

## **Mineralogy (51-205)**

Course Syllabus Fall 2008

MWF 11:30-12:30 *Harrington Room 217*

Labs T 8-11:20 AM (D. Ju, TA) and T 1:50-5:10 (D. Wagner, TA) *Harrington Room 216*

**Prerequisites:** GEO 102 OR GEO 150 AND CHEM 105 OR 109 (may be taken concurrently)

**Instructor:** Dr. Jennifer Wenner, Associate Professor of Geology

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**Office hours:** M 3-4, W 9-10, W 12:40-3 and by appointment...I'm here most of the time ... check my office door for my schedule and make an appointment.

**Texts:** Nesse, W. D., 2000, *Introduction to Mineralogy*, Oxford University Press, New York, 442 p.  
Wenner, J.M., 2008, *Mineralogy Handbook*, Oshkosh Document Services, Oshkosh, WI.

### *COURSE GOALS*

**Welcome to Mineralogy!** Minerals are the **basic building blocks of rocks**; therefore, mineralogy and optical mineralogy provide the foundation for many aspects of your future as a geologist. Every sub-discipline of the geosciences relies on an understanding of the physical, chemical and optical properties (as well as many other analytical techniques) for basic mineral identification, and as the basis for understanding Earth processes. Mineral varieties you will see both in hand sample and thin section are taken from igneous, metamorphic and sedimentary rocks. Furthermore, this course will draw on, and enhance, what you know (or are learning) from chemistry and physics. By the end of this course you should:

1. Be able to identify the major rock forming minerals in hand specimen and thin section with the aid of various analytical methods (namely, your own observations and the polarizing light microscope).
2. Be able to use physical and optical properties of minerals and a set of determinative tables to identify ANY unknown mineral you are given.
3. Have a working knowledge of mineral classification and nomenclature, crystallography, crystal chemistry and systematic mineralogy.
4. Relate physical properties of minerals to their crystal structures and chemical compositions (these interrelationships help us to relate mineralogy to geology).
5. Appreciate the influence of crystal chemistry on mineral assemblages and weathering.
6. Be comfortable researching and learning mineralogical topics individually and in groups.

This is really your first “majors” course in the Geology Department. As such, be prepared to be challenged and to spend a significant amount of time devoted to the study of minerals this semester. Don't forget that you have all kinds of resources available to help you, including your classmates, TAs and instructor! Ask for *help* if you need it – I *WANT* you to succeed in this course!

## MINERALOGY AND A LIBERAL ARTS EDUCATION

As students in the College of Letters & Science at UWO, you are engaging in a liberal arts education (studies designed to provide general knowledge and *develop intellectual capacities*). The curriculum in COLS is designed to provide you with **the capacity to solve problems and think critically** – skills not specific to a single vocation but important to a variety of careers (including geology). Your courses are also designed to teach you **to communicate important ideas (verbally and in written form)**. Because Mineralogy is a course within the COLS curriculum, I have designed this course to engage your mind in problem solving, critical thinking and a variety of ways to communicate your thoughts and ideas. **Collaboration (on most assignments) is encouraged** – geoscientists collaborate on a regular basis – your job is to engage the minds of the people around you, as well. Mineralogy is a required course for the geology major because it is fundamental to the study of the Earth and applies to many aspects of human life. Minerals are essential in understanding hazards, are key ingredients in some medicines and household items, may help us understand global climate change and understanding them may help us address many other important questions from many other disciplines. Think of mineralogy as a means to understanding and appreciating the world around us!

### NUTS AND BOLTS OF THE CLASS:

Class meeting times are Mondays, Wednesdays and Fridays from 11:30-12:30. Please arrive in the classroom on time (or, even better, a little early) so that we can get started right away.

Please notice that there are a few days in October when I will be out of town. We will make up class time with take-home exams and a field trip.

The mandatory field trip for this class will happen the weekend after I get back from GSA (October 11). *Please mark it in your calendar right now so that you can be prepared for it.* This trip will last all day (do not plan to be home before 7 pm) and you are all invited to come to my house for pizza dinner after the field trip. If you are not able to make it to the dinner, please let me know so I can plan accordingly.

