

ERTH 4303: Resources of the Earth Winter 2018 Course Outline

Lectures: Friday 8:30 - 11:30 TB 208

Office Hours: by arrangement

Course objective:

To learn about mineral, water, and food resources, in the context of economic and environmental consequences of their extraction and use; and the differences between concepts of sustainability of resource utilization in the short term (e.g., market cycles, electoral cycles), longer term (decades to centuries) and ultimate sustainability of industrial society.

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Textbook and Supplementary readings: There is no textbook required.

Stephen E Kesler and Adam C Simon, 2015, Mineral Resources, Economics and the Environment. Cambridge University Press ISBN 1107074910. Available on Amazon.
Vaclav Smil, 2017, Energy and Civilization. Available for free download from Carleton Library.
Vaclav Smil, 2014, Making the Modern World: Materials and Dematerialization. One print copy in the Carleton University Library. \$33.00 on Amazon.ca
Vaclav Smil, 2012, Harvesting the Biosphere: What We Have Taken From Nature. One print copy in the Carleton University Library.
Vaclav Smil, 2016, Still the Iron Age: Iron and Steel in the Modern World. One copy available for online reading through Carleton Library. \$75 on Amazon.ca

Course notes: I will put my .ppt lectures onto the course website for you after the class. They are mostly images, supplemented by notes in the files themselves. Come to class.

Wikipedia assignment: Your term work will consist of editing or writing a Wikipedia article. You must enroll on Wikipedia as a student editor for this course. Please bring a laptop to class.

Class participation: I will be using Tophat to give in-class quizzes and to promote participation in discussions. You must enroll in Tophat and pay a fee for the semester. Your grade will depend in part on your participation in these discussions, which you can do via smartphone or computer if you are not comfortable speaking out in class. You must attend the classes to obtain the participation marks and answer the quizzes.

Marking:

Midterm test (at student's discretion, this mark can be exempted and a new weight of 60% put on the final exam. This decision is irreversible)	20%
Assignment	40%
Class participation (Tophat)	10%
Final examination: 3 hours, TBA	30%

Brief course outline, by week and lecture date:

Items written in underlined italics are assignments for Wikipedia. Their grades total 100, which will be recalculated to make up the 40% weight of your course mark given to the Wikipedia assignment. Pay attention to the due dates. Items listed as 'no grade assigned' must be completed but will not be marked. The next assignment on your to do list will not be marked until the training exercise has been completed.

1. Jan 11. Introduction to the course. Chapters 1 and 2.

Concepts of carrying capacity of Earth and sustainable use of resources; overview of mineral deposit geology in the context of plate tectonic theory.

Getting started on Wikipedia - everyone has a Wikipedia account 5%

Training - Wikipedia essentials. 2.5% mark weight due Jan 18.

Training - Editing basics. 2.5% mark weight due Jan 18.

Note: subsequent Training exercises will be due but not marked.

2. Jan 18. Environmental geochemistry. Chapter 3.

Geochemical reservoirs, reactions, geochemical cycles, timescales, pollution and remediation.

Evaluate Wikipedia 10%.

Exercise: Evaluate an article due Feb 1.

Training - Evaluating articles and sources

How to edit: Wikicode vs Visual Editor

Class discussion: Thinking about sources and plagiarism

3. Jan 25. Mineral exploration and production. Chapter 4.

Exploration methods, mining, beneficiation, smelting, refining, mining law in Canada.

Choose your topic/Find your sources no grade assigned

Discussion: What's a content gap?

Guides for writing articles in your area - Chemistry, Environmental Science

4. Feb 1. Mineral economics. Chapters 5 and 6.

Resources and reserves, reporting requirements in Canada, elasticity in supply and demand, return on investment, present value, externalities, long term sustainability.

Add to an article 10%. due Feb 8.

Training - adding citations

Exercise - add a citation

5. Feb 8. Energy mineral resources. Chapter 7.

Fossil fuels, peak oil, carbon footprint and other externalities, enhanced recovery, nuclear power, renewable energy.

Start drafting your contributions - Everyone has started writing 20%, due Feb 15.

Training: plagiarism, drafting in the sandbox

6. Feb 15. Iron, steel and ferroalloys. Chapter 8.

History of iron production, manganese, nickel, chromium, silicon, cobalt, molybdenum, vanadium, tungsten, niobium; resources, markets, environmental impacts, and future supplies.

Peer review two articles. **no grade assigned** due Mar 1.

Discussion: Thinking about Wikipedia

7. Reading week no class Feb 22

8. Mar 1. MIDTERM TEST IN CLASS 60 minutes

Respond to your peer review. 10% (you will receive this grade only if you did your two reviews) due Mar 8.

9. Mar 8. Return of graded midterms Ferroalloys and aluminum. Chapter 9.

Begin moving your work to Wikipedia. no grade assigned due Mar 15.

Training: Moving work out of the sandbox

10. Mar 15. Light elements and technological elements. Chapters 9 and 10.

magnesium, titanium; copper, lead, zinc and tin; resources, markets, environmental impacts, and future supplies. Antimony, arsenic, beryllium, bismuth, cadmium, cesium, gallium, germanium, indium, lithium, mercury, rare earths, scandium yttrium, rhenium, selenium, tellurium, thallium, zirconium, hafnium; resources, markets, environmental impacts, and future supplies.

Continue improving your article. No grade assigned.

Training: contributing images and media files

Exercise: add links to your article

11. Mar 22. Precious metals and gems. Chapter 11.

Gold, silver, platinum-group elements, diamonds, gems; resources, markets, environmental impacts, and future supplies.

