

GEO 416K - Earth Materials

Fall 2013

Course Syllabus

Instructor: Jung-Fu “Afu” Lin
Office: JSB 4.140; 471-8054
Course Hours: MW 5-6:30 PM, JGB 2.216
Office Hours: MW 6:30-7:30 PM, or by appointment at JGB 4.140
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Course Overview: This course is intended as an introduction to minerals, optical mineralogy, igneous and metamorphic rocks, and their associated rocks. We will also learn about the techniques (e.g., Optical Microscope) to study them. There are two components to the course: a 90-minute lecture on MW 5-6:30 pm (Given by Dr. Lin) and 2 two-hour laboratory sessions per week (Given by your TA).

Course Aims and Summary: The goal of the course is to improve your understanding of the physical, chemical, crystallographic and structural properties of rocks and minerals. You will identify a range of minerals, and also igneous and metamorphic rocks. Minerals are the fundamental building blocks of all rocks, and consequently the Earth and other planets. Mineralogy combines elements of physics, chemistry, math, and geology. Knowledge of mineralogy is the basis for the understanding of geological processes, including the formation and alteration of the Earth and other planets as a function of time. This course will focus primarily on minerals in igneous and metamorphic rocks. Much of our understanding of the Earth and its evolution through time comes from identifying and mapping rocks throughout the world. Different rock types and minerals play crucial roles in a multitude of basic and applied sciences, including the material sciences, building construction, and applied industry, to name just a few. The purpose of this course is to give all of you a hands-on opportunity to learn about earth materials in rocks, mainly igneous and metamorphic, and their mineral constituents. You will be exposed to some basic techniques for identifying minerals in hand sample and using an optical microscope. This syllabus represents the current plans and objectives of the course. As we go through the semester, those plans may need to be changed to enhance the class learning opportunity. Such changes are not unusual and should be expected.

Office hours: MW 6:30-7:30 pm, or by appointment

The instructor and TAs are happy to meet with you outside of class during office hours or by appointment to discuss any material. My office hours are for your benefit and are conveniently scheduled right after the class hours. I would be happy to schedule an appointment with you if you cannot come to my normal office hours. Please come see me or email me if you have questions. Exam review sessions will be scheduled approximately one week prior to the lecture exams. Your TAs will be of great help to your questions as well—for materials related to your lab sessions, try to address those questions to your TA. Your TA may also schedule lab office hours for you.

Required Texts:

Lectures:

Earth Materials by C. Klein and A. Philpotts(This is a new textbook we will be using this year. I have reserved a copy in the Walter Library on the 4th floor of the Jackson School Building)

Labs:

Earth Materials Lab Manual, Kendall Hunt Publishing, by Professor E. Catlos

(This will be your primary lab manual for most of your lab sessions)

Recommended: Introduction to Optical Mineralogy, Oxford University Press, 4th edition by W.D. Nesse

(This is recommended to help you understand optical microscope and mineralogy)

These required textbooks will be used extensively in both lectures and your lab; you should bring the lab textbooks to your lab sessions. Your TA may distribute additional lab materials for you to learn. Other readings will be assigned throughout the course, and those books will be on reserve in the Walter Geology Library.

Blackboard: In this class I use Blackboard (<https://courses.utexas.edu/>) to distribute course materials, to communicate online, and to post grades. Call the ITS Help Desk at 475-9400, Monday through Friday 8 a.m. to 6 p.m., for help with Blackboard. Check your Blackboard and email regularly for class updates. Email is recognized as an official mode of university correspondence; therefore, you are responsible for reading your email for university and course-related information and announcements.

Lecture Information: The lecture schedule (see below) includes the reading assignments for each date and is intended as a guideline only: the lecture schedule is subject to change as needed. The lectures and reading assignments are designed to complement and reinforce each other. *Anything* presented in either the lectures or reading assignments is “fair game” on examinations. I do not take attendance, but you will likely do better on the exams if you come to class and review session. Please **be considerate to your classmates and to me during the lectures. Please turn off cell phones and pagers!** If you bring a laptop to class, please sit where you will not disturb your neighbors--please turn off the speaker of your laptop.

Laboratory Information: Laboratory is held in EPS 2.102. You will receive a separate syllabus for your lab section in the first lab from your TA. There will be a mid-term and final examination in the laboratory, covering laboratory material. You will need a hand lens (10x) for many laboratories, and so you should purchase one. Your first laboratory will be on the 1st week of September, depending on your lab section.

