EARTH SC 2K03  Optical Crystallography and Mineralogy

Instructor: Alan Dickin (e-mail: dickin@mcmaster.ca)

Summary

This course is an introduction to optical mineralogy based on the use of the polarising microscope. We begin by studying crystal systems, the principles of the behaviour of light in transparent minerals, and the use of the petrological microscope to study the optical properties of minerals. We will then make a systematic examination of the structure, chemistry and occurrence of the rock-forming minerals found in common igneous and sedimentary rocks.

Each week a microscope-based lab will build the student’s ability to use the petrographic microscope. At the end of the course, students will have acquired the practical skill of mineral identification in thin section, which can be applied to other geological problems or courses, such as Earth Sci 3K03.

The course is structured around the labs:

0  Microscope familiarisation
1  Mineral relief (inc Becke line test)
2  Birefringence, pleochroism, extinction angle
3  Uniaxial figure
4  Biaxial figure
5  Quartz and felspars
6  Sheet silicates, oxides
7  Pyroxenes and amphiboles
8  Olivine, Calcite, Apatite, Rock description
9  Revision period
10 Lab exam

The theory lectures include the following material, but the order of presentation may be varied to keep in step with the labs:

Petrological microscope
Bonding & ion coordination
Symmetry and concept of unit cell
Light transmission through minerals
Refraction effects
Interference effects
Optical figures
Structure, chemistry & occurrence of each mineral group
Simple phase diagrams of selected minerals

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Textbook
The course textbook is Nesse, W. D. *Introduction to Optical Mineralogy*. **This is essential.** Courseware is also required, and **coloured pencils** are strongly recommended for drawing minerals.

Course grading
The breakdown of the grading of this course is:
- 30% for lab reports handed in each week (reduced credit for late work)
- 10% for a Mid Term test (Tue October 18th in normal class period)
- 20% for an open-book lab exam (November 22nd, 24th and 25th in normal lab periods).
- 40% for a closed-book written exam in December

E-mail communication
All e-mail communications to the instructor must originate from McMaster e-mail accounts.

Absences
Accommodations for unavoidable absences require e-mail to the instructor in good time to request alternative arrangements at the instructor’s discretion.

Ethical Standards
Students are expected to display high standards of ethical behaviour. Consultation between one another is welcomed, but lab write-ups are expected to be original, individual work. Evidence of copying from other students’ work or previous years’ work will lead to zero grades for labs.

Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university. It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, specifically Appendix 3, at this site: [http://www.mcmaster.ca/senate/academic/ac_integrity.htm](http://www.mcmaster.ca/senate/academic/ac_integrity.htm)

The following illustrates only three forms of academic dishonesty:
- Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained;
- Improper collaboration in group work;
- Copying or using unauthorized aids tests and exams.

Right to make changes to this course
The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.