators to assess the contribution of mining and mineral activities to sustainable development Approaches to implement proposed solutions		Assignment #4- Debate questions to be uploaded in the onQ site @ 11:59 on THURSDAY
Week 12	Part 5 B: The way forward and possible solutions: Critical analysis of the established policies and criteria to evaluate global provision of resources	Assignment #4 A, B: Live Debate: Critical analysis of the established policies and criteria to evaluate global provision of resources (PART A- TEAM; PART B- INDIVIDUAL)	Assignment #3- Seminar 2-part A: PowerPoint slides due: be uploaded in the onQ site @ 11AM on Monday

COURSE COMMUNICATION

QUESTIONS ABOUT COURSE MATERIAL

Questions or comments regarding the course material that can be of benefit to other students should be discussed in the classroom during lectures and tutorials. The instructor, TAs, and students are encouraged to engage during lectures and seminars' presentations, by asking questions and sharing their experience that relate to the theme.

COURSE ANNOUNCEMENTS

The instructor will routinely post course news in the Announcements section on the main course homepage on onQ. Please sign up to be automatically notified by email when the instructor posts new information in the Announcements section. Instructions on how to modify your notifications are found in the **Begin Here** section of the onQ course site.

OFFICE HOURS

In addition to interaction in the Q&A discussion forums, you will have the opportunity to interact with either a TA or the instructor through tutorial time for this course. The instructor will provide a schedule of availability at the beginning of the term. If you need to meet the instructor outside the tutorial time, send an email requesting a meeting with the instructor.

CONFIDENTIAL MATTERS

If you have a confidential matter you would like to discuss with your instructor, their contact details are on the first page of this document. Expect email replies within 48 hours.

LATE POLICY

In the event of extenuating circumstances, you must follow the policies for requesting an academic consideration (as described above). In the absence of an approved consideration request, the late penalty will apply as described in the specific assignments.

STANDARD QUEEN'S AND SMITH ENGINEERING POLICIES

NETIQUETTE

In this course, you may be expected to communicate with your peers and the teaching team also through electronic communication. You are expected to use the utmost respect in your dealings with your colleagues or when participating in activities, discussions, and online communication.

Following is a list of netiquette guidelines. Please read them carefully and use them to guide your online communication in this course and beyond.

1. Make a personal commitment to learn about, understand, and support your peers.
2. Assume the best of others and expect the best of them.
3. Acknowledge the impact of oppression on the lives of other people and make sure your writing is respectful and inclusive.
4. Recognize and value the experiences, abilities, and knowledge each person brings.
5. Pay close attention to what your peers write before you respond. Think through and re-read your writings before you post or send them to others.
6. It's alright to disagree with ideas, but do not make personal attacks.
7. Be open to be challenged or confronted on your ideas and challenge others with the intent of facilitating growth. Do not demean or embarrass others.
8. Encourage others to develop and share their ideas.

STUDENT CODE OF CONDUCT

Queen's University values maintaining an environment free of, and will not tolerate, harassment, discrimination, and reprisal. The Student Code of Conduct applies to all students at Queen's. It outlines the activities and behaviours that could be considered Non-Academic Misconduct (NAM). The Code also describes the NAM process and the sanctions that could be imposed on a student found responsible for a violation.

All students should be familiar with the Student Code of Conduct and related policies on sexual violence prevention and response and harassment and discrimination prevention and response.

<https://www.queensu.ca/nonacademicmisconduct/policies>

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ACADEMIC INTEGRITY

As an engineering student, you have made a decision to join us in the profession of engineering, a long-respected profession with high standards of behaviour. As future engineers, we expect you to behave with integrity at all times. Please note that Engineers have a duty to:

- Act at all times with devotion to the high ideals of personal honour and professional integrity.
- Give proper credit for engineering work

The standard of behaviour expected of professional engineers is explained in the [Professional Engineers Ontario Code of Ethics](#). Information on policies concerning academic integrity is available in the [Queen's University Code of Conduct](#), in the [Senate Academic Integrity Policy Statement](#), on the [Smith Engineering website](#), and from your instructor.

Departures from academic integrity include plagiarism, use of unauthorized materials or services, facilitation, forgery, falsification, unauthorized use of intellectual property, and collaboration, and are antithetical to the development of an academic community at Queen's. Given the seriousness of these matters, actions which contravene the regulation on academic integrity carry sanctions that can range from a warning or the loss of grades on an assignment to the failure of a course to a requirement to withdraw from the University.

In the case of online or remotely proctored exams, impersonating another student, copying from another student, making information available to another student about the exam questions or possible answers, posting materials to online services, communicating with another person during an exam or about an exam during the exam window, or accessing unauthorized materials, including internet sources and using unauthorized materials, including smart devices, are actions in contravention of academic integrity.

GENERATIVE ARTIFICIAL INTELLIGENCE (AI) TOOLS, LIKE CHATGPT

Students must submit their own work and cite the work that is not theirs. Generative AI writing tools such as ChatGPT may be permissible **if explicitly noted** in the assignment instructions. In these cases, be sure to cite the material that they generate and fully understand their content. **Without specific permission** noted in the assignment, you are not allowed to use Gen AI tools, or it **constitutes a Departure from Academic Integrity**.

TURNITIN STATEMENT

This course makes use of Turnitin, a third-party application that helps maintain standards of excellence in academic integrity. Normally, students will be required to submit their course assignments through onQ to Turnitin. In doing so, students' work will be included as source documents in the Turnitin reference database, where they will be used solely for the purpose of detecting plagiarized text in this course. Data from submissions is also collected and analyzed by Turnitin for detecting Artificial Intelligence ([AI-generated text](#)). These results are not reported to your instructor at this time but could be in the future.