Grades: Your final course grade will be based on the combined results of the lecture and laboratory portions of your class in the approximate proportions:

Lecture (>60%)

2 mid-term exams: 36% (18% each)

Final exam is worth 24%

Pop quizzes: extra credits of ~5-10%

Laboratory (>40%)

Laboratory exercises (14%)

Laboratory midterm exam (12%)

Laboratory final exam (14%)

There are three exams during normal lecture hours and one final exam. Everyone must attend the final exam, which is worth 24%. The date of the final exam is scheduled and released by the University toward the end of the semester. **You will be allowed to drop your lowest test score from one of your three lecture midterm exams (see grading below).** There is one lab midterm (worth 12% of your grade) and one lab final (worth 14% of your grade). *The laboratory component of this class is worth 40% of your total grade.* Pop quizzes will be counted as extra credits (approximately 5-10 points of your total grade). ***I do not give make-up exams!***

Class exams: During the semester there will be three lecture exams (multiple choices only), given during the regular lecture period, and one final exam. Each exam will cover material from the date of the previous exam up through the class before the exam. Please realize that the material in this course builds upon itself to some degree. The lecture final exam is cumulative and will cover material from the entire course. ***I do NOT give lecture make-up exams, except legitimate reasons (medical illness or family emergency).*** You must bring your UT ID cards to all exams. You will need a pencil and an eraser. You will not be allowed to have cell phones, laptops, or anything else out during exams. Pencils and erasers will NOT be provided. I may also give a number of pop quizzes during my lectures.

Laboratory Score: **Laboratory attendance is mandatory.** Credit will not be given for work turned in without attending a lab session. **Laboratory attendance is mandatory. If you miss more than THREE LABS, you won't get credit for the whole class.** You must attend the lab for which you enrolled (unless prior arrangements have been made with the TA or with me). It will be MUCH efficient for you to complete each lab assignments by working diligently during each lab period. Most of the assignments require materials only available to you in the lab. However, in case you need extra time to finish writing up the assignments, lab exercises are due at the *beginning* of the next session for that specific lab. Late assignments will not be accepted. For all labs, plan on bringing standard supplies: laboratory textbook, mechanical pencil, eraser, pen, ruler, protractor, and calculator. Group discussion about laboratory projects is encouraged, but **all work submitted for grading must be an individual's sole effort and all written work must be in your own words! Do not let anyone copy your work. You are permitted to drop one lab assignment from your final grade.** Academic honesty is expected, and the usual University rules will be applied to plagiarism or cheating. Lab exams will be administered during the regular lab times. The laboratory final exam will NOT be comprehensive, but the final labs build upon the material covered prior to the lab midterm exam and thus you will need to retain knowledge of material from previous labs for optimal performance on the lab final exam.

I will use the Plus/Minus System for final grade report. Since this is a big class, grading cutoff will be very tight and be followed strictly. I will count your final grade to one decimal point--this decimal point will be rounded up. For example, 89.4 after rounding up will be a B+, and 89.5 after rounding up will be an A-. Letter Grades with Decimal Equivalents and Grade Range:

| | |
|-----------|-----------------|
| A (4.00) | (≥93) |
| A- (3.67) | (below 93 - 90) |
| B+ (3.33) | (below 90 - 87) |
| B (3.00) | (below 87 - 83) |
| B- (2.67) | (below 83 - 80) |
| C+ (2.33) | (below 80 - 77) |
| C (2.00) | (below 77 - 73) |
| C- (1.67) | (below 73 - 70) |
| D+ (1.33) | (below 70 - 67) |
| D (1.00) | (below 67 - 63) |
| D- (.67) | (below 63 - 60) |
| F (0.00) | (below 60) |

Prerequisites: Please confirm that you have fulfilled the following prerequisites:

- Grade of C or better in GEO 401 or GEO 303 or GEO 312K
- Grade of C or better in CH 301
- Grade of C or better in *OR* concurrent registration for CH 302

Mineralogical Society of America Undergraduate Prize: The student with the highest final grade in this class will be nominated for the **Mineralogical Society of America Undergraduate Prize**. The Mineralogical Society of America's Undergraduate Prize (formerly *American Mineralogist* Undergraduate (AMU) Award) program recognizes outstanding students who have shown an interest and ability in the discipline of mineralogy. Each student was cited by his or her department for outstanding achievement in mineralogy-related courses. The MSA Prize allow MSA to join with the individual faculty to formally recognize outstanding students. Each student is presented a certificate at an awards ceremony at his or her university or college. In addition, each recipient receives a student membership in MSA with access to the electronic version of *American Mineralogist*, and a *Reviews in Mineralogy and Geochemistry* or *Monograph* volume chosen by the sponsor, student, or both. Deadlines for nominating students are January 1 and July 1 of each year. The recipient from UT Austin last year was Kevin Eric Bone sponsored by Dr. Elizabeth Catlos

Special Needs: The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities. To determine if you qualify, please contact the Dean of Students at 471-6259. If they certify your needs, I will work with you to make appropriate arrangements.

