

ERTH 3204: Mineral Deposits Winter 2023 Course Syllabus

Lectures: first class Jan 10 Tuesday 2:35 - 5:30 HP 3120

Labs: note: first lab Jan 13 Friday 2:35 - 5:30 HP 2120

Course objective:

To be able to recognize and name ores and associated alteration and host rocks representing the principal types of ore deposits mined in Canada, to understand their genesis and exploration models, and to be conversant with the legal and regulatory framework for mining.

Instructor: Jim Mungall
jamesmungall@cunet.carleton.ca

TA:
Yingzhou Li yingzhouli@cmail.carleton.ca

Office Hours: Wednesday between 9 am and 3 pm via Zoom by arrangement with the professor. Send me an email to arrange a meeting. Try to spend the whole 3 hours in the lab each week and we can also talk then.

Texts: Treatise on Geochemistry (2nd Ed), Volume 13: Geochemistry of Mineral Deposits, S.D. Scott Ed. (e-book available from Carleton University Libraries for free download).

Ore Microscopy and Ore Petrography, 2nd Ed, by James R Craig and David J Vaughan. Wiley and Sons, Inc, 1994. Free download from MSA:

http://www.minsocam.org/msa/OpenAccess_publications/Craig_Vaughan/

Thin Section Microscopy 2nd Ed, by Michael M. Raith, Peter Raase, and Juergen Reinhardt ISBN 978-3-00-037671-9 (PDF)

Free download from MSA:

http://www.minsocam.org/msa/OpenAccess_publications/Thin_Sctn_Mcrscopy_2_prnt_eng.pdf

Course notes: I will put my .pptx lectures onto the course website on Brightspace for you.

Quizzes: There will be a quiz to follow each lecture. You can answer the quiz any time during the week following the lecture. There will be 12 quizzes in total.

Course work: Each week I will give a lecture in person outlining the geology and economics of one of the principal mineral deposit types mined in Canada. Each week in the lab I will spend an hour showing you the important rock types, textures, and mineral assemblages associated with ore in that week's deposit type. Then most weeks you will have one week to prepare a report summarizing the characteristics of ores of that deposit type, illustrated with hand sample photos and photomicrographs of ore minerals that you have taken in the lab. Two

hours in the lab after I have finished should be enough to give you what you need to complete the assignment.

Your report must be written in proper English, with correct spelling and grammar (use the checkers in Word to help with this). Your errors or omissions will be highlighted and the first five assignments will be returned to you for corrections and then you can resubmit them for a final grade. **It must not include any text copy-pasted from your sources or from your classmates.** It must be written in your own words – plagiarism will result in a mark of zero on that week's assignment and repeat offenses will be reported to the Dean's office. Images not created by you may be used but must be properly cited.

There are 9 such reports to do but only 8 will be used in your course mark - you can choose which lab to drop. They are each due 1 week after the day of the lab; for the first 4 the instructors will review them and identify errors or weaknesses, they will be returned to you a week later and you will have one extra week to correct them, upon which you will have the option resubmit them or stick with your original submission. The final version (or original one if you decline to make changes) will then receive a mark. The last 4 assignments will be due one week after the lab, without a second round of revisions. By that time you should know what is expected. The very last assignment is due three days after the lab, on the last day of term.

When you submit these reports, imagine that you have just begun working at a small exploration company and your boss is going to decide whether or not to make your position semi-permanent based on the quality and usefulness of what you give her.

