GEL 60: Intro to Earth Materials Fall 2019

Overview:

This course introduces the physical and chemical properties of minerals within their context as the fundamental building blocks of rocks. Particular emphasis will be given to learning the association of minerals with the rock types they typically occur in, as well as a basic introduction to the petrologic processes that form them. Skills to be learned include mineral observation and identification techniques in hand samples and thin section, as well as an introduction to quantitative analytical techniques such as SEM and XRD, and how to use the data produced by each technique.

Instructors:

Prof. Kari Cooper, kmcooper@ucdavis.edu, Room 3127 Earth & Physical Sciences Building

Lecture TA: Kevin Schrecengost, kschrec@ucdavis.edu

Lab TA's: Supratim Dey, supratim@ucdavis.edu; Cole Bishop, mcbishop@ucdavis.edu; Dylan Vasey, davasey@ucdavis.edu

Office Hours:

Cooper: Wednesdays 11 am-noon, 3127 EPS; or by appointment
Schrecengost: Fridays, 10-11 am, 2242 EPS
Dey: Wednesdays 2-3 pm, EPS 1314
Bishop: TBA
Vasey: TBA

Meeting Times/Locations:

Lectures:
MWF: 10:00-10:50 am, Earth and Physical Sciences 1348
Lab sections:
A01: Tu 1:10-4:00 pm, EPS 1314
A02: M 4:10-7:00 pm, EPS 1314
A03: W 1:10-4:00 pm, EPS 1314

Important Dates:

1. Lab midterm: Mon-Weds, **October 21-23** (in lab room)
2. Lecture Midterm: Wednesday, **October 30** (in class)
3. Veteran's Day Holiday: Monday **Nov. 11**: no labs this week
4. Thanksgiving Day Holiday: Thursday-Friday **Nov. 28-29**: no class (but note that labs still run M-W Nov 25-27!)
5. Lab final: Monday **Dec. 2** (in lab room)
6. Lecture Final Exam: Monday, **December 9** at 10:30-12:30 (2 hours; in lecture room)

Textbook:

Required text:

Earth Materials: Introduction to Mineralogy and Petrology, Klein & Philpotts, Cambridge University Press. Either the 1st Edition (2013) or the 2nd edition (2016) are ok.

Optional/recommended:

An Introduction to the Rock-forming Minerals, 3rd Edition, Deere, Howie, and Zussman, Mineralogical Society, London, 2013.

Introduction to Optical Mineralogy, Nesse, W.D., Oxford University Press, 2004.

Atlas of Rock-forming Minerals in Thin Section, Mackenzie and Guilford, Wiley & Sons, 1980

The best way to succeed in this course is to read the assigned chapters in the textbook before the lectures. The lectures are intended to explain material in the text that is difficult to master, not duplicate it. When you read ahead of time, you will also find that you will get a deeper understanding from class and will be able to selectively reread relevant parts of the text when you are studying for exams. If you put off the reading until the days before the exams, you are likely to have a hard time in this class.

Grading:

Quizzes:	5%
Problem sets:	10%
Lecture Midterm:	15%
Lecture Final Exam:	20%
Lab exercises:	35%
Lab exams:	15%

Quizzes: There will be a short quiz at the beginning of many of the lectures. In order to encourage reading the material before class, some of these will focus on readings for the lecture material for that day. Quizzes will not be announced in advance.

Problem sets: There will be seven problem sets due throughout the quarter. They will usually be due one week after being posted. You are welcome to turn in your problem set early; **however, no credit will be given for problem sets turned in late.** Solution keys will not be posted, though every effort will be made to grade and hand them back before the next problem set is assigned. I highly recommend you take advantage of office hours to review the problem sets after they have been graded. These will build on lectures and reading by giving you some experience working through problems and calculations related to the course material, as well as having some questions that are similar to exam questions. They will be posted approximately one week before each due date.

Lecture Exams: You must take the exams at the regularly scheduled time. The only exceptions to this policy are for *truly exceptional* circumstances such as a serious illness that prevents you from taking the exam (must be documented by a doctor) or a family emergency. The burden is on you to convince me that the circumstances are truly exceptional – things like forgetting to set your alarm, forgetting the time of the exam, or travel to attend a family event do *not* constitute an emergency.

Laboratory Exercises: The laboratory sessions meet once a week. **Attendance is mandatory.** These sessions are an integral part of this course and you are required to attend. The previous lab exercise is due at the beginning of the first session of a new lab exercise. You are welcome to use the laboratory whenever lectures or other labs are not in progress. As with problem sets, **no credit will be given for labs turned in late**. Late labs, however, will be corrected by your TAs.

Lab exams will be given during your regularly lab period for the week, and will be held in the lab room. They will assess your practical skills and information related to the lab exercises.

Hand Lens: A 10x hand lens is required for this course. If you are a geology major and do not own one, now is the time to buy one. The bookstore should carry them or you can get them through other sources such as Amazon.com. If you have any questions about the type or quality of hand lens necessary, please talk to one of the TAs.

