

Mineralogy (51-205)

Course Syllabus Fall 2009

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

Labs M 1:50-5:10 PM and T 1:50-5:10 (E Geis, 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 8-9, T 12-1, W 9-11 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., 2009, *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, systematic mineralogy and mineral associations.
4. Relate physical properties of minerals to their crystal structures and chemical compositions (these interrelationships help us to relate mineralogy to geological processes).
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!

FORMAT OF THE COURSE AND YOUR RESPONSIBILITIES

If you haven't taken a course from me before, you might be surprised by the structure of Mineralogy. I expect ***interaction and participation, and I place a great deal of responsibility on you, the student.*** After all, I can't do your learning for you! Part of being a sophisticated learner is being aware of how *you* learn. I care very much that you gain skills and knowledge in this course and active participation in "doing mineralogy" is the best way I know to do that. Thus, class sessions are designed around activities having to do with the topic at hand.

With so many activities in class, one of your responsibilities is to ***come to class prepared.*** This means completing reading, online quizzes and any other pre-class material asked of you. You will be expected to actively participate every day in exercises and/or activities that are designed to help you learn about mineralogy.

I expect you to ***treat others with tolerance and respect and to act responsibly and reliably*** when you work in groups. We will collaborate quite a bit in this course because it prepares you for real world collaboration in the geosciences. You may not always agree with the folks in your group, but treat them respectfully and learn how to convince naysayers with good evidence and respectful discussion.

Another of your responsibilities is to ***complete assignments ON TIME.*** Every assignment will designate the date that it is due. These are hard and fast deadlines and mean that it is due before we start class or lab on that date. There are two reasons for this: 1) if you haven't finished the current assignment, you may not be ready for the next one; 2) students like to keep track of their grades and I like to return graded assignments as soon as I can – prompt response from me is impossible if I don't have all assignments. *As with any rule, there are always exceptions. In the back of your Handbook, you will find two "Mineralogy Bucks" for late assignments. These are good for a ~48-hour extension on any assignment (certain conditions apply). But, you only get 2 "coupons", so use them wisely.*

I do not physically take attendance, but anyone who has taken the course will be able to tell you that it's hard to make up what you miss if you skip a class. Should you miss a class, I do expect that you will gather all the important information 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...I made everyone sit around doing useless stuff...") !!!

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 and learn 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 ***show up on time, make my expectations for assignments clear,*** and return graded assignments in a timely fashion. I will also do my best to ***help you become more aware of how you learn.*** 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 look 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.***

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 a little early) so that we can get started right away.

Please note that there are a few days in October and December when I will be out of town. We will make up class time with take-home exams and a field trip on October 10.

The mandatory field trip for this class will happen on October 10. *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* (There are also some supplemental readings that will be provided in lab and at the library).
- Mineralogy Handbook (2009): This is a lab manual and course guide. You should bring it to class EVERY DAY.
- Three ring binder for all of your assignments. In this course, you will have a “portfolio” binder in which you will keep all of your assignments organized. From time to time, I will collect these portfolios and grade in-class and homework assignments. You might want to get some loose-leaf paper as well.
- Hand lens/mineral identification tools: You can purchase one of these from me or the Geology Club. This is one of the most important tools you will have for mineral ID and every geologist should have one. Bring it to lab EVERY WEEK!

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. There is a significant amount of research that suggests that peer instruction is a far more effective method of teaching than lecture. 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 medicines and household items, and may help us understand global climate change and other important issues about the Earth. Think of mineralogy as a means to understanding and appreciating the world around us!

INFORMATION ABOUT GRADING

GRADING	GRADING SCALE
EXAM 1 (material through 10/9).....10%	A 90-100%
EXAM 2 (material through 11/11).....10%	B 80-90%
EXAM 3 (comprehensive with min ID)15%	C 70-80%
MINERAL ID EXAM5%	D 60-70%
Labs (1-11).....22%	F.....< 60%
Mineral quizzes3%	
Lab project10%	
In-class assignments and homework.....15%	
Online quizzes (posted on D2L)5%	
Field trip (Saturday, October 10, 2009)5%	

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.*** Exams 1 and 2 are worth 10%; Exam 3 (comprehensive) is worth 15% of your grade.