You will need the following items for this course:

- **Textbook:** Nesse, W. D., 2000, *Introduction to Mineralogy* (this is the same text we've used for years so, you can probably find it used or borrow it from someone who's taken the course).
- **Mineralogy Handbook:** This is a lab manual and course guide. You should bring it to class EVERY DAY.
- **Non-spiral bound lab notebook:** You will record your observations in this notebook and hand it in each week to me.
- **Hand lens/mineral identification tools:** You can purchase these from me or the Geology Club. The hand lens is one of the most important tools you will have for mineral ID and every geologist should have one. Bring it to lab EVERY TIME!

## FORMAT OF THE COURSE AND YOUR RESPONSIBILITIES

If you haven't had a course from me before, you might be surprised by the structure of the class. I expect a lot, and I place a great deal of responsibility on you. After all, I can't do your learning for you! I care very much that you learn in this course, and having me stand in front of you and talk at you for an hour at a stretch allows *me* to present material but doesn't do much to help you learn. So! ***I will design class sessions around having you do mineralogy related activities, rather than having me talk at you about it.*** You will come away from this course with skills and knowledge in mineralogy that you can use in the future, not just some material that you can spit back at me on a test.

One of your responsibilities is to ***come to class and be prepared to actively participate in exercises and/or activities that are designed to help you learn.*** I do not take attendance, but anyone who has taken the course before will be able to tell you that the things we do in class are key. I do expect that you will make up *all* work before the next class session so that you don't hold yourself or anyone else back. ***It is your responsibility to find out what you need to do to catch up*** – that's part of the responsibility game. Don't expect that I'm going to smile cheerfully if you saunter into class and say, "What did I miss last class?" (or worse, "Did I miss anything last class?" Oops, big blunder...Makes me feel as if I should reply, "Oh, no, of course not...we just sat around doing useless stuff...") !!!

I also expect you to ***treat others with tolerance and respect and to act responsibly and reliably when working in groups.*** There will be numerous opportunities to collaborate with others. I recognize that folks in groups don't always agree, but look at disagreements as an opportunity to present reasoned arguments for your point of view (a good reasoned argument may sway your group members). Being able to express yourself and your scientific viewpoint to others is an important part of being an excellent scientist. If there is disfunction or disrespect in your group, please speak to me privately about it – I want groups to work well together.

Another of your responsibilities is to ***turn your assignments in ON TIME.*** Every assignment (homework, online quizzes, and labs) will designate the date that it is due. This is a hard and fast deadline and means that it is due before we start class or lab on that date. There are two reasons for this: 1) new assignments build on skills you learned in the previous week, if you haven't finished, you may not be ready for the next assignment. 2) I like to correct and return assignments as soon as I can – prompt response from me is difficult when some students have not completed the assignments. As with any rule, there are always exceptions. In the back of your Handbook, you will find two "coupons" for late assignments. These are good for a 48-hour extension on any assignment. But, you only get 2 "coupons", so use them wisely.

Finally, I expect you to teach me something new during this course. I find that each semester students find new and exciting ways to talk about mineralogy – this is one of my favorite parts of the course! Let's learn together!

## MY RESPONSIBILITIES

I've told you what I expect of you, but I also have responsibilities in this course. What can you expect from me? I will do my best to ***help you become a better self-learner and teacher.*** You can expect me to ***treat you with fairness and respect*** and to ***hold you to high standards and expectations.*** You can also expect that I will ***take an interest in you and hope to learn something from you.*** Finally, you can expect me to ***be excited and knowledgeable about mineralogy*** and to ***create interesting and challenging opportunities for you to learn the subject.***

SOME ADMINISTRATIVE THINGS YOU NEED TO KNOW:

Collaboration with your fellow students will be an essential part of this course. Collaboration is not the same as copying (plagiarism). I expect you to turn in your own work. Please note: *The Wisconsin Administrative Code* states: **“Students are responsible for the honest completion and representation of their work, for the appropriate citation of sources, and for respect of others’ academic endeavors. Students who violate these standards must be confronted and must accept the consequences of their actions.”** (§ UWS 14.01) *Plagiarism and other forms of academic misconduct are serious offenses with severe penalties. These penalties may include a failing grade on the assignment or in the course, disciplinary action by the Dean, even expulsion from the university. See the University of Wisconsin Oshkosh Student Discipline Code for definitions of academic misconduct and details about procedures, sanctions, and other relevant information. Specific questions about the provisions in the Student Discipline Code should be directed to the Dean of Students Office.*

If you do not understand the statement above or the definition of plagiarism, please make sure that you see me. By enrolling in this class (and actually in the University) you are agreeing to abide by this Code of Conduct - to treat others with the respect they deserve by giving credit where credit is due and to honestly represent your work. I will not hesitate to enforce the severest of penalties on students who violate this code.