Class Lectures:

I use a combination of writing/drawing on the whiteboard and use PowerPoint in lectures mainly to show illustrations, photos, or movies. These photographs and movies are used to further illustrate figures or concepts that are covered in the book. This approach allows you to draw and write with me and is shown to be a much more effective way of teaching. I will also ask you to work in pairs or small groups to answer questions or think about concepts during class. Please come prepared to be engaged and participate.

Accessibility and accommodations:

If you have concerns about accessibility or need special accommodations for exams or lectures, first contact the UC Davis Student Disability Center, and if they determine that special accommodations are warranted, I will work with you to find a solution. Accommodations must be put in place *before* the exams, and it is your responsibility to start the process early enough to allow enough time for this to happen.

Academic honesty:

Academic misconduct such as cheating or plagiarism will be dealt with in accord with the Code of Academic Conduct. You must review this document before the course, and confirm that you have reviewed it online (you will be prompted to do so by email and on MyUCDavis). An updated version can be found at http://sja.ucdavis.edu/files/cac.pdf. You must also confirm your participation in this course by following this link: participate.ucdavis.edu.

Academic Senate policy *requires* instructors to report any suspected cases of cheating or plagiarism to Student Judicial Affairs.

Schedule

GEL 60 2019: Earth and Planetary Materials						
Week	**day**	**date**	**Lecture Topics**	**Lecture Reading**	**Lab Topics**	**Problem Sets**
0	Wednesday	9/25/19	Introduction to Earth Materials course	Ch. 1-3, K&P	No lab	
	Friday	9/27/19	Mineral prop's and ID continued	Ch. 1-3, K&P		Problem set 1 posted
1	Monday	9/30/19	Basics of crystallography	Ch. 4-5, K&P	Hand sample ID	
	Wednesday	10/2/19	Crystallography 2	Ch. 4-5, K&P		
	Friday	10/4/19	Wrap up crystallography; intro to optical mineralogy	Ch. 6, K&P		**Problem set 1 due**; Problem set 2 posted
2	Monday	10/7/19	Optical microscopy 2	Ch. 6, K&P	Optical mineralogy 1	
	Wednesday	10/9/19	Optical microscopy 3	Ch. 6, K&P		
	Friday	10/11/19	Putting it all together: mineral ID using petrographic microscope	Ch. 6, K&P		**Problem set 2 due;** Problem set 3 posted
3	Monday	10/14/19	Igneous rock forming minerals	Ch. 7-8, K&P	Optical 2	
	Wednesday	10/16/19	Igneous rock forming minerals 2	Ch. 7-8, K&P		
	Friday	10/18/19	Intro to phase equilibria and phase diagrams	Ch. 7-8, K&P		**Problem set 3 due**
4	Monday	10/21/19	Igneous rock classification and occurrence	Ch. 9, K&P	**lab midterm**	
	Wednesday	10/23/19	Composition classification diagrams	Ch. 9, K&P		
	Friday	10/25/19	Igneous rocks and their tectonic associations	Ch. 9, K&P		
5	Monday	10/28/19	Midterm review		Igneous Minerals	
	Wednesday	**10/30/19**	**Lecture midterm exam**			
	Friday	11/1/19	Metamorphic rock-forming minerals; prograde vs. retrograde index minerals	Ch. 13, K&P		Problem set 4 posted
6	Monday	11/4/19	Intro to thermodynamics	Ch. 14, K&P	Metamorphic Minerals 1	
	Wednesday	11/6/19	Thermodynamics, cont.	Ch. 14, K&P		
	Friday	11/8/19	Metamorphic grade and facies	Ch. 14, K&P		**Problem set 4 due;** Problem set 5 posted
7	**Monday**	**11/11/19**	**Veteran's day Holiday**		**No lab**	
	Wednesday	11/13/19	Tectonic association of metamorphic rocks	Ch. 14, K&P		
	Friday	11/15/19	Introduction to economic ore minerals	Ch. 15, K&P		**Problem set 5 due;** Problem set 6 posted
8	Monday	11/18/19	ore minerals and deposits	Ch. 15, K&P	Metamorphic Minerals 2	
	Wednesday	11/20/19	ore deposts	Ch. 15, K&P		
	Friday	11/22/19	Sedimentary rock-forming minerals	Ch. 10-12		**Problem set 6 due**
9	Monday	11/25/19	Sedimentary rock formation and processes, classification and association	Ch. 10-12, K&P	Sedimentary Minerals	
	Wednesday	11/27/19	Analytical methods: intro to X-ray diffraction	TBA		Problem set 7 posted
	Friday	**11/29/19**	**Thanksgiving holiday**			
10	Monday	12/2/19	XRD continued	TBA	**Lab Final**	
	Wednesday	12/4/19	intro to electron microbeam methods	TBA		
	Friday	12/6/19	Review for final exam			**Problem set 7 due**
week	**Monday**	**12/9/19**	**Final exam, 10:30-12:30**			