GEO 426P — Igneous and Metamorphic Petrology

Organizational Matters

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Office Hours: MWF 11:00-11:45 by appointment, or any other time with prior arrangement – or knock on my door anytime!

TAs: Stephanie Moore, Sarah Stacy
They will provide contact information in lab.

Lab Sections:

27565	TTh 10-12	(Stacy)
27570	TTh 12-2	(Moore)
27575	MW 2-4	(Stacy)
27580	TTh 2-4	(Moore)

Labs begin on Wednesday 18 January and Thursday 19 January; they will meet in EPS 2.102. You will need a hand lens for some labs.

Laboratory exercises complement lectures and are an essential part of the course. Optical mineralogy is an important tool in the laboratory. Both lab and class topics build upon knowledge gained in the prerequisite course, GEO 416K, "Earth Materials".

Textbooks: **(Required)** Winter, John D. (2001) *Principles of Igneous and Metamorphic Petrology*, Prentice Hall, Second Edition

(Required) Klein, Cornelis & Dutrow, Barbara. (2007) *Mineral Science*, John Wiley & Sons, Inc. -- or an equivalent textbook covering optical and systematic mineralogy

Keeping up with the reading is vital! Petrology is too complicated to learn just from short lectures in class (and the readings are too detailed to absorb without coming to class). The way to learn this material is to read it quickly before class, come to class and ask questions, then re-read it again with care!

Honor Code: UT's honor code reads: "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."

Take it to heart…

Grading:

1/3 Lab

Lab instructors will determine lab grades on the basis of exams, quizzes, and exercises. ***Satisfactory completion of the laboratory is required as an essential part of the course: therefore, if you earn a grade below "C–" in the lab, your lab grade will be your grade for the entire course (unless adding in the lectures makes it still lower).***

2/3 Lecture (unless above italicized clause applies)

Four mid-semester exams are scheduled during class time over the course of the semester; see the syllabus for dates. Make-up exams will be given only if a written doctor's excuse is accepted.

A wrinkle that should help: because Exam #2 is cumulative over the first half of the semester, if you do better on Exam #2 than on Exam #1, I'll give you the score for Exam #2 on both of them! Ditto for Exam #4: your score on it will replace your score on Exam #3 if you do better on Exam #4!

The average of your mid-semester exam scores will make up half of your lecture grade (1/3 of your total grade), and the final exam will make up the other half (the other 1/3 of your total grade).

Final exam:

The final exam will be given at the time determined by the registrar (Monday, May 14th, 2-5 pm). Consult the final exam schedule to determine the location.

After the last mid-semester exam and before the final exam, you will be given a preliminary course grade.

You may be exempt from taking the final exam if you meet <u>all</u> of the following criteria:

(1) You are willing to accept your preliminary course grade as your final course grade.

(2) Your preliminary course grade is a C– or better.

(3) You did not miss any of the four lecture exams or any of the lab exams.

(4) You attend all three lectures during the last week of classes <u>in their entirety</u>.

This is intended to help motivate people to keep up with their study of petrology during the semester, and to avoid any necessity of "cramming" at the end (which just doesn't work…).

GEO 426P, Spring 2012 — Syllabus

Day / Date	No.	Lecture Topic	**Lab Topic** [that day or following day]
W 18 Jan	1	Optical mineralogy: Review of basics	Uniaxials: Ortho- and Conoscopic
F 20 Jan	2	Optical mineralogy: Uniaxial indicatrix	
M 23 Jan	3	Optical mineralogy: Retardation, birefringence	Biaxials: Conoscopic 1
W 25 Jan	4	Optical mineralogy: Biaxial indicatrix & interference figures	Biaxials: Conoscopic 2
F 27 Jan	5	Fundamentals of igneous petrology	
M 30 Jan	6	Classification and textures of igneous rocks	Optical Orientation
W 1 Feb	7	Structures of igneous rocks	**EXAM 1: Optical mineralogy**
F 3 Feb	8	Petrologic tools: Thermodynamics and the phase rule	
M 6 Feb	9	Petrologic tools: Analysis of one- and two-component systems	Igneous Textures 1
W 8 Feb	10	Petrologic tools: Analysis of three- (or more) component systems	Igneous Textures 2
F 10 Feb	11	Chemical petrology: Major and minor elements	
M 13 Feb	12	Chemical petrology: Trace elements and isotopes 1	Chemical Petrology 1
W 15 Feb	13	Chemical petrology: Trace elements and isotopes 2	Chemical Petrology 2
F 17 Feb		**EXAM 1 - Covers lectures 1-13 (and assigned reading)**	
M 20 Feb	14	Mantle melting and the generation of basaltic magma	Basalts / gabbros 1
W 22 Feb	15	Magma diversity	Basalts / gabbros 2
F 24 Feb	16	Layered mafic intrusions	
M 27 Feb	17	Mid-ocean ridge volcanism	Layered intrusions
W 29 Feb	18	Oceanic intraplate volcanism and continental flood basalts	Arcs (Mt. St. Helens)
F 2 Mar	19	Island arcs	
M 5 Mar	20	Continental arcs and granitoids	Granitoids
W 7 Mar	21	Continental alkaline magmatism and anorthosites	**EXAM 2: Igneous petrology**
F 9 Mar		**EXAM 2 - Covers lectures 1-21 (and assigned reading)**	

GEO 426P, Spring 2012 — Syllabus (continued)

Day / Date	No.	Lecture Topic	**Lab Topic** [that day or following day]
M 19 Mar	22	Metamorphic fundamentals 1: Processes, materials, tectonic settings	Nomenclature; Macroscopic textures
W 21 Mar	23	Metamorphic fundamentals 2: Equilibrium assemblages	Macroscopic textures (continued)
F 23 Mar	24	Metamorphic fundamentals 3: Facies and facies series	
M 26 Mar	25	Metamorphic fundamentals 4: Metamorphic reactions	Metamorphic textures in thin section
W 28 Mar	26	Review of structures & compositions of metamorphic minerals 1	Review: Metamorphic minerals
F 30 Mar	27	Review of structures & compositions of metamorphic minerals 2	
M 2 Apr	28	Pelitic rocks 1: Barrovian facies series	Pelitic rocks
W 4 Apr	29	Pelitic rocks 2: Buchan facies series; high P/T; migmatites	Pelitic rocks (continued)
F 6 Apr		**EXAM 3 - Covers lectures 22-29 (and assigned reading)**	
M 9 Apr	30	Mafic rocks 1: Zeolite to granulite facies	Mafic rocks
W 11 Apr	31	Mafic rocks 2: Blueschist, eclogite facies; low P/T variants	Mafic rocks (continued)
F 13 Apr	32	Metamorphic fluids	
M 16 Apr	33	Calcareous rocks: marbles and calc-silicates	Calcareous rocks
W 18 Apr	34	Ultramafic rocks	Calcareous rocks (continued)
F 20 Apr	35	Contact metamorphism, cataclasis	
M 23 Apr	36	Thermobarometry	Cataclastic and mylonitic rocks
W 25 Apr	37	The big picture: Metamorphism as a probe of deep time	**EXAM 3: Metamorphic petrology**
F 27 Apr		**EXAM 4 - Covers lectures 22-37 (and assigned reading)**	
M 30 Apr	38	The Llano Uplift 1	[No lab]
W 2 May	39	The Llano Uplift 2	[No lab]
F 4 May	40	The Llano Uplift 3 (+ Course-Instructor Survey)	

Final Exam is scheduled for 2-5 pm, Monday 14 May 2012