

ERTH 2102 Mineralogy to Petrology - Syllabus

Course description

ERTH 2102 Mineralogy to Petrology [0.5 credit]

Chemical, optical and crystallographic properties of common rock-forming minerals, with introduction to common mineral assemblages of igneous, sedimentary, and metamorphic rocks.

Lectures two hours a week and laboratory three hours a week.

Precludes additional credit for ERTH 3202.

Prerequisite(s): ERTH 1001 (no longer offered) or ERTH 1006 and (ERTH 1009 or GEOG 2013) and CHEM 1002 or CHEM 1006.

Learning outcomes

1. Introduce crystallography, crystal chemistry, and systematic mineralogy.
2. Relate the physical properties of minerals to their crystal structures.
3. Introduce analytical methods used in modern mineralogy and petrology, especially polarized light microscopy and X-ray fluorescence analysis.
4. Learn how minerals and rocks are classified and named.
5. Identify minerals and rocks in hand specimen and thin section.
6. Appreciate the influence of crystal chemistry on mineral assemblages in rocks and mineral weathering.
7. Develop the ability to research and learn mineralogical and petrological topics individually and in groups.

Times and locations

This course combines in-person and online delivery types, subject to government regulations and public health guidelines. All lectures will be held online each Monday from 2:35 - 4:25 pm, and the lab sessions will be held Wednesdays from 2:35 - 5:25 pm. Some lab sessions will be conducted online and others will be conducted in-person (Herzberg Labs, room 2120). Please see the Course Plan for details. Online sessions will be conducted synchronously using the Zoom video conferencing platform. Zoom invitations will be sent out by the teaching team prior to each session. Students cannot attend a different lab time/day/section but must attend the section that they have registered in. All students must follow lab protocols. For details, please see here: https://earthsci.carleton.ca/sites/default/files/content-files/TeachingLabs_EarthSci_COVID19_Guidelines%5B1%5D.pdf

Please also review the return to campus lab video here: <https://earthsci.carleton.ca/return-to-campus-2021>

Teaching team

Instructor: Fred Gaidies

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Textbooks

Dyar MD, Gunter M, Tasa D (2019, or the 2008 B&W version). Mineralogy and optical mineralogy. Mineralogical Society of America, Chantilly, VA. This text has an excellent coverage of mineralogical topics, and together with its superb Mineral Database serves as a **required reference** for this course. We will use the text and the database extensively - it can be obtained here: <http://www.minsocam.org/msa/DGTxt/>.

Nesse W (2012) Introduction to optical mineralogy. Oxford University Press. This is an excellent text on the optical properties of minerals. It is a **recommended reference** for this course.

Online resources

This document is available on Brightspace as are many others relevant to the course. Frequently, visit the homepage of this course for updates with respect to the course plan. The course plan contains information on lecture and laboratory topics, reading assignments, homework, and pre-lecture as well as pre-lab preparations. Note that this course plan may be altered during the term.

The course website contains most of the laboratory assignments and homework, and you will have to read them carefully before the respective labs and lectures. Lecture notes will be made available after each lecture.

Course requirements

You are expected to attend all lectures and laboratories. Arriving late to class is distracting to students, professor, and teaching assistants. Students are required to download, install, and use the Zoom videoconferencing software. Instructions can be found here: <https://carleton.ca/zoom/>.

The lab component of the course must be passed in order to pass the course. All labs must be completed and handed in at the end of each respective lab session (unless exceptions are announced by the teaching team).

Reading assignments, homework, pre-lecture and pre-lab preparations are mandatory. It is the student's responsibility to come to lectures and labs prepared.

There will be three examinations during the course: (1) A combined lecture and laboratory midterm exam (two hours, likely during lab sections) that will cover everything up to and including Lecture #6 and Lab #5; (2) A final lab exam (two hours, likely during lab sections) to test your understanding of fundamental concepts of crystal chemistry, crystallography, optical mineralogy, and petrography; (3) A final exam during the official examination period (to be scheduled by the registrar, two hours) that will primarily focus on lecture material.

Grading

15% Laboratory exercises

15% Midterm exam

30% Laboratory exam

40% Final exam

Academic Integrity

It is your responsibility to review Carleton's policy on Academic Integrity - Section 10.1 of the Calendar: <https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/academic-integrity-and-offenses-of-conduct/#academic-integrity-policy>

Plagiarism

The instructor is required to report all incidents (or suspected incidents) of plagiarism to the Dean. All work handed in must be your own work. Plagiarism and cheating are viewed as being particularly serious and the sanctions imposed are accordingly severe. Students are expected to familiarize themselves with and follow the Carleton University Student Academic Integrity Policy. The Policy is strictly enforced and is binding on all students. Plagiarism and cheating – presenting another's ideas, arguments, words or images as your own, using unauthorized material, misrepresentation, fabricating or misrepresenting research data, unauthorized co-operation or collaboration or completing work for another student – weaken the quality of the graduate degree. Academic dishonesty in any form will not be tolerated. Students who infringe the Policy may be subject to one of several penalties including: expulsion; suspension from all studies at Carleton; suspension from full-time studies; a refusal of permission to continue or to register in a specific degree program; academic probation; or a grade of Failure in the course.

Academic Accommodations

You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the necessary processes are described here: <https://students.carleton.ca/course-outline/>

Recording of Class Sessions

This class or portions of this class will be recorded by the instructor for educational purposes. These recordings will be shared only with students enrolled in the course. Your instructor will communicate how you can access the recordings.

