EESC36H3 F - Petrology

Fall 2023 Syllabus

**Prerequisites**: EESB19H3 or (EESC35H3)

**Corequisites**: None

**Exclusions:** (EESC32H3), GLG207H, ERS203H

**Recommended Preparation**: EESB15H3

**Credit Value:** 0.5

| **Section** | **Date & Time** | **Delivery Mode & Location** |
| --- | --- | --- |
| **LEC01** | Thursday, 2:00 PM - 4:00 PM | In Person: EV 140 |
| **PRA0001** | Wednesday, 1:00 PM - 4:00 PM | In Person: EV 224 |

**Important: First Lecture is in EV 140 on Wednesday Sept. 6 during lab time!**

## Course Contacts

**Course Website:** <https://q.utoronto.ca/courses/313101>

**Instructor:** Prof. Heidi Daxberger

**Email:** [heidi.daxberger@utoronto.ca](mailto:heidi.daxberger@utoronto.ca)

**Phone:** 416 208-5136

**Office Hours and Location:** Thursday 4 pm to 5 pm (EV224 or EV466), and by appointment also virtual

**Teaching Assistant:** Adriano Roberto

## Course Overview

This course surveys the processes that produce the chemical and mineralogical diversity of igneous, sedimentary, and metamorphic rocks including: the distribution, chemical and mineral compositions of rocks of the mantle and crust, their physical properties, and their relation to geological environments. Descriptive petrology for various rocks will also be covered.

Petrology is the study of rocks. This course examines the origin, evolution and distribution of “hard rocks”, i.e. igneous and metamorphic rocks. In the classroom portion fundamentals on igneous melt generation, evolution and crystallisation processes will be introduced. Furthermore, we will look at magmatic and metamorphic processes in various plate tectonic settings e.g. generation of new oceanic crust at mid ocean ridges or partial melting and metamorphism along subduction zones. Optical mineralogy (microscopy) using polarizing light microscopes will be used for identification of rock forming minerals, petrographic description and classification of selected rock samples and thin sections. This part of the course will be done in a virtual fashion (digitized thin sections).

Part of this course is an **In-Person field trip** (Bancroft Region) during which we will look at a variety of igneous as well as metamorphic rocks. The region surrounding Bancroft was part of intense deformation, metamorphism and intrusive/extrusive magmatism due to mountain building processes over 1 billion years ago. During this trip the students will get a chance to practice practical s

### Course Learning Outcomes

**After this course you will be able to…**

* describe the theory of how polarizing light microscopy works.
* apply rock identification and microscopy techniques.
* explain concepts on magmatic and metamorphic processes and can relate these to plate tectonic settings and thermal controls.
* apply the appropriate terminology.
* describe and classify the various given samples/data (hand samples, rock thin sections), analyze geochemical data and can distinguish between the different rock types.

**to conclude** possible rock formation processes based on the given samples/data.

## Course Materials

**Recommended Reading Materials:**

- Earth Materials - Introduction to Mineralogy and Petrology, Klein & Philpotts, 2013, Cambr. Univ. Press

- Plate Tectonics – Cont. Drift & Mountain Building, Frisch-Meschede-Blakey – Free Download Library

- Mineralogy-Petrology Lab Manual (B19-C36, Quercus)

- Polarizing Light Microscopy Guide (Quercus)

**Please see the Quercus Course Homepage for information on Online Open Access Textbooks!**

**Study Questions – Group or Individual Work:**

I will post a set of study questions on each course topic, which should help you to identify the important course information, study for the quizzes and exams, prepare you for the field trip and to keep on top of the material.