Polish your work. No grade assigned.

12. Mar 29. Food. Chapter 12. Construction, chemical, and industrial minerals. Chapter 13.

History and current state of food production; potash, phosphate, nitrate supplies, arable land as a resource; environmental risk and food security.

Limestone, dolomite, lime, salt, sulfur, fluorite, iodine, sodium sulfate, bromine; cement, aggregate, dimension stone, gypsum, clays, glass, etc.

Finish writing your article. No grade assigned.

Reflective essay 10%. Due April 5.

13. Apr 5. Global mineral reserves, resources, and sustainability. Chapter 14.

Resource estimation; recycling, substitution, energy cost of declining grade; environmental impact; future prospects for industrial society.

Review for final examination.

All edits complete 35% due Tuesday April 9.

Academic offences:

<https://carleton.ca/senate/wp-content/uploads/Academic-Integrity-Policy1.pdf>

I have vigorously pursued academic offenses in the past and intend to continue to when circumstances warrant it. The following passages have been excerpted from the calendar of Carleton University, and will be applied in this course to ensure that students get credit where credit is due.

Excerpt from the Academic Integrity Policy:

"Students are responsible for being aware of and demonstrating behaviour that is honest and ethical in their academic work. Such behaviour includes:

- Following the expectations articulated by instructors for referencing sources of information and for group work.
- Submitting original work, citing sources fully, and respecting the authorship of others.
- Asking for clarification of expectations as necessary. Students who are in any doubt as to whether an action on their part may be viewed as a violation of the standards of academic integrity should ask for clarification.
- Identifying situations that may reasonably lead to a violation of this policy.
- Preventing their work from being used by others, e.g. protecting access to computer files, etc.
- Adhering to the principles of academic integrity when conducting and reporting research."

"Examples of plagiarism include, but are not limited to:

- submitting a take-home examination, essay, laboratory report or other assignment written, in whole or in part, by someone else;
- using ideas or direct, verbatim quotations, paraphrased material, algorithms, formulae, scientific or mathematical concepts, or ideas without appropriate acknowledgement in any academic assignment;
- using another's data or research findings
- submitting a computer program developed in whole or in part by someone else, with or without modifications, as one's own'
- failing to acknowledge sources through the use of proper citations when using another's work and/or failing to use quotation marks"

You may often be working on lab assignments together and you are strongly encouraged to work together to understand what you are looking at in the lab. However when you write and submit your lab reports, all of the text and all of the images that you submit must be your own or must be cited (e.g., this section scan given to you by the TA). Even with proper attribution, use of copied images is strongly discouraged except for those that are distributed to you by the instructors for the express purpose of including in your lab.

This means: don't copy and don't cheat.

LEARNING OUTCOMES

By the end of the course, each successful student will acquire the knowledge in the lecture allowing them to understand and critically evaluate historical, contemporary, and projected:

- sources and material flows of the key mineral resources used in contemporary society.
- economic and environmental constraints on mineral resource utilization.
- global supplies of food from agriculture and from natural sources.

STUDENT ACCOMMODATIONS

Examinations and Assignments

Students with conflicts for any examination must have a note from an employer or a medical certificate (see below) in order to **write the exam** at another date. Unless caused by illness, all conflicts **MUST** be reported to the instructor **PRIOR** to the exam date. If a lab is missed, a student may make it up along with the lab quiz in another lab section during that week without requiring a medical certificate. In the case of a serious illness, see

<http://carleton.ca/registrar/special-requests/deferral/> for the rules concerning deferral of an exam or assignment.

No outside study aids (calculators, notes) will be allowed for any exams. Any materials required for the exams will be provided by the instructor.

Excerpt from the Carleton University Calendar:

"Students who claim illness, injury or other extraordinary circumstances beyond their control as a reason for missed term work are held responsible for immediately informing the instructor concerned and for making alternate arrangements with the instructor and in all cases this must occur no later than three (3.0) working days after the term work was due. The alternate arrangement must be made before the last day of classes in the term as published in the academic schedule. Normally, any deferred term work will be completed by the last day of term. In all cases, formative evaluations providing feedback to the student should be replaced with formative evaluations. In the event the altered due date must extend beyond the last day of classes in the term, the instructor will assign a grade of zero for the work not submitted and submit the student's earned grade accordingly; the instructor may submit a change of grade at a later date. Term work cannot be deferred by the Registrar."

There will be no make-up work, but if your documentation is accepted then the original assignment will be accepted late, on a date to be arranged with the instructor.

Requests for Academic Accommodation

You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

Pregnancy obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist.

For more details, visit the Equity Services website: carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

Religious obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

Academic Accommodations for Students with Disabilities

If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. carleton.ca/pmc

Survivors of Sexual Violence

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and its survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: carleton.ca/sexual-violence-support

Accommodation for Student Activities

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. <https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf>

For more information on academic accommodation, please contact the departmental administrator or visit: students.carleton.ca/course-outline

Missed tests or late assignments:

Missed assignments, and late hand-ins will **only** be excused for cases in which the absence was entirely beyond your control (e.g., medical reasons, personal affliction, bereavement), and only if the proper documentation is submitted. For medical exemption you must use (or furnish the information demanded in) the official Carleton University Medical Certificate which must be filled out by a doctor **on the day of the missed work or test**. Documentation of the reason for

your absence must be submitted to the instructor within three working days of the absence or missed work.

https://carleton.ca/registrar/wp-content/uploads/med_cert.pdf