INFORMATION ABOUT GRADING

GRADING	GRADING SCALE		
EXAM 1 (Ch. 1-4).....	10%	A.....	92-100%
EXAM 2 (Ch. 6-7).....	10%	AB.....	87-92%
EXAM 3 (comprehensive with min ID).....	15%	B.....	82-87%
Labs.....	30%	BC.....	77-82%
Lab project.....	10%	C.....	72-77%
Homework, in-class assignments.....	7%	CD.....	67-72%
MINERAL ID EXAM.....	5%	D.....	60-67%
Online quizzes (posted on D2L).....	5%	F.....	< 60%
Field trip (Saturday, October 7, 2006).....	5%		
Mineral quizzes.....	3%		

**EXAMS:**

All exams on “lecture” material will be open-book, take-home exams (see below for exception). The exams involve significant thought and synthesis and are designed to help you learn the material better. ***These exams are NOT collaborative endeavors and should be completed INDIVIDUALLY. Please see the statement above for information about your responsibilities to honestly represent your own work.***

### **LABS:**

Labs are designed to guide you towards learning as much as you can about MINERALS – the building blocks of most geologic materials! Each lab can be found in the *Mineralogy Handbook*, available for purchase at the bookstore. Please take the time to page through the lab for that day.

- All observations made during lab (including any sketches) and the answers to lab questions should be recorded in a *non-spiral-bound lab notebook*.
- All assignments should be finished by the beginning of lab on the date that they are due; however, I will not collect lab notebooks until you leave the lab room.
- The lab period for this class is 3 hours – please do not expect to be excused early. In addition, you should expect to spend time outside of the scheduled lab and class periods working on assignments and learning minerals and their formulas. The ONLY way to learn to recognize minerals is by practicing and practicing.
- Every student should have a 10x handlens at the beginning of the first lab

### **LAB PROJECT:**

At the end of the semester, you will be given an opportunity to show off the skills you have learned in the lab. Each group of 3-4 students will examine a suite of related minerals, record observations in lab notebooks, write a short paper and present their results in poster form.

### **MINERAL ID EXAM:**

The sole exception to the take-home exam is the MINERAL ID EXAM. Sometime in early October, you will be asked to ID and write the chemical formula for about 30 minerals (without the crutch of determinative tables). The mineral ID exam is worth 5% of your total grade.

### **ONLINE QUIZZES:**

In preparation for “lecture” periods and the activities that we will do together, you are expected to do the reading in advance of the class period. To encourage you to do this, I have set up some Desire2Learn quizzes based on the reading. These are open book quizzes – in fact some of them ask questions about figures in the text. You are also 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 am. They count for 5% of your total grade.

### **MINERAL QUIZZES:**

Each week, we will have a mineral quiz in lab. These will consist of identification of minerals in hand sample and writing out their chemical formulas without the use of determinative tables. That is to say, you will be allowed to use reasonable tools (hand lenses, streak plates, magnets, etc.) but will need to ID minerals based on physical properties that you have learned.

### **FIELD TRIP:**

In Early October, we will be embarking on a field trip to Central Wisconsin. This day trip (expect to spend your entire Saturday) to the Wolf River Batholith and the Wausau Syenite is designed to let you see minerals in their natural habitats. The date for the trip this year is **October 11, 2008**.