## Marking Scheme

| **Assess.** | **%** | **Details** | **Due Date** |
| --- | --- | --- | --- |
| **8x Labs** | 32% | The purpose of the weekly lab period is to demonstrate practical methods for analysis of structural data and interpretation of geologic maps. Labs are mandatory (32% - In-lab or homework) for all students and the respective assignments are graded. During the lab you will have a chance to work more independently to strengthen your knowledge; during the lectures you’ll receive more guidance throughout the material. Lab assignments are to be completed in one week and submitted in the following week’s lab.  The knowledge acquired during the laboratory exercises can also be tested in the 3 Online Quizzes.  As we will work in an official LAB space, you will need   * **lab coats** * **safety goggles (not when working with microscope)**   The lab assignments include a lot of drawings of microscope thin section views and diagrams, so you will need **pencils, colour pencils, eraser and a sharpener, a ruler, calculator (to calculate composition percentages)** | see schedule |
| **3x Online Quizzes** | 3% | Three online quizzes will be posted (see course schedule) and each quiz is 1 % (3 % total) of final grade. Each quiz will consist of roughly 10 - 20 questions (multiple choice, True/False). | see schedule |
| **2-Day Field Trip** | 5% | This field trip is mandatory for all students. A fee for accommodation (TBA) will arise, which we will keep as low as possible. Transportation costs are covered.  During the field trip groups of 2-3 students will look at the local rock formations, describe and ID these, 2% of the grade will be based on trip participation and 3% will be based on your written (group) field trip report.  Deadline: TBA.  An equivalent alternative assignment will be given if a student cannot participate during the field trip.  Furthermore, we are outdoors and therefore some preparations are needed:  - Be prepared for any kind of weather (sun, rain: rain jacket, sun screen, hat)  - Sturdy footwear (at least running shoes, preferably hiking boots)  -> NO open-toed shoes, sandals, or heels!!!  - Adequate clothing (long pants, layers, rain cloth)  - Safety goggles or light tinted sunglasses  - Daypack with an adequate amount of water and lunch (+ smaller snack)  - If possible small camera, field book (e.g. small notebook), pencil & pen  Additional required safety equipment (e.g. hard hats, additional safety goggles) will be supplied by the department.  Additional information will be given in a timely manner, as it is still unclear if it will be a 2-day trip (accommodation, equipment such as sleeping bag etc.)! | 2023-11-11  2023-11-12 |
| **Bell Ringer Test** | 2% | In the course schedule above, you will find one Bell Ringer Online Quiz. In this test all rock and minerals that we discussed in the course can be included. | 2023-11-22 |
| **Glossary Entries** | 2% | Part of the course work is to create eight glossary posts (each 0.25%, total 2%). The course glossary is hosted on One Drive and will include the most important new terminology of the course. You can select eight terms from the glossary list. Student contributions will be monitored by the TAs and instructor throughout and by the end of the term (grade based on quality of post: for more info see main glossary page). Attention: Posts are only graded if submitted by the deadlines!  **Four of the posts have to be finished by October 15 (topics: Igneous rocks + Microscopy), and the second set of four posts by December 4, 2023!** | 2023-10-152023-12-03 |
| **Course Participation** | 3% | ALL students are expected to attend ALL lectures. It is the responsibility of the student to ensure that notes are obtained for any classes missed.  Your active course participation is worth 3% of the final grade (grade is not based on the correct answer, but participation). You can miss up to 25% of the (live - recorded lecture) activities without losing grades, hence if your participation is between 100-75% off all lectures, you will get the full 3%. If your participation is between 75 and 50% you will get 1.5% of the participation mark. If your participation is below 50% no participation marks will be given (0%). | 2023-12-03 |
| **Geochem projects Present.** | 3% | Students will download geochemical data of selected plate tectonic settings and manipulate and plot the respective data. Finally, the students will present their findings to their peers. | TBD schedule |
| **Mid Term Test** | 20% | The Mid Term Test is cumulative up to the by the Registrar’s Office scheduled date. The exam will be a 32-hour In Person Test. This may include multiple choice/matching and short answer questions, as well as potentially open-ended questions, critical thinking, drawing of graphs/diagrams, geological data (etc.). More information will be distributed closer to the end of the term. | TBD (Reg. Office) |
| **Final Exam** | 30% | The final examination is cumulative and will be scheduled by the University and held during the December examination period. The exam will be a 3-hour InPerson test. This may include open ended questions, critical thinking, drawing of graphs/diagrams, geological data and use of geologic maps/cross sections (etc.). More information will be distributed closer to the end of the term. | Final Exam Period - TBD Reg. Office |

### Late Assessment Submissions Policy

The dates for each lab assignment and course quizzes (mostly done in form of Quercus quizzes, lab assignments mostly due at the end of each lab) are provided on the course website (see due dates of quizzes) and are shown in the course schedule. Most of the assignments are automatically graded upon submission by Quercus.

All other deadlines that have to be adhered to are mentioned in each section (e.g. Glossary).

If a student submits the assignment late, Quercus Gradebook will automatically apply late submission policies. For example, the late submission policies for this course are **a 5% deduction per day**.

