University of Toronto-Scarborough

Department of Physical and Environmental Sciences

EESC36H3 Petrology - Fall 2016

Instructor: Dr. Heidi Daxberger, ESBC 466, phone: 416-208-5136, heidi.daxberger@utoronto.ca

Office hours: Tuesday 4 pm to 5 pm, and by appointment

Teaching Assistant: **Kirsten Kennedy**

Lectures: **Tuesday, 6 pm – 8 pm (Room HW 215)**

Labs: **Lab section 1: Wednesday, 9 am – 12 pm (Room EV 224)**

Lab section 2: Wednesday, 1 – 4 pm (Room EV 224)

Overview:

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. Additionally, we will briefly look into the petrology of certain types of sedimentary rocks. Optical mineralogy (microscopy) using polarized microscopes enables identification of rock forming minerals, petrographic description and classification of selected rock samples and thin sections.

Course objectives:

- Development of optical microscopy skills and their application
- Petrographic description (hand sample, thin section)
- Interpretation of petrography regarding conditions of petrogenesis (e.g. mineral phase relations)
- Recognition and interpretation of mineralogical and textural changes in rocks
- Interpretation of metamorphic mineral assemblages and reactions (pressure-temp. conditions)
- Knowledge about metamorphic fazies and their distribution due to tectonic and thermal controls
- Properties and formation of chemical sedimentary rocks

To allow us to move through the material in an efficient way, please review the following topics in your Mineralogy EESB19 and Earth History EESB15 notes of the prerequisite:

- Description and ID of rock forming minerals (mineralogy)
- Basics regarding magmatic rocks (common minerals, plutonic vs. volcanic rocks)
- Basics regarding metamorphic rocks (common minerals, metamorphic fazies)
- Basics regarding chemical sedimentary rocks (common minerals, precipitation)

Important:

Important point: our lab exercises are held in a space classified as a *laboratory* – this means that we all **should be dressed in lab coats – please bring them for tutorials (labs) and wear them at all times**. Another consequence: **there is no eating or drinking in the lab**.

Readings:

Required text: **Earth Materials – Introduction to Mineralogy and Petrology,**

C. Klein & A. Philpotts, 2013, Cambridge Univ. Press

Additional (Course reserve): Introduction to Optical Mineralogy, W. D. Nesse, 2013, Oxford Univ. Press

Lecture & Lab Schedule - Subject to change:

Week	Date	Lecture (Tuesday)	Lab (Wednesday)	Notes
2	Sept. 6/7	Introduction – Structure of Earth and Petrology	**Lab Intro: Optical Microscopy**	
3	Sept. 13/14	Igneous Petrology (origin of magmas, magmatic processes and chemical evolution of magmas)	Lab 1: Theory, Mic. Minerals	
4	Sept. 20/21	Igneous Petrology (Tectonic-igneous rock association, mineralogy of magmatic rocks, classification)	Lab 2: Theory, Mic. Minerals	
5	Sept. 27/28	Igneous Petrology (Classification, texture of igneous rocks & field relations)	**Bell Ringer (Igneous Rocks)** Lab 3: Theory, Mic. Rocks	
6	Oct. 4/5	Midterm	Lab 3: Theory, Mic. Rocks	Quiz 1
7	Oct. 10-14	Thanksgiving – Reading Week		
8	Oct. 18/19	Metamorphic Petrology (Intro to metamorphism, mineralogy of metamorphic rock)	Lab 4: Theory, Mic. Rocks	Oct. 21 or 22 for 1-day Field trip
9	Oct. 25/26	Metamorphic Petrology (Classification, deformation and texture of metamorphic rocks)	Lab 5: Theory, Mic. Rocks	Oct. 28 or 29 for 1-day Field trip
10	Nov. 1/2	Metamorphic Petrology (Classification, deformation and texture of metamorphic rocks)	Lab6: Theory, Mic. Rocks	Quiz 2
11	Nov. 8/19	Metamorphic Petrology (Metamorphic reactions and metamorphic facies)	**Bell Ringer (Metam. Rocks)** Lab 7: Theory, Mic. Rocks	
12	Nov. 15/16	Metamorphic Petrology (Metamorphic reactions and metamorphic facies)	Lab 8: Theory, Mic. Rocks	
13	Nov. 22/23	Metamorphic Petrology (Metamorphic reactions and metamorphic facies)	**Bell Ringer (Ign. & Metam.)** Lab 8: Theory, Mic. Rocks	Quiz 3
14	Nov. 29/30	Metamorphic Petrology (Metamorphic reactions and metamorphic facies)	Practical Test!!!	
15	Dec. 2 - 20	Study Break &Final Exams		

Marking Scheme:

8 Lab assignments (each 4.5%)	36%
3 Online Quizzes (each 2%)	6%
1 or 2-Day Field Trip	5%
3 Bell Ringer (each 1 %)	3 %
i-clicker	4%
Midterm	18%
Final Exam	28%
Total	100%

Lectures and Lab exercises:

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.***

Labs are mandatory for all students and the respective assignments are graded. During tutorials you will have a chance to work more independently in order to strengthen your knowledge; during the lectures you'll receive more guidance throughout the material. The knowledge acquired during the laboratory exercises can also be tested in the 3 Online Quizzes.

Required lab materials:

- A drafting compass (for drawing cycles and arcs)
- A drafting ruler, small scissors, pencils, color pencils, eraser
- A notebook for tutorials and practice (having some simple drafting paper, without lines or squares, is for this course)

1 or 2-Day Field Trip – Hastings County (Marmora, Burleigh Falls to Bancroft etc.) – Group Work:

This field trip is mandatory for all students. A fee for transportation will arise, which we will keep as low as possible.