## LECTURE AND LAB SCHEDULE (tentative)

**Bold typeface indicates lab topic**

<b>Wk</b>	<b>Date</b>	<b>Topic(s)</b>	<b>pages in Nesse</b>
1	W 3-Sep-08	The essence of mineralogy	
	F 5-Sep-06	The Big 10 minerals/the Big 8 Elements	p. 45-46
2	M 8-Sep-08	Hand sample identification	Ch. 6
	<b>T 9-Sep-08</b>	<b>Mineral Properties/the Big 10</b>	Ch. 6
	W 10-Sep-08	Introduction to Crystal Chemistry	pp. 39-46
	F 12-Sep-08	An introduction to symmetry	pp. 6-14
3	M 15-Sep-08	2-D symmetry (operations and plane lattices)	14-19
	<b>T 16-Sep-08</b>	<b>Mineral Identification/Sedimentary and hydrothermal minerals</b>	
	W 17-Sep-08	3D symmetry (operations and 32 crystal classes)	24-29
	F 19-Sep-08	The 6 crystal systems	29-38
4	M 22-Sep-08	Naming planes and Lines (Miller Indices)	19-24
	<b>T 23-Sep-08</b>	<b>Miller Indices/Metamorphic Minerals</b>	
	W 24-Sep-08	Crystal Chemistry - atomic structure revisited	39-46
	F 26-Sep-08	Crystal Chemistry - Chemical bonding	46-56
5	M 29-Sep-08	Crystal Chemistry - Pauling's Rules	57-65
	<b>T 30-Sep-08</b>	<b>Mineral Classification Scheme/accessory minerals</b>	
	W 1-Oct-08	Crystal Chemistry - Mineral formulas	65-73
	F 3-Oct-08	Relationship of Chemistry to mineral properties <i>(EXAM 1 HANDED OUT)</i>	
6	M 6-Oct-08	<b>GSA ANNUAL MEETING (NO CLASS)</b>	
	<b>T 7-Oct-08</b>	<b>MINERAL ID EXAM</b>	
	W 8-Oct-08	<b>GSA ANNUAL MEETING (NO CLASS)</b>	
	F 10-Oct-08	Light <i>(EXAM 1 DUE)</i>	114-117
	<b>S 11-Oct-08</b>	<b>FIELD TRIP (8AM – 6 PM)</b>	<b>handout</b>
7	M 13-Oct-08	refraction of light and Snell's Law	117-121
	<b>T 14-Oct-08</b>	<b>Light</b>	
	W 15-Oct-08	isotropic and anisotropic materials	121-137
	F 17-Oct-08	interference phenomena	137-139
8	M 20-Oct-08	important anisotropic optical properties	136-139
	<b>T 21-Oct-08</b>	<b>The petrographic microscope - optical properties</b>	<b>118-121</b>
	W 22-Oct-08	Uniaxial indicatrix	130-133
	F 24-Oct-08	Unaxial vs. biaxial indicatrix	130-136

<b>Wk</b>	<b>Date</b>		
9	M 27-Oct-08	Uniaxial interference figure	139-143
	<b>T 28-Oct-08</b>	<b>mineral identification in hand sample and thin section</b>	
	W 29-Oct-08	uniaxial interference figures (exercise)	139-143
	F 31-Oct-08	Biaxial interference figures	143-151
10	M 3-Nov-08	Biaxial minerals (exercise)	183-200
	<b>T 4-Nov-08</b>	<b>interference figures</b>	
	W 5-Nov-08	Crystal Growth	74-84
	F 7-Nov-08	Phase diagrams - <b>EXAM 2 HANDED OUT</b>	handout
11	M 10-Nov-08	Environments of Formation	handout
	<b>T 11-Nov-08</b>	<b>Igneous minerals in hand sample and thin section</b>	<b>186-190</b>
	W 12-Nov-08	Framework silicates	201-202, 208-213, 225
	F 14-Nov-08	Sheet silicates - <b>EXAM 2 DUE</b>	235-251
12	M 17-Nov-08	Chain silicates	261-265, 277-280
	<b>T 18-Nov-08</b>	<b>Sedimentary minerals in hand sample and thin section</b>	<b>190-194</b>
	W 19-Nov-08	Ring and disilicates	291, 300
	F 21-Nov-08	Orthosilicates	306, 310-312, 314-316
13	M 24-Nov-08	Non-silicates	326-329, 340-341, 346, 356, 370-371, 374
	<b>T 25-Nov-08</b>	<b>Metamorphic minerals in thin section and hand sample</b>	<b>194-199</b>
	W 26-Nov-08	<b>NO CLASS - THANKSGIVING HOLIDAY</b>	
	F 28-Nov-08	<b>NO CLASS - THANKSGIVING HOLIDAY</b>	
14	M 1-Dec-08	non-silicates	378-382, 397, 400, 401
	<b>T 2-Dec-08</b>	<b>Lab project</b>	
	W 3-Dec-08	Lab project	
	F 5-Dec-08	Lab project	
15	M 8-Dec-08	<b>lab project</b>	
	<b>T 9-Dec-08</b>	<b>Lab Project Session (EXAM 3 HANDED OUT)</b>	
	W 10-Dec-08	<b>Exam work time</b>	
	F 12-Dec-08	<b>EXAM 3 AND LAB PROJECT DUE (11:30 AM)</b>	