

Mineralogy (51-205) Fall 2007 Syllabus

Lecture: MWF 11:30 a.m. – 12:30 p.m., Harrington 217

Lab: 1:50 p.m. – 5:10 p.m., Harrington 216

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Office hours: T – 12:30 p.m. – 1:50 p.m., W – 10:10 a.m. – 12:30 p.m., and by appointment.

Required Materials:

Nesse, W. D., 2000, *Introduction to Mineralogy*, Oxford University Press, New York, 442 p.

Wenner, J. M., 2007, *Mineralogy Handbook*, Oshkosh Document Services, Oshkosh, WI

A non-spiral-bound lab notebook (one with gridlines is highly recommended)

A 10x handlens (see me for purchase)

Pencils (mechanical preferred), erasers, and a small 6 inch metric ruler (this helps with drawings/sketches in your notebook)

Course Objective: Mineralogy is a foundation course for the geology major. Here, through the study of minerals, you will develop skills in analytical and critical thinking, laboratory observation, literary research, scientific writing, and oral presentation. Learning and understanding the primary principles of mineralogy will enhance and aid in your studies in other areas of geology. Mineral varieties (hand sample and thin section) that you will study are taken from igneous, metamorphic, and igneous rocks. The course will also utilize and build upon what you know (or are learning) from chemistry and physics. Upon successful completion of this course, you will be able to identify minerals on the basis of physical and optical properties. Additionally, you will develop a greater sense of the work ethic and devotion required of a science major.

Expectations: Please come to class prepared to actively participate in exercises and/or activities that are designed to help you learn. In the “lecture” portion of the class, you will be placed in a group. Please sit with that group during each class period. Because you are expected to participate, attendance

and promptness are extremely important (to me AND the members of your group) and mandatory

COURSE BREAKDOWN

EXAMS: There are three exams in this course. All lecture material exams will be open-book, take-home examinations. The exams are designed to test your knowledge and your ability to find and utilize information. Although you are encouraged to work in groups on other assignments, in-class exercises, etc., these exams **MUST BE COMPLETED INDIVIDUALLY**. Should I find any evidence that suggests collaboration/plagiarism on take-home exams, I will not hesitate to investigate it further and refer it to the appropriate department and university officials. Academic dishonesty is a serious threat to the integrity of the institution. Exams 1 and 2 are worth **10%** of your final grade. Exam 3 is worth **15%** due to some mineral identification.

MINERAL ID EXAM: The sole exception to the take-home exams is the MINERAL ID EXAM. You will be asked to ID and write-out the chemical formula for a number of minerals (without the aid of notes, books, or determinative tables). The MINERAL ID EXAM is worth **5%** of your total grade.

D2L QUIZZES: In preparation for lecture, you are required to do the assigned reading in advance of the class period. To encourage you to do this, I have set up quizzes on D2L that are based on the reading. These are open textbook quizzes. You are allowed to retake each quiz as many times as you like (preferably until you get 100%) – **RIGHT UP UNTIL CLASS STARTS THAT DAY**. The quizzes will disappear once class begins at 11:30 a.m. These quizzes are worth **5%** of your total grade.

MINERAL QUIZZES: Each week, we will have a mineral quiz in lab. These will consist of minerals in hand sample and writing out their chemical formulas without the use of determinative tables. You will be allowed to use the standard equipment (i.e., hand lens, streak plate, magnets, etc.), but will need to ID the minerals based on physical properties you've learned in class. Mineral quizzes are worth **3%** of your total grade.

LAB PROJECT: The lab project is a chance for you to experience how scientific research is organized and presented to your colleagues. Each student will be assigned to a group (2 to 3 people) that will examine a suite of rocks for mineralogy. Based on the mineralogy and other information given, you will be asked to write out your observations in your lab notebook, write a short paper, and make and present a poster with your findings. The entire geology department will be invited to share in your findings. This project is extremely important and will be worth **10%** of your total grade.

