

GEOL 3217 — Metamorphic Petrology

COURSE OVERVIEW

In this course you will learn to describe and analyze metamorphic rocks both microscopically and macroscopically. By understanding metamorphic processes, including diffusion, solid state reactions, and plastic deformation, you will learn how to interpret the conditions and geologic history of metamorphic rocks and metamorphic terranes.

The course includes **3 hours of lectures** and a **3 hour laboratory** exercise every week.

Instructor: Dr Tobias Stephan
CB-4005
tstephan@lakeheadu.ca
Office hours: Thu 1–3 pm

Teaching Assistant: TBA

Class Schedule: Lectures: Mon & Wed 4:00–5:30 pm (CB-3031)
Labs: Mon 11:30 am–2:30 pm (CB-3031)

Grading: Midterm 20%
Final 30%
Labs 25%
In-Class Participation 5%

TENTATIVE CLASS SCHEDULE

Week	Subject	Chapter
PART A – FUNDAMENTALS		
1	Introduction	1
2	Deformation, Fabric and Classification	6
3	Chemical Equilibrium and the Phase Rule	2–3
4	Chemographics	
5	Metamorphic Facies and Facies Series	4–5
PART B – ROCK TYPES		
6	Metapelites	7
7	Metabasites	8
8	Calcareous Rocks	9
9	Migmatites	
PART C – THERMODYNAMICS		
9	Thermodynamics	10
10	Geothermobarometry	13–16
11	Kinetics of Metamorphic Reactions	12
12	Metamorphic Fluids and Metasomatism	
PART D – TECTONICS		
13	Tectonics and Case Studies	17
14	Final Project Presentations	18

LEARNING OUTCOMES

The completion of this course ensures that students are able to:

- Identify and describe metamorphic rocks and textures in hand sample and thin section

- Recognize the protolith for metamorphic rocks and the tectonic setting in which they formed
- Understand metamorphic reactions and why/when they occur
- Use mineral chemistries and rock types to determine the temperature-pressure-time path of the rock

TECHNOLOGY GUIDELINES

- Note taking:** Please take notes on paper rather than on a laptop — I make a lot of drawings on the board. Talk to me in person if you really want to use a device. No photographs of the board are allowed unless you ask permission.
- Calculators:** It would be better if you use a real calculator rather than your phone (because phones are not going to be allowed, see below). Calculators must comply with the faculty of engineering's [calculator policy](#).
- Phones:** We're going to try an experiment this term: **No phones.** At all. Ever. (Meaning I never want to see one out.) The labs can be quite challenging and I want you to be able to focus extended periods of time. You can use a computer if you need a calculator during lab.
- Note:** No photographs of the board.

CLASS PARTICIPATION

Class participation (and obviously attendance) is expected for all class and lab meetings. If you are too ill to attend class, please send me an email prior to class (if possible). Group work is common in class. Be prepared to work with different people—this is a life skill.

ACADEMIC INTEGRITY

Standard rules of academic integrity apply to all assignments. Namely, your work should be your own. If you solve problems with other students, please list their names and explain the nature of your collaboration. Please review the University's [webpage about academic integrity incl. plagiarism](#). No ChatGPT or other generative AI will be necessary for this class. So don't use them.

LABS

There is a weekly lab for this course. Each lab report needs to be completed by the start of the following lab.

The tentative lab schedule is:

- 1 Introduction to Metamorphic Rocks
- 2 Identifying Metamorphic Minerals
- 3 Chemical Equilibrium & Reactions
- 4 Geothermometry and Geobarometry (SEM visit)
- 5 Metamorphic Textures
- 5 Metapelites
- Midterm review and Q&A session
- 6 Metabasites
- 7 Marbles & Deformation Texture
- 8 Final Projects (SEM time on 11th & 18th)

TEXTBOOKS

WINTER, J. D. *Principles of Igneous and Metamorphic Petrology*, 2nd edition. (2009): [Download pdf](#)

EXAMS

Midterm: Written exam

Final (oral) exam: Students will research a topic in structural geology and/or tectonics and give a presentation of approximately *10 minutes*. Topics will be randomly assigned shortly after the midterm exam. The presentation will be followed by a *10-min discussion* to assess both the student's understanding of the topic and their broader knowledge of structural geology and tectonics.

EXAM POLICY

All materials from the course including lectures, readings, and laboratories are testable materials for the midterm exams.