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 grade.

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. The 11 labs are worth 22% of your grade.

- All observations made during lab (including any sketches) and the answers to lab questions should be recorded in your three ring binder.
- All assignments should be finished by the beginning of lab on the date that they are due; however, I will not collect your binders 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 and practicing.
- Every student should have a 10x hand lens at the beginning of the first lab

MINERAL QUIZZES:

Each week in lab, we will have a mineral quiz. These 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. These quizzes will stop after the Mineral ID exam in mid-October. Mineral quizzes are worth 3% of your grade.

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 (in hand sample and thin section), record observations, write a short paper and present their results in poster form. The lab project counts for 10% of your 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 grade.

IN-CLASS ASSIGNMENTS/HOMEWORK:

A lot of this course consists of in-class activities and assignments; sometimes, you’ll have to do some work before coming to class so that you’re prepared to work in class. Sometimes you’ll have to finish up an in-class assignment as homework. All of the assignments should be placed in your (well-organized) binder. I will collect the binders from time to time to grade the assignments. Assignments (in and out of class) count for 15% of your grade.

FIELD TRIP:

In October, we will be embarking on a field trip to Central Wisconsin. This day trip (expect to spend your entire Saturday from 8-6) 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 10, 2009**. The field trip counts for 5% of your total grade.

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. Every semester, I have to have the dreaded “plagiarism” conversation with at least one class. Let’s hope it isn’t this one!

LECTURE AND LAB SCHEDULE (TENTATIVE)

Week	Date	Topic(s)	pages in Nesse	outside reading*	D2L quiz
1	W 9-Sep-09	Intro & What is a mineral?			
	F 11-Sep-09	The Big 10 minerals/the Big 8 Elements	45-46	<i>D: Ch. 1</i>	Y
2	M 14-Sep-09	Hand sample identification	Ch. 6	<i>D: Ch 2</i>	Y
	Lab 1	Mineral Properties/the Big 10	Ch. 6		
	W 16-Sep-09	Introduction to Crystal Chemistry (or a reason for understanding symmetry)	39-46	<i>K: 37-52</i> <i>D: 47-68</i>	Y
	F 18-Sep-09	An introduction to symmetry -lattices and point symmetry	6-14	<i>K: 111-118</i> <i>D: 225-242</i>	Y
3	M 21-Sep-09	2-D symmetry (practice)		<i>K: 143-158</i>	
	Lab 2	Mineral Identification/Sedimentary and hydrothermal minerals			
	W 23-Sep-09	3D symmetry (Point and space groups)	14-19	<i>D: 242-249</i>	Y
	F 25-Sep-09	The 6 crystal systems		<i>K: 129-131</i>	Y
4	M 28-Sep-09	Naming planes and Lines (Miller Indices)	19-38	<i>K: 131-142</i>	Y
	Lab 3	Miller Indices/Metamorphic Minerals			
	W 30-Sep-09	Crystal Chemistry - ions, electronegativity, bonding, size and oxidation state	41-56	<i>D: 121-144</i>	Y
	F 2-Oct-09	Crystal Chemistry - Chemical bonding	46-56	<i>K: 53-66</i> <i>D: 147-168</i>	
5	M 5-Oct-09	Crystal structure - Pauling's Rules	57-65	<i>K: 143-158</i> <i>D: 225-242</i>	Y
	Lab 4	Mineral Classification Scheme/accessory minerals			
	W 7-Oct-09	Crystal Chemistry - substitution/compositional variation	65-73		Y
	F 9-Oct-09	mineral formulas/mineral properties		<i>D: Ch. 10</i>	
	S 10-Oct-09	Field Trip (8am – 6 pm)	see back of Handbook		
6	M 12-Oct-09	Light	114-122	<i>K:288-290</i> <i>D: 401-411</i>	Y
	Lab 5	Light and Snell's Law			
	W 14-Oct-09	The optical indicatrix	130-135	<i>K: 290-294</i> <i>D: Ch. 5</i>	Y
	F 16-Oct-09	interference & birefringence (EXAM 1 BEGINS)	122-130	<i>K: 294-298</i>	Y
7	M 19-Oct-09	NO CLASS - GSA Annual Meeting			
	Lab 6	MINERAL ID EXAM			
	W 21-Oct-09	NO CLASS - GSA Annual Meeting			
	F 23-Oct-09	Uniaxial interference figure (EXAM 1 DUE)	140-143	<i>K:299, 304</i>	Y
8	M 26-Oct-09	uniaxial interference figures (exercise)			
	Lab 7	The petrographic microscope - optical properties	118-121		
	W 28-Oct-09	Unaxial review and biaxial intro			
	F 30-Oct-09	biaxial indicatrix	133-136		Y

* available in the lab as photocopies.