FIELD TRIP: On Saturday, October 5, 2007 we will be taking a field trip to Central Wisconsin to examine and document outcrops of the Wolf River Batholith and the Wausau Syenite. This is a day trip, so please devote your entire Saturday to this trip. We will go rain or shine. This REQUIRED field trip is worth **5%** of your total grade.

HOMEWORK/IN-CLASS ASSIGNMENTS: Practice and repetition is required in order to learn new skills. So, you will be asked to be active participants during portions of the lectures (instead of me talking all the time and you listening) by completing in-class assignments and exercises. At times, these assignments/exercises will continue as homework outside of class or you will have extra homework in addition to what we do in class. These assignments/exercises are worth **7%** of your total grade.

LABORATORY: There are several items that you should purchase before arriving to lab on TUESDAY:

1. A non-spiral-bound notebook (one with gridlines is highly recommended)
2. A 10x handlens (see me for purchase)
3. The Mineralogy Handbook

Laboratory is a significant portion of mineralogy and other core courses in the discipline. Each lab has been designed to guide you towards learning as much as you can about minerals – the building blocks of most geologic materials. The labs are intended to use mineralogy to figure out the problem at hand as well as learn how to conduct yourself in a laboratory setting. Key things that you will be expected to memorize and reiterate by the end of the course: (1) the chemical formulas for the minerals listed in Appendix B of the Mineralogy Handbook and (2) identification of minerals in both hand sample and thin section. Mineral ID isn't so much memorization as it is figuring out how combinations of mineral properties make up the diagnostic properties of a given mineral. Laboratory is worth **30%** of your total grade.

IMPORTANT POINTS ABOUT LABORATORY:

- All labs are found in the *Mineralogy Handbook* (Wenner, 2007). I encourage you to page through the book before lecture and laboratory.
- All of your observations and answers to the lab should be recorded in your non-spiral-bound lab notebook.
- All lab assignments are due on Friday so that I can grade them and get them back to you in time for the next lab period. I will inform you if and when deadlines change.

- I do NOT accept significantly late assignments. The material builds rather quickly in the class and you must keep up. Meeting deadlines is a part of your academic life.
- Please acquire a 10X handlens prior to the first lab period. Keep the handlens with you at all time.
- For many of the labs, you will be working with/collaborating with at least one other of your classmates (not enough microscopes). YOU MUST DO YOUR OWN WORK. I would like lab to keep in tune with the group learning environment we use in lecture.

LECTURE AND LAB SCHEDULE (tentative)

****I reserve the right to modify this schedule****

Bold/Italic typeface indicates lab topic - "**OLQ**" indicates an online quiz due before class

| Wk | Date | Topic(s) | Reading (Nesse) |
|----|--------------------|---|-----------------|
| 1 | W 5-Sep-07 | organizational meeting; course philosophy; mineral properties | pp. 3-5 |
| | F 7-Sep-07 | crystallography: translational symmetry (2-D part I) (OLQ) | pp.6-12 |
| 2 | M 10-Sep-07 | crystallography: 2-D symmetry (2-D part II) (OLQ) | pp. 12-20 |
| | T 11-Sep-07 | <i>mineral properties and rock-forming minerals I</i> | |
| | W 12-Sep-07 | Crystallography: point symmetry and groups | 20-29 |
| | F 14-Sep-07 | Practice with 3D crystallography | 20-29 |
| 3 | M 17-Sep-07 | Miller indices - forms | 29-38 |
| | T 18-Sep-07 | <i>Rock-forming minerals II</i> | |
| | W 19-Sep-07 | Miller Indices | |
| | F 21-Sep-07 | More Miller Indices | |
| 4 | M 24-Sep-07 | crystal chemistry: periodic table, elements and minerals | 39-46 |
| | T 25-Sep-07 | <i>Miller Indices and rock-forming minerals III</i> | |
| | W 26-Sep- | crystal chemistry: bonding (in-class exercises) | 46-56 |