Marking item:	Total weight
Quizzes after each lecture (12 x 3%), delivered through Brightspace	36%
Lab assignments (8 x 8%)	64%
No exam, no midterm test, no lab test, therefore no e-proctoring	

Brief course outline, by week and lecture/lab date:

1. **Jan 10.** Intro to mineral deposits, regulations, economics (quiz)
Lab Jan 13. Intro to reflected light microscopy, description of principal ore minerals
2. **Jan 17.** Magmatic sulfide deposits - base metals (quiz)
Lab Jan 20. Magmatic sulfide - base metal dominant **Lab report due Jan 27**
3. **Jan 24.** Magmatic sulfide deposits - PGE dominant (quiz)
Lab Jan 27. Magmatic sulfide - PGE dominant **Lab report due Feb 3**
4. **Jan 31.** Career workshop - Identifying Employability Skills (quiz)
Feb 3 No lab this week.
5. **Feb 7.** Chromitites (quiz)
Lab Feb 10. Chromitite **Lab report due Feb 17**
6. **Feb 14.** Kimberlite genesis, diamonds (quiz)
Lab Feb 17. Kimberlite and diamonds **Lab report due Mar 3**
7. **Feb 21. Reading Week - no class, no lab**
8. **Feb 28.** Career Workshop - Resume and Cover Letter Development (quiz)
Mar 3 no lab this week
9. **Mar 7. PDAC** - no lecture but attendance at PDAC is strongly encouraged
PDAC week lab Picking winners and losers **Lab report due Mar 17**
10. **Mar 14.** Porphyry deposits (quiz)
Lab Mar 17. Porphyry deposits **Lab report due Mar 24**
11. **Mar 21.** Gold deposits (quiz)
Lab Mar 24. Orogenic Gold **Lab report due Mar 31**
12. **Mar 28.** Volcanogenic massive sulfide deposits (quiz)
Lab Mar 31. VMS deposits **Lab report due Apr 7**
13. **Apr 4.** Mississippi-Valley type deposits (quiz)
Lab Apr 7. MVT deposits **Lab report due Apr 12 (last day of term)**
14. **Apr 11.** Uranium deposits (quiz)
No lab

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 skills and knowledge sets in the lecture and laboratory sessions allowing them to:

- be able to identify most of the important ore minerals mined in Canada both in hand specimen and in the ore microscope.
- be able to identify and categorize mineralized rocks and associated alteration styles representative of most of the principal economic mineral deposits of Canada.
- demonstrate knowledge of the mode of formation of most of the principal Canadian ore deposit types.
- be able to locate and synthesize published information on mineral deposits in brief reports
- demonstrate familiarity with the main exploration methods employed to find each of the principal Canadian ore deposit types.
- be able to describe in broad terms the methods used in ore beneficiation and in the assessment of economic potential of ore deposits.
- demonstrate familiarity with the legal and regulatory framework that applies to exploration, development, and marketing of mineral deposits in Canada.

In the context of Earth Science Learning Outcomes, this course will contribute to the following:

1. Identify common minerals, rocks and fossils – Outcome Reinforced
2. Construct and interpret data sets and maps (e.g., geological, hydrological, geochemical, GIS, paleontological, geophysical) – Outcome Reinforced
3. Develop a comprehensive knowledge of surficial and internal Earth processes and their principles through time – Outcome Reinforced
4. Explain the origin, consumption and impacts of humans on natural resources (e.g., energy, mineral, water, atmosphere) – Outcome Mastered
6. Critically evaluate geoscience data and their uncertainty to produce a scientific report – Outcome Reinforced

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 or submit assigned work late. 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 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.

Missed or late lab exercises:

Lab exercises are due two weeks after the date on which the work was assigned but it is highly recommended that the work be completed within the first week. The instructors will have one week to do their preliminary assessment, upon which the work will be returned to the student. A final version of the assignment is due four weeks after the date on which the work was first assigned or April 14, whichever comes sooner. If a second submission is not received then the mark will be based on assessment of the first submitted version. Late work might be accepted in exceptional circumstances (by written request to the course instructor) but no work will be accepted after April 14.

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:

The deadlines for the weekly lab assignments are firm except for incapacitation that can be covered by submission of a Self-Declaration form. If you submit a [Self-Declaration form](#) you may be allowed extensions to the lab report deadlines.

Quizzes may be reopened for you if you make a request. Note however that they can be taken online over a three-day period and you don't have to be present at the lecture to answer the quiz so you will have ample opportunity to get to them before they close.