## Course Schedule

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Topics** | **Week** |  | **Lect. Date** | **Lecture / Lab Topic** | **Quizzes** | **Quiz Date** |
| Mic Intro | **1** | **Wednesday** | **Sept. 6 - Wednesday Lab Sessions!** | **IMPORTANT! First Lab Sessions: Polarzing Light Microscopy Refresher** |  |  |
| **1** | **Thursday** | **Sept. 7** | **Lect. 1: Polarizing Light Microscopy Refresher + Intro to Concept Maps + Igneous Petrology** | Quiz 1 - Microscopy Basics - Graded Recap Quiz | Sept. 8 - 11 |
| Magmatic R | **2** | Wednesday | Sept. 13 | **Lab 1** Mic Minerals |  |  |
| Thursday | Sept. 14 | **Lect. 2A:** Intro Igneous Petrology |  |  |
| **3** | Wednesday | Sept. 20 | **Lab 1/2** - Mic. Min/Ign. |  |  |
| Thursday | Sept. 21 | **Lect. 2B:** Ign. Petro | Quiz 2 | Sept. 22 - 24 |
| **4** | Wednesday | Sept. 27 | **Lab 2** - Mic. Ign. |  |  |
| Thursday | Sept. 28 | **Lect. 3**: Ign. Petro |  |  |
| **5** | Wednesday | Oct. 4 | **Lab 3** - Mic. Ign. |  |  |
| Thursday | Oct. 5 | **Lect. 4:** Ign. Petro | Potential Midterm Date (depends on Reg. Office) | |
| **Oct. 9 - 13** | | | | **Reading Week** | | |
| Magm. R. - continued | **6** | Wednesday | Oct. 18 | **Lab 4 -** Mic. Ign. |  |  |
| Thursday | Oct. 19 | **Lect. 5:** Ign. Petro Phase Diagrams | Potential Midterm Date (depends on Reg. Office) | |
| **7** | Wednesday | Oct. 25 | **Lab 5 -** Mic Metam.  (ungraded lab prep quiz) |  |  |
| Thursday | Oct. 26 | **Lect. 6:** Phase Diagr. + Geochem. Presentations | Potential Midterm Date (depends on Reg. Office) | |
| Metam. R. | **8** | Wednesday | Nov. 1 | **Lab 6 -** Lab Prep + Lab 6 rock Mic. Meta. |  |  |
| Thursday | Nov. 2 | **Lect. 7:** Metamorphic Petro |  |  |
| **9** | Wednesday | Nov. 8 | **Lab 7 -** Mic. Meta. |  |  |
| Thursday | Nov. 9 | **Lect. 8:** Metamorphic Petro | **Field Trip - Grenville Metased. Belt: Nov. 11-12** | |
| **10** | Wednesday | Nov. 15 | **Lab 8 -** Mic. Meta. |  |  |
| Thursday | Nov. 16 | **Lect. 9:** Metamorphic Petro |  |  |
| **11** | Wednesday | Nov. 22 | **Bell Ringer +** Lab 8 - Mic. Meta. |  |  |
| Thursday | Nov. 23 | **Lect. 10:** Metamorphic Petro | Quiz 3 | Nov. 24-26 |
| **12** | Wednesday | Nov. 29 | **Lab exam** |  |  |
| Thursday | Nov. 30 | **Lect. 11:** Metamorphic Petro |  |  |
| 13 |  | Dec. 5-6 | Study break |  |  |

## Policies & Statements

### Plagiarism Detection Tool

Normally, students will be required to submit their course essays to the University's plagiarism detection tool for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the Centre for Teaching Support & Innovation web site (<https://uoft.me/pdt-faq>).

### Academic Integrity

The University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences.  
  
Potential offences in papers and assignments include using someone else's ideas or words without appropriate acknowledgement, submitting your own work in more than one course without the permission of the instructor, making up sources or facts, obtaining or providing unauthorized assistance on any assignment.  
  
On tests and exams, cheating includes using or possessing unauthorized aids, looking at someone else's answers during an exam or test, misrepresenting your identity, or falsifying or altering any documentation required by the University.

### Equity, Diversity and Inclusion

The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities.  
  
The University of Toronto is a richly diverse community and as such is committed to providing an environment free of any form of harassment, misconduct, or discrimination. In this course, I seek to foster a civil, respectful, and open-minded climate in which we can all work together to develop a better understanding of key questions and debates through meaningful dialogue. As such, I expect all involved with this course to refrain from actions or behaviours that intimidate, humiliate, or demean persons or groups or that undermine their security or self-esteem based on traits related to race, religion, ancestry, place of origin, colour, ethnic origin, citizenship, creed, sex, sexual orientation, gender identity, gender expression, age, marital status, family status, disability, receipt of public assistance or record of offences.

### University Land Acknowledgement

I wish to acknowledge this land on which the University of Toronto operates. For thousands of years, it has been the traditional land of the Huron-Wendat, the Seneca, and the Mississaugas of the Credit. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.

### Accommodations

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible.  
  
AccessAbility Services staff (located in Rm AA142, Arts and Administration Building) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations 416-287-7560 or email [ability.utsc@utoronto.ca](mailto:ability.utsc@utoronto.ca). The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.

### Use of Generative Artificial Intelligence Tools

Students may use artificial intelligence tools, including generative AI, in this course as learning aids or to help produce assignments. However, students are ultimately accountable for the work they submit.  
  
Students may not use artificial intelligence tools for taking tests, writing research papers, creating computer code, or completing major course assignments. However, these tools may be useful when gathering information from across sources and assimilating it for understanding.  
  
The knowing use of generative artificial intelligence tools, including ChatGPT and other AI writing and coding assistants, for the completion of, or to support the completion of, an examination, term test, assignment, or any other form of academic assessment, may be considered an academic offense in this course.