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|----|----------|------------------|---|----------------|
| | F | 28-Sep-07 | crystal structure controls, Pauling's Rules (in-class exercises) | 57-65 |
| 5 | M | 1-Oct-07 | crystal structure: polymorphism, classification and compositional variation | 65-73 |
| | T | 2-Oct-07 | Minerals IV | |
| | W | 3-Oct-07 | mineral properties, elemental composition and bonding | 97-113 |
| | F | 5-Oct-07 | light (EXAM 1 HANDED OUT) | 114-116 |
| | SAT | 6-Oct-07 | Field trip to Wolf River Batholith and Wausau | Handout |
| 6 | M | 8-Oct-07 | refraction of light; Snell's law | 117-121 |
| | T | 9-Oct-07 | light – Snell's law an introduction to the petrographic microscope | |
| | W | 10-Oct-07 | Snell's law and isotropic minerals | 121-125 |
| | F | 12-Oct-07 | Uniaxial indicatrix 1 (EXAM 1 DUE) | 122-125 |
| 7 | M | 15-Oct-07 | Uniaxial indicatrix 2: polarization | 125-129 |
| | T | 16-Oct-07 | Using the petrographic microscope – optical properties | 118-121 |
| | W | 17-Oct-07 | Uniaxial indicatrix 3: retardation and interference | 130 |
| | F | 19-Oct-07 | uniaxial indicatrix 4: interference figures | 131-133 |
| 8 | M | 22-Oct-07 | TBA | |
| | T | 23-Oct-07 | MINERAL ID EXAM | |
| | W | 24-Oct-07 | TBA | |
| | F | 26-Oct-07 | uniaxial interference figures in-class exercise | 139-143 |
| Wk | | Date | Topic(s) | pages in Nesse |
| 9 | M | 29-Oct-07 | Biaxial indicatrix 1 | |
| | T | 30-Oct-07 | interference figures | |
| | W | 31-Oct-07 | Biaxial indicatrix 2 | 133-136 |
| | F | 2-Nov-07 | Biaxial indicatrix 3 | 143-151 |
| 10 | M | 5-Nov-07 | Biaxial indicatrix 4 | 143-151 |
| | T | 6-Nov-07 | mineral identification in thin section (Lab project assignments given out) | |
| | W | 7-Nov-07 | biaxial minerals (in-class exercise) | |
| | F | 9-Nov-07 | Framework silicates: common minerals (EXAM 2 Handed out) | Ch 12 |
| 11 | M | 12-Nov-07 | Chain silicates and orthosilicates: igneous minerals | Ch 14, 16 |
| | T | 13-Nov-07 | Igneous minerals in thin section and hand sample | 158 |
| | W | 14-Nov-07 | Orthosilicates and sheet silicates: metamorphic minerals | Ch. 16, 13 |
| | F | 16-Nov-07 | Carbonates, Phosphates, etc.: Sedimentary minerals (EXAM 2 DUE) | Ch.17 |
| 12 | M | 19-Nov-07 | Oxides, hydroxides, sulfides, etc. accessory minerals | Ch. 18, 19, 20 |

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| | T | 20-Nov-07 | Sedimentary minerals in thin section and hand sample | |
| | W | 21-Nov-07 | NO CLASS – THANKSGIVING HOLIDAY | |
| | F | 23-Nov-07 | NO CLASS – THANKSGIVING HOLIDAY | |
| 13 | M | 26-Nov-07 | Igneous mineral associations | 310-322 |
| | T | 27-Nov-07 | Metamorphic minerals in thin section and hand sample | |
| | W | 28-Nov-07 | Sedimentary mineral associations | |
| | F | 30-Nov-07 | Metamorphic mineral associations | |
| 14 | M | 3-Dec-07 | Lab project (introduction) | |
| | T | 4-Dec-07 | Lab project | |
| | W | 5-Dec-07 | Lab project | |
| | F | 7-Dec-07 | Lab Project Session (presentations) (EXAM 3 handed out) | |
| 15 | M | 10-Dec-07 | TBA | |
| | T | 11-Dec-07 | TBA | |
| | W | 12-Dec-07 | TBA | |
| | F | 14-Dec-07 | EXAM 3 due by 12:30 pm | |