

# GEO 416K

## Earth Materials

### Fall 2008

#### Course Syllabus

**Instructor:** James Gardner  
**Office:** GEO 4.108; 471-0953  
**Office Hours:** W 1-2 PM; TTH 10-11 AM, or by appointment  
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**Course Overview:** This course is intended as an introduction to minerals, igneous and metamorphic rocks, and their associated rocks. We will also learn about the techniques to study them. For many of you, this will be the only time you get to see what constitutes most of the Earth. For others, this will be the springboard to a more in-depth study of the petrology and petrography of igneous and metamorphic rocks in GEO 426P. There are two components to the course: a one-hour lecture on MWF, and 2 two-hour laboratory sessions per week.

**Required Text:** Introduction to Mineralogy by W.D. Nesse. This required text will be used extensively; you should bring it everyday to both the lectures and your lab. Other readings will be assigned throughout the course, and those books will be placed on reserve in our geology library. The more important graphics that I will show in lecture will be available on-line as pdf files at <http://www.geo.utexas.edu/courses/416k/> and you should have those available by the beginning of the pertinent class.

**Laboratory Information:** You will receive a separate syllabus for your lab section in the first lab. 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 after the Labor Day holiday, either Wednesday or Thursday, depending on your lab section. The ten lab sections, and their status as of 8:30 AM Wednesday, August 27, are listed below:

UNIQUE #	DAYS AND TIME	STATUS
26990	TTH 8-10 AM	NINE SLOTS OPEN
26995	TTH 10-12 AM	THREE SLOTS OPEN
27000	MW 12-2 PM	ELEVEN SLOTS OPEN
27005	TTH 12-2 PM	ONE SLOT OPEN
27010	MW 2-4 PM	FULL
27015	TTH 2-4 PM	ONE SLOT OPEN
27020	MW 4-6 PM	SEVEN SLOTS OPEN
27030	MW 8-10 AM	ELEVEN SLOTS OPEN
27035	TTH 4-6 PM	SIX SLOTS OPEN

**Grades:** Your course grade will be based on the combined results of the lecture and laboratory portions of your class in the approximate proportions: 3 class exams (30%), class quizzes (15%), final exam (10%), and laboratory score (45%). **THERE IS NO GRADE CURVE IN THIS COURSE.**

*Class exams:* There will be three full-period class examinations during the course, which are listed on the class schedule. No books or class notes will be permitted. Attendance to these exams is required, and a missed exam will be counted as a zero, unless a written doctor's excuse is provided. If an acceptable excuse is provided, a make-up exam will not be given, but your grade will be calculated based only on the other class exams and other components. Anyone caught cheating on the exams will receive a zero.

*Class quizzes:* There will be approximately 30 quizzes during the course of the semester. Each will be given at the beginning of class (10 AM), and take about 3 minutes. There will be no make-up quizzes given.

*Final Examination:* A final examination will be given during the time scheduled by the registrar (December 12, 2 – 5 PM). It will cover the last approximately quarter of the class, following the third class exam. No books or class notes will be permitted. Attendance to these exams is required, and a missed exam will be counted as a zero, unless a written doctor's excuse is provided. If an acceptable excuse is provided, a make-up exam will not be given, but your grade will be calculated based only on the other class exams and other components. Anyone caught cheating on the exams will receive a zero.

*Laboratory Score:* This portion of your grade is based on your laboratory exercises, quizzes, and examinations, as determined by your laboratory instructor. *The laboratory is a required part of the course, and completion and receiving a passing grade is required to pass the course.* See your laboratory syllabus for details and dates.

**Prerequisites:** There are several prerequisites that you must have fulfilled to be in this class. Please confirm that you have fulfilled them:

- 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

**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; 471-4641 TTY. If they certify your needs, I will work with you to make appropriate arrangements.

**Summary:** 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 superconductivity, to name just a few. The purpose of this course is to give all of you a hands-on opportunity to learn about 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 optical microscopy.

Date	Lecture	MWF 10-11	Lab	Date	
8/27	Introduction/Overview				No labs this week
8/29	Crystallography				
9/1	Labor Day Holiday			1,2	No lab Monday or Tuesday
9/3	Point Symmetry		1	3,4	Introduction Lab
9/5	Miller Indexes				
9/8	Crystal Forms		2	8,9	Symmetry of Minerals
9/10	Chemical bonds and Coordination		3	10,11	Crystal axes
9/12	Bond strength and silicate structures				
9/15	Substitutions, Defects, and Twinning		4	15,16	Miller Indexes
9/17	Physical Properties		5	17,18	Identification of Real Minerals
9/19	Reflection and refraction of light				
9/22	<b>CLASS EXAM</b>		6	22,23	X-ray Diffraction
9/24	Relief and Becke lines		7	24,25	Introduction to Microscopy
9/26	Optical Interferences				
9/29	Uniaxial Indicatrix I		8	29,30	Optical Properties I
10/1	Uniaxial Indicatrix II		9	1,2	Optical Properties II
10/3	Biaxial Indicatrix I				
10/6	Biaxial Indicatrix II		10	6,7	Optical Properties III
10/8	Biaxial Indicatrix III		11	8,9	Optical Properties IV
10/10	Extinction and Pleochroism				
10/13	Crystal Formation		12	13,14	Mineral Formulas
10/15	Earth's Mantle and Crust		13	15,6	Optical Properties V
10/17	<b>CLASS EXAM</b>				
10/20	Mantle melting and Tectonics			20,21	<b>LABORATORY MIDTERM</b>
10/22	Mid-ocean Ridges		14	22,23	Identifying Igneous Rocks
10/24	Crystallization I				
10/27	Crystallization II		15	27,28	Mantle Melting
10/29	Igneous Textures		16	29,30	Plutonic Igneous Rocks
10/31	Magmatic Intrusions				
11/3	Volcanic Eruptions		17	3,4	Extrusive Igneous Rocks
11/5	Interpreting Magma Dynamics		18	5,6	Pyroclastic Rocks
11/7	Volcanoes and Their Hazards				
11/10	Introduction to Metamorphic Rocks		19	10,11	Metamorphic minerals/textures
11/12	<b>CLASS EXAM</b>		20	12,13	Identifying Metamorphic Rocks
11/14	P-T diagrams and Reaction types				
11/17	Reaction rates		21	17,18	Pressure-Temperature Facies
11/19	P-T-time paths		22	19,20	Prograde/Retrograde Reactions
11/21	Metamorphic Compositions				
11/24	Ore generation		23	24,25	Ore minerals
11/26	No Class				No lab Wednesday or Thursday
11/28	Thanksgiving Holiday				
12/1	Radiometric Dating of Rocks		24	1,2	Radiometric Dating of Rocks
12/3	Applications of Radiometric Ages			3,4	<b>LABORATORY FINAL</b>
12/5	Alteration and Clays				

12/12 **FINAL EXAMINATION FRIDAY AT 2 TO 5 PM**