The University of Texas Honor Code: *“The core values of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the University is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community.”*

Students are expected to read and to strictly adhere to the University’s Honor Code and written policies on academic dishonesty. Cheating or plagiarism will not be tolerated. Any student caught violating University policy will be referred to the Dean of Student Affairs for disciplinary action. **All written work must be in your own words!**

| Date | Lecture | MW 5-6.30p | Lab | Laboratory Topic |
|-------------|--|-------------------|------------|--------------------------------------|
| 8/28 | No class (*: watch Hazen's lecture) | | | No labs this week |
| 9/2 | Labor Day Holiday | | | No lab Monday or Tuesday |
| 9/4 | Introduction/Overview | | 1 | Mineral Properties |
| 9/9 | Materials of the Solid Earth | | 2 | Mineral Properties |
| 9/11 | Mineral Identification | | 3 | Unusual Mineral Properties |
| 9/16 | Fundamentals of Crystal Structure | | 4 | Mineral Classification |
| 9/18 | Symmetry Elements | | 5 | Symmetry |
| 9/23 | Crystal Systems | | 6 | Symmetry with Blocks |
| 9/25 | Projections, Point Groups, Twinning | | 7 | Microscope Introduction |
| 9/30 | CLASS EXAM I | | 8 | Basic Microscope Observations |
| 10/2 | Intro to Optical Mineralogy | | 9 | Interference Colors |
| 10/7 | Uniaxial Indicatrix II | | 10 | Minerals in Thin Section |
| 10/9 | Biaxial Indicatrix I | | 11 | Minerals in Thin Section |
| 10/14 | Biaxial Indicatrix II | | 12 | Rocks in Thin Section |
| 10/16 | Phase Diagrams | | 13 | Rocks in Thin Section |
| 10/21 | Phase Diagrams | | | LABORATORY MIDTERM |
| 10/23 | CLASS EXAM II | | 14 | Silicate Minerals |
| 10/28 | Crystal Formation, Silicate Structures | | 15 | Igneous Rocks in Hand Sample |
| 10/30 | Igneous Minerals | | 16 | Igneous Rocks in Hand Sample |
| 11/4 | Igneous Rocks, Mantle and Crust | | 17 | Classification of Igneous Rocks |
| 11/6 | Melting Processes | | 18 | Metamorphic Rocks and Minerals |
| 11/11 | Metamorphic Minerals | | 19 | Metamorphic Rocks and Minerals |
| 11/13 | Metamorphic Rocks | | 20 | <i>Identifying Metamorphic Rocks</i> |
| 11/18 | Thermodynamics, Phase Rule | | 21 | <i>Pressure-Temperature Facies</i> |
| 11/20 | P-T Path Diagrams | | 22 | <i>Prograde/Retrograde Reactions</i> |
| 11/25 | CLASS EXAM III | | 23 | Economic Minerals |
| 11/27 | No Class—Thanksgiving! | | | No lab Wednesday or Thursday |
| 12/2 | Economic Minerals | | 24 | Economic Minerals |
| 12/4 | Effects on Human Health | | | LABORATORY FINAL |

12/13- **FINAL EXAMINATION** (TIME TBD)

*: For the first week of the semester, you are assigned to watch the following lecture video. This lecture gives you a general idea of the Earth Materials class as well as forefront knowledge in the field.

Jackson School Technical Sessions Speaker Series Presents Distinguished Speaker:

Dr. Bob Hazen

Geophysical Laboratory, Carnegie Institution of Washington

Clarence Robinson Professor of Earth Science, George Mason University

Judd H. and Cynthia S. Oualline Centennial Lectureship in Geological Sciences

Title: Recent Advances in the Co-Evolution of the Geosphere and Biosphere

<http://mediasite.jsu.utexas.edu/UTMediasite/Play/6ec77a5f373e4518a928fa86cae75c711d?catalog=3e0f576a-5623-4504-9df0-29d00b0bf8f4>