Unauthorized student recording of classroom or other academic activities (including advising sessions or office hours) is prohibited. Unauthorized recording is unethical and may also be a violation of University policy. Students requesting the use of assistive technology as an accommodation should contact the [Paul Menton Centre](#). Unauthorized use of classroom recordings – including distributing or posting them – is also prohibited. Under the University's [Copyright Policy](#), faculty own the copyright to instructional materials – including those resources created specifically for the purposes of instruction, such as lectures slides, lecture notes, and presentations. Students cannot copy, reproduce, display, or distribute these materials or otherwise circulate these materials without the instructor's written permission. Students who engage in unauthorized recording, unauthorized use of a recording, or unauthorized distribution of instructional materials will be referred to the appropriate University office for follow-up.

Special Information for Pandemic Measures

All members of the Carleton community are required to follow COVID-19 prevention measures and all mandatory public health requirements (e.g., wearing a mask, physical distancing, hand hygiene, respiratory and cough etiquette) and [mandatory self-screening](#) prior to coming to campus daily.

If you feel ill or exhibit COVID-19 symptoms while on campus or in class, please leave campus immediately, self-isolate, and complete the mandatory [symptom reporting tool](#). For purposes of contact tracing, attendance will be taken in all classes and labs. Participants can check in using posted QR codes through the cuScreen platform where provided. Students who do not have a smartphone will be required to complete a paper process as indicated on the [COVID-19 website](#).

All members of the Carleton community are required to follow guidelines regarding safe movement and seating on campus (e.g., directional arrows, designated entrances and exits, designated seats that maintain physical distancing). In order to avoid congestion, allow all previous occupants to fully vacate a classroom before entering. No food or drinks are permitted in any classrooms or labs.

For the most recent information about Carleton's COVID-19 response and required measures, please see the [University's COVID-19 webpage](#) and review the [Frequently Asked Questions \(FAQs\)](#). Should you have additional questions after reviewing, please contact covidinfo@carleton.ca

Please note that failure to comply with University policies and mandatory public health requirements, and endangering the safety of others are considered misconduct under the [Student Rights and Responsibilities Policy](#). Failure to comply with Carleton's COVID-19 procedures may lead to supplementary action involving Campus Safety and/or Student Affairs.

ERTH 2102 Mineralogy to Petrology - Course Plan

Note that this schedule may be altered during the term.

Week #	Monday lecture	Wednesday lab
2 Sep 13 - Sep 17	Lecture 1: Part I: Administrative stuff & Why mineralogy and petrology? Part II: The essence of mineralogy: Chemical elements, crystal systems, and optical classes [Read: Chapter 1 (2-12)]	Lab 1: Physical properties of minerals in hand specimens (online)
3 Sep 20 - Sep 24	Lecture 2: Part I: The essence of mineralogy (continued): The Big Ten [Read: Chapter 1 (12-17)]. Part II: Introduction to crystal chemistry (Read: Chapter 3)	Lab 2: Introduction to crystal chemistry (online)
4 Sep 27 - Oct 01	Lecture 3: Part I: Introduction to crystallography (Read: Chapter 4) Part II: Introduction to systematic mineralogy: Framework silicates and layer silicates [Read: Chapter 6 (103-111); pre-lecture preparation: homework #1]	Lab 3: Symmetry elements and their combinations as expressed by external crystal form: 32 point groups (online) Pre-lab preparation: homework #2
5 Oct 04 - Oct 08	Lecture 4: Introduction to systematic mineralogy: Layer silicates (cont.), chain silicates, ring silicates, disilicates, orthosilicates, non-silicates [Read: Chapter 6 (111-120)].	Lab 4: Indexing planes and directions in a lattice and on crystals (online)
6 Oct 11 - Oct 15	Thanksgiving	Lab 5: Introduction to the polarized light microscope (in-person)

Week #	Monday lecture	Wednesday lab
7 Oct 18 - Oct 22	Lecture 5: Part I: Chemistry of the elements: Atomic structure and color in minerals [Read: Chapter 7 (126-141)] Part II: Introduction to optical mineralogy (Read: Chapter 5)	Lab 6: Polarized light microscopy using conoscopic illumination (in-person)
8 Oct 25 - Oct 29	Reading Week	
9 Nov 01 - Nov 05	Lecture 6: Part I: Introduction to optical mineralogy (cont.) [Read: Chapter 5] Part II: Review of class	Midterm exam (Lectures 1-6, Labs 1-5) (in-person)
10 Nov 08 - Nov 12	Lecture 7: Optical crystallography [Read: Chapter 17 (435-469)]	Lab 7: Igneous rocks in hand specimens and thin sections (in-person)
11 Nov 15 - Nov 19	Lecture 8: Part I: Optical crystallography (cont.) [Read: Chapter 17 (469-480)] Part II: Chemical analyses of rocks and minerals: XRF and EPMA [Read: Chapter 9 (169, 177-181)]	Lab 8: Sedimentary rocks in hand specimens and thin sections (in-person)
12 Nov 22 - Nov 26	Lecture 9: Part I: Optical crystallography (sign of elongation) Part II: Environments of mineral formation [Read: Chapter 20 (535-542)]	Lab 9: Metamorphic rocks in hand specimens and thin sections (in-person)

Week #	Monday lecture	Wednesday lab
13 Nov 29 - Dec 03	Lecture 10: Part I: Environments of mineral formation (cont.) [Read: Chapter 20 (535-542)] Part II: Ternary phase diagrams; Silica polymorphs and feldspars [Read: Chapter 20 (542-544) and Chapter 22 (577-588)]	Lab Review (in-person)
14 Dec 06 - Dec 10	Lecture 11: Silicate minerals: feldspathoids, zeolites, layer silicates; polymorphism [Read: Chapter 22 (588-599, 577-606)] Lecture 12 (on Friday): Review of class	Lab exam (in-person)
Official Examination Period		