During the field trip groups of 2-3 students will look at the local rock formation, describe and ID these, by filling out a given table. This table will be handed in during the in-class exercise in the week after the field trip (5% of final grade).

Furthermore, we are outdoors and therefore some preparations are needed:

- Be prepared for any kind of weather (sun vs. rain: rain jacket, warm cloth/layers, 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 sun glasses
- 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 timely manor, as it is still unclear if it will be a 1 or 2-day trip (accommodation, equipment such as sleeping bag etc.)!

i-clicker (Lecture participation) – Individual submission:

i-clickers are mandatory for this class and they will be used for participation marks during the lectures (I-clicker). Total **participation is worth 4% of the final grade** (grade is not based on right answer, but participation). We will start using/testing the I-clickers in the first week. Graded participation will start in the **second week (Lecture 2)**. You can miss up to 20% of the I-clicker participation without loosing grades. If your participation is between 80-70% off all lectures, you will get the full 4%. If your participation is between 70 and 50% you will get 2% of the participation mark. If your participation is below 50% no participation marks will be given (0%). **Each student can only use their own clicker! Submitting answers for a fellow student, who is not present during class, is an offence covered under the code of Academic Integrity (see section below)!**

Bell-Ringer Test – Individual Work:

In the course schedule above you will find three dates for Bell Ringer Tests (each worth 1%, total 3% of final grade). These will be held in preparation for the final exam. These c. 20 minute tests will test your mineral, rock ID skills and is based on the lecture/lab samples. Before the Bell Ringer happens, the lab (ESCB 224) will be open to look at the lab samples again.

Online Quizzes – Individual Work:

Three online quizzes will be posted (see course schedule) and each quiz is 2 % (6% total) of final grade. Each quiz will consist of roughly 8 - 15 questions (multiple choice, True/False).

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.

Make Your Own Geo-dictionary (MYOGD) – Group or Individual Work:

A file called "Make your Own Geo-dictionary (MYOGD) is a word document which provides you with important terminology and concepts in Geology. This exercise is not graded, therefore is not mandatory to be finished, but finding the definitions (figures etc.) for these terms will help you to prepare for the exams, quizzes, in-class exercises and later courses. As there are many terms new to you, this can be an overwhelming task to do on your own. Best is if you from a group with some of your fellow students to complete the dictionary together. Make sure all of your group mates are on

the same page about accuracy and detail. Besides online sources, the appendix of the course textbook, as well as already existing dictionaries for Earth Sciences or Geology (see course reserve) may be useful to find the respective definitions (and figures etc.).

Final Examination:

The final examination is cumulative and will be scheduled by the University and held during the December examination period. The exam will contain multiple choice, true and false and short answer questions. Figures, movies and animations are examinable, as are in-class participation/lab type exercises. The exam will be more heavily focused on post-midterm material. The assigned readings are examinable, the material covered in lecture is weighted more heavily than the readings.

Library Service:

Research Help: University of Toronto Scarborough Library

Staff at the UTSC Library will be happy to help you find the resources you need for your assignments, and learn the research skills you will need for success at university.

Research help is available by phone, e-mail, chat, or in-person in the Library.

For more information, please see the Library's Help Guide for UTSC Students: http://guides.library.utoronto.ca/utsc_help

Need in-depth or department specific assistance? Contact Sarah Forbes, Liaison Librarian for Physical and Environmental Sciences: http://uoft.me/smforbes

Blackboard:

Lecture and lab material will be posted on and Online Quizzes will be done through blackboard. Please check daily for updates.
Blackboard: https://portal.utoronto.ca

Academic Integrity Statement:

Academic integrity is one of the cornerstones of the University of Toronto. It is critically and important both to maintain our community which honours the values of honesty, trust, respect, fairness and responsibility and to protect you, the students within this community, and the value of the degree towards which you are all working so diligently. According to Section B of the University of Toronto's Code of Behaviour on Academic Matters, which all students are expected to know and respect, it is an offence for students:

- to use someone else's **ideas or words** in their own work without acknowledging that those ideas/words are not their own with a citation and quotation marks, i.e. to commit plagiarism.
- to include false, misleading or concocted **citations** in their work.
- to obtain **unauthorized assistance** on any assignment. **This includes i-clickers!**
- to provide **unauthorized assistance** to another student. This includes showing another student completed

work.
- to submit their own work for credit in **more than one course** without the permission of the instructor.
- to falsify or alter any **documentation** required by the University. This includes, but is not limited to, doctor's notes.
- to use or possess an **unauthorized aid** in any test or exam.

There are other offences covered under the Code, but these are by far the most common. Please respect these rules and the values, which they protect. It is your responsibility to ensure that your work maintains academic integrity. If you have any concerns please see the instructor before a potential problem arises. Please familiarize yourself with the Code (http://www.governingcouncil.utoronto.ca/policies/behaveac.htm) and also with the handout "How not to plagiarize", available in the Course Documents section on BB. At the University of Toronto academic dishonesty can result in a *mark of zero, a reduction in final grades, denial of privileges, a monetary fine, failure in the course, suspension, permanent record, a recalling of degrees/diplomas and certificates, or expulsion.*

Accessibility Needs:

The University of Toronto is committed to accessibility. If you require accommodations for a disability, or have any accessibility concerns about the course, the classroom or course materials, please contact Accessibility Services as soon as possible: UTSC campus AccessAbility http://www.utsc.utoronto.ca/~ability/ or St. George Campus Dis*Ability* *d*isability.services@utoronto.ca or http://studentlife.utoronto.ca/accessibility.