K=Klein and Dutrow, 2007, Mineral Science. (also on reserve at the library)
D = Dyar, Gunter and Tasa, 2008, Mineralogy and Optical Mineralogy.

LECTURE AND LAB SCHEDULE (TENTATIVE)

9	M	2-Nov-09	Biaxial exercise and interference figures	143-151	<i>K: 300-304</i>	Y	
		Lab 8	Mineral ID in Hand Sample and Thin Section		<i>D: 515-533</i>		
LAB PROJECTS BEGIN							
	W	4-Nov-09	Biaxial interference figures exercise				
	F	6-Nov-09	Crystal Growth, stability, nucleation	74-84	<i>K: 218-222, 245-249</i>	Y	
10	M	9-Nov-09	Crystal Defects & Post-Crystallization processes	84-94	<i>K: 222-244, 266-285</i>	Y	
		Lab 9	Interference Figures		<i>K: 249-265</i>		
	W	11-Nov-09	Thermodynamics and the Phase rule	handout	<i>D: 535-545</i>	Y	
	F	13-Nov-09	Igneous minerals I: Felsic minerals (EXAM 2 BEGINS)	201-234	<i>K: 467-482, 534-552</i> <i>D: 103-108, 578-589</i>		
11	M	16-Nov-09	Igneous minerals II: Mafic minerals	261-268, 306-314	<i>K: 434-452, 483-519</i> <i>D: 111-117, 606-627</i>		
		Lab 10	Igneous minerals in hand sample and thin section	183-190	<i>K: 574-585</i>	Y	
	W	18-Nov-09	Sheet silicates	235-251	<i>K: 519-534</i> <i>D: 108-111 (593-606)</i>		
	F	20-Nov-09	Metamorphic minerals I: Pelites (EXAM 2 DUE)	314-323	<i>K: 596-603</i> <i>D: 551-552</i>		
12	M	23-Nov-09	Metamorphic minerals II: Metabasalts	291-300, Ch. 14			
		lab 11	Metamorphic minerals in thin section and hand sample	194-199		Y	
	W	25-Nov-09	NO CLASS - THANKSGIVING HOLIDAY				
	F	27-Nov-09	NO CLASS - THANKSGIVING HOLIDAY				
13	M	30-Nov-09	Sedimentary Minerals I: Weathering/ alteration & Framework Silicates	252-260, 370-374	<i>K: 585-596</i> <i>D: 550-551</i>		
		lab 12	Sedimentary minerals in thin section and hand sample	190-194		Y	
	W	2-Dec-09	Sedimentary minerals II: Carbonates and Evaporites	326-346, 374-377	<i>K: 399-433</i> <i>D: 667-671</i>		
	F	4-Dec-09	Hydrothermal minerals	378-396,	<i>K: 331-366</i> <i>D: 558-657</i>		
14	M	7-Dec-09	accessory minerals and native elements	346-351, 397-404	<i>K: 368-393</i> <i>D: 644-648 & 657-667</i>		
		Lab project	Work on Lab Project				
	W	9-Dec-09	Lab project				
	F	11-Dec-09	Lab Project Session (EXAM 3 BEGINS)				
15	M	14-Dec-09	work on exam (no class)				
		NO LAB	work on exam (no class)				
	W	16-Dec-09	work on exam (no class)				
	F	18-Dec-09	EXAM 3 AND LAB PROJECT WRITE-UPS DUE (12:30 PM)				

* available in the lab as photocopies.

K=Klein and Dutrow, 2007, Mineral Science. (also on reserve at the library)

D = Dyar, Gunter and Tasa, 2008, Mineralogy and Optical Mineralogy.