

GEOSCIENCES 493/637: (4 credits) Rock-Forming Minerals Spring 2007

Class: M 9:20-10:20 Th 1:20-2:20 NSci 235 **Lab:** F 12-3 NSci 311
Prerequisites for Geos 493: Geos 225 + Geos 214 + Geos 417

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Textbook: Deer, Howie, & Zussman, The Rock-forming Minerals, 2nd Ed.

Course Description: Examination of the rock-forming minerals; their structure and composition. Application of mineral data to problems in geochemistry, petrology and ore deposits. Laboratory involves analysis of minerals by various analytical techniques.

Course Goals:

1. To thoroughly understand mineral structures, their compositions & compositional variations.
2. To become experienced and competent in petrographic mineral identification.
3. To be able to use mineral compositions and textures to unravel geologic histories.
4. To be able to use a variety of mineral compositional and identification tools.

Student Learning Outcomes: By actively participating in this course you will become proficient at

1. Expressing chemical compositions of minerals in atomic and weight units
2. Using and generating chemical formulas for a variety of minerals
3. Reliably identifying a variety of minerals by reflected and transmitted light techniques
4. Using various X-ray techniques for mineral identification and compositional determination
5. Use of Microsoft Excel for computation and graphing

Instructional Methods:

Reading, laboratory and problem assignments will accompany the lectures. Problems and labs are due a week after they're assigned. Note that *all answers must be accompanied by appropriate calculations and discussion*. **It is vital to complete the weekly homework and lab exercises, as it is impossible to learn the course material without doing so!!** Honest-to-God, it's like learning to drive: you can talk and talk about putting in the clutch and shifting gears, but you never really learn it until you do it. **It is very difficult to catch up if you fall behind!!!**

We encourage you to contact us by phone, email, or in person if you have issues with regard to the assignments but we have found that it is difficult (and often frustrating) to explain computations over the phone. Consequently, we encourage you to work on the problems *before* the night before they're due--that way we can discuss problem difficulties in person at school. If you do your work on a spreadsheet you can email it with questions. We can work out something for everyone's needs; the critical objective is to set aside time for assignments and to get help when you need it.

Course Policies:

Naturally, we would like you to attend class and lab and to show up on time. If you know you will miss a class or lab, let us know and we will give or email you the lecture notes and assignments and (or) lab in advance. *As routine completion of problem sets & labs is essential to understanding the material in this course, we will submit an instructor-designated drop if you are missing more than 2 assignments by the 5th week of classes.* **We also reserve the right to dock points for severely late problem sets or labs.**

Evaluation: There will be no exams. The class grade is based on:

problem sets: 40% labs: 50% final project: 10%

Final grades will be normalized to the highest point total among students in the class. A point total within 90% of this will be an 'A, within 80% = B, within 70% of the top score = C, within 60% = D, < 60% = F.

Note that these two classes are taught in conjunction with one another. The grading for the graduate and undergraduate classes will be separate.

Disabilities Services: The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. UAF is committed to equal opportunity for all students. If you have a documented disability, please let us know within the first two weeks of class, and we will work with the Office of Disabilities Services to make the appropriate accommodation. If you have a specific undocumented physical, psychiatric or learning disability, you will benefit greatly by providing documentation of your disability to Disability Services in the Center for Health and Counseling, 474-7043, TTY 474-7045.

Geos 493 proposed Class schedule Spring 2007

wk	Day	LECTURE/DISCUSSION		LAB/ Problem Set	Reading
T1	1-16	INTRO; General mineral subst rules + mineral recal	ps1	mineral calculations	DHZ p. 678-685
1	1-18	Review of transmitted light microscopy	L1	Review of trans light microscopy & photos	Nesse
T2	1-22	Intro to reflected light microscopy: theory & practice	ps2	simple mineral P-T calc'ns	
2	1-25	Overview of mineral thermodynamics	L2	Reflected light—techniques & mineral ID	Craig & Vaughn
T3	1-29	Ox & sulfidation state, sulf-ox-silicate equilibrium	ps3	Mt-ilm geothermometry	
3	2-1	Use of oxides/sulfides: ilm-mt geothermometer	L3	Fe-Ti oxides and related minerals—refl light	DHZ p. 540-568
T4	2-5	XRF, microprobe, XRD, adv. XRD	ps4	sulfide thermometry/barometry	
4	2-8	Sulfide minerals, stability & thermo	L4	Making p t/s; XRD & XRF to ID unknowns	DHZ p. 583-605
T5	2-12	Everything about Garnet & olivine	ps5	Minerals & plutons	DHZ p. 3-13,31-46
5	2-15	Sphene, zircon, Al ₂ SiO ₅ , other orthosilicates	L5	Garnet-olivine-spinels	DHZ p. 22-66
T6	2-19	epidote-cordierite-tourmaline, etc.	ps6	Garnet compositional calculations	DHZ p. 67-137
6	2-22	Pyroxenes I	L6	Epidote-cordierite-tourmaline	DHZ p. 143-165
T7	2-26	Calcic pyroxenes & pyroxene/oid I.D.	ps7	Pyroxene recalculation & name	DHZ p. 166-207
7	2-28	Amphiboles—overview & hornblende	L7	Pyroxenes	DHZ p. 223-247
T8	3-5	Identification of Amphiboles	ps8	Amphibole & Fe ²⁺ /Fe ³⁺ recal'ns	DHZ p. 248-258
8	3-8	Funky Amphiboles; Amphibole & P/T	L8	Amphiboles: simple and difficult	DHZ p. 259-271
9		SPRING BREAK 3-12 TO 3-18		SPRING BREAK 3-12 TO 3-18	
10	3-19	Discussion of projects	ps 9	Written summary of project & progress	
10	3-22	Overview of tectosilicates & their properties	L9	guided student project work	391-395
11	3-26	Feldspars	ps10	feldspar barometry/thermometry	396-454
11	3-29	Micas	L10	Feldspars, including staining	279-351
12	4-2	F,Cl in micas; mica identification	ps11	halogens in micas	
12	4-5	Mineralogy and radiometric dating I	L11	Micas	22-30
13	4-9	Mineralogy and radiometric dating II	ps12	P-T from mineral compositions	663-671
13	4-12	Other phyllos (chl, clay) + zeolites	L12	Can it be dated?; zeolites & clays	353-376, 515-529
14	4-16	Carbonates, phosphates, sulfates I	ps13	Carbonates & apatite	606-640
14	4-19	ID of carbs, phosphates, sulfates	L13	Carbonates, phosphates, sulfates...	641-671
15	4-23	Glasses		Student projects	
15	4-25	Prep for student projects		Student projects	
16	4-30	Prep for student projects		Student projects	
16	5-3	Prep for student projects		Student Project Presentations	