Turnitin is a suite of tools that provide instructors with information about the authenticity of submitted work and facilitates the process of grading. The similarity report generated after an assignment file is submitted produces a similarity score for each assignment. A similarity score is the percentage of writing that is similar to content found on the internet or the Turnitin extensive database of content. Turnitin does not determine if an instance of plagiarism has occurred. Instead, it gives instructors the information they need to determine the authenticity of work as a part of a larger process.

Please read Turnitin's [Privacy Policy](#), [Acceptable Use Policy](#) and [End-User License Agreement](#), which govern users' relationship with Turnitin. Also, please note that Turnitin uses cookies and other tracking technologies; however, in its service contract with Queen's Turnitin has agreed that neither Turnitin nor its third-party partners will use data collected through cookies or other tracking technologies for marketing or advertising purposes.

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Portions of this document have been adapted, with permission, from the University of Toronto Centre for Teaching Support and Innovation tip sheet "[Turnitin: An Electronic Resource to Deter Plagiarism](#)".

ACADEMIC AND STUDENT SUPPORT

Queen's has a robust set of supports available to you including the [Library](#), [Student Academic Success Services \(Learning Strategies and Writing Centre\)](#), and [Career Services](#). Learners are encouraged to visit the Smith Engineering [Current Students](#) web portal for information about various other policies such as academic advisors, registration, student exchanges, awards and scholarships, etc. Students are also encouraged to review the information that is available in the EngQ Hub, posted in onQ.

ABSENCES (ACADEMIC CONSIDERATIONS) AND MISSED ASSIGNMENTS

For information on academic considerations due to extenuating circumstances, please review the information on the [Smith Engineering website or Faculty of Arts and Sciences website](#). Note that unacceptable reasons include extra-curricular activities, travel plans, generally behind on schoolwork, etc. Do not schedule travel during midterms and final exams, as travel is not an acceptable reason for granting academic considerations.

ACCOMMODATIONS FOR DISABILITIES

Queen's University is committed to working with students with disabilities to remove barriers to their academic goals. Queen's Student Accessibility Services (QSAS), students with disabilities, instructors, and faculty staff work together to provide and implement academic accommodations designed to allow students with disabilities equitable access to all course material (including in-class as well as exams). If you are a student currently experiencing barriers to your academics due to disability related reasons, and you would like to understand whether academic accommodations could support the removal of those barriers, please visit the QSAS website (<https://www.queensu.ca/studentwellness/accessibility-services>) to learn more about academic accommodations. To start the registration process with QSAS, click the **Access Ventus** button found on the Ventus student portal: <https://www.queensu.ca/studentwellness/accessibility-services/ventus>

Ventus is an online portal that connects students, instructors, Queen's Student Accessibility Services, the Exam's Office, and other support services in the process to request, assess, and implement academic accommodations. To learn more about Ventus, visit A Visual Guide to Ventus for Students: <https://www.queensu.ca/ventus-support/students/visual-guide-ventus-students>

For questions or assistance with requesting Academic Consideration or Accommodation, contact the Smith Engineering Program Advisor (Accommodations and Considerations) at engineering.aac@queensu.ca

Every effort has been made to provide course materials that are accessible. For further information on accessibility compliance of the educational technologies used in this course, please consult the links below.

EDUCATIONAL TECHNOLOGY	ACCESSIBILITY COMPLIANCE INFORMATION
onQ (Brightspace Learning Management System by D2L)	https://www.d2l.com/accessibility/standards/
MS-Teams	https://support.microsoft.com/en-us/office/accessibility-support-for-microsoft-teams-d12ee53f-d15f-445e-be8d-f0ba2c5ee68f
Zoom	https://zoom.us/accessibility

Please Note: If you find any element of this course difficult to access, please discuss with your instructor how you can obtain an accommodation.

RELIGIOUS OBSERVANCE

Students in need of accommodation for religious observance are asked to speak to their professor within a week of receiving their syllabus. Note also that alternative assignments are considered a "reasonable accommodation" under the Ontario Human Rights Code. Students with questions about their rights and responsibilities regarding religious accommodation should contact the Chaplain Chaplain@queensu.ca.

OTHER HUMAN-RIGHTS BASED ACCESSIBILITY NEEDS

Students who have accessibility needs based on human-rights covered grounds, should inform their instructors within a week of receiving their syllabus. Student can also contact the contact the Smith Engineering Program Advisor (Accommodations and Considerations) at engineering.aac@queensu.ca for guidance.

TECHNICAL SUPPORT

Some basic comfort level with basic hardware and software skills are required for this course. If you require technical assistance, please contact [Technical Support](#).

SUPPORTIVE PERSONAL COUNSELLING

If at any time you find yourself feeling overwhelmed, anxious, sad, lonely, or distressed, consider confidential [personal counselling and wellness services](#) offered by Smith Engineering and the [Queen's student wellness services](#).

ACKNOWLEDGMENTS

Thank very much to Yunyi Chen (Educational Developer-Global Learning, Curriculum & Pedagogy at the Centre for Teaching and Learning) for diligently working with me in applying the Holistic Framework to the context of this course, and to Dr. Victoria Remenda (former Department Head) and Bas Vrien (Chair of the Geological Engineering Curriculum Committee) in supporting its development.