GEOL 327: Igneous and Metamorphic Petrology (4 credits)
Spring 2019

Lecture: MW 1-2:15PM in WRI C235; **Lab**: Tuesday 2:30-5:15PM and Friday 8:30-11:30AM in LFG 202 or 107

Instructor: Arya Udry
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Office Hours: Mon and Wed 10-11AM, or by appointment

Teaching Assistant: Amanda Ostwald
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Required Textbook: *Principles of Igneous and Metamorphic Petrology (2nd Edition)* by *John D. Winter (ISBN 13: 978-0-321-59257-6).* Every student is expected to do the readings before the relevant lecture.

http://www.facultybookshelf.org/course/20492

Prerequisites: 220 Mineralogy (C or above)

Course Description This upper-level course introduces both igneous and metamorphic petrologic processes, which can be constrained by identifying and classifying igneous and metamorphic rocks.

Learning Objectives: At the end of this course, students should be able to:
- Identify, describe, and classify igneous and metamorphic minerals and rocks in hand samples and thin sections
- Interpret magmatic history of rocks using hand sample and microscopic study
- Understand and use various geochemical data and phase diagrams to constrain petrogenesis of igneous rocks and their tectonic context
- Identify and understand metamorphic mineral assemblages to constrain history and P-T conditions
- Discuss the role of igneous and metamorphic processes in the origin and evolution of the Earth's crust and mantle

Grading policy: Final grades will be assigned according to the following schedule. The instructor may also elect to curve the **final** grades in the student favor.

Grade	Semester Average	Grade	Semester Average
A	Over 93	C	Between 73 and 77
A-	Between 90 and 93	C-	Between 70 and 73
B+	Between 87 and 90	D+	Between 67 and 70
B	Between 83 and 87	D	Between 63 and 67
B-	Between 80 and 83	D-	Between 60 and 63
C+	Between 77 and 80	F	Less than 60

Grades: Grades are based on a combination of in class exams: two covering igneous petrology and one (final) covering metamorphic petrology. The final will include some igneous-related questions but will not be, strictly speaking, a comprehensive exam.

Exam I	15%
Exam II	20%
Exam III (final)	25%
Homework + Field trip	5%
Lab Quizzes and exercises	30%
Participation	5% (based on instructor & T.A. evaluation)

Important notes:

1. You MUST pass both the lecture and the laboratory in order the pass the course. A grade of F in lab or a grade of less than 60 in lecture will earn an F for the entire course regardless of the numerical average of the two scores.
2. Required reading means that you are responsible for knowing the assigned material.
3. No extra credit will be given.

Attendance and Make ups: On time attendance to class lectures, laboratory, and field trip is required. We will make accommodations for reasonable absences (illness for example), but may require documentation. Please notify us as soon as possible that you will be missing a class and especially a lab or an exam. If you miss a lecture, you are responsible to find out what material was covered and if any schedule changes were announced. If you miss an exam, you must notify me **before the event** with an acceptable excuse with required documentation. Make-up exams must be taken within **one week** of the scheduled test.

Lab Policies: Lab assignments are due at the beginning of the following lab period. Labs turned in late will be given partial credit (75%) up to 24hr late. 24-48hr will be graded at 50% and no credit will be given for labs more than 2 days late without a valid excuse. Please let the T.A. know ahead of time if you are going to be missing a lab. If you skip lab or leave more than 15 min early, you forfeit the opportunity to ask questions/seek help during office hours.

Official Extracurricular Activity: All students who represent UNLV at any official extracurricular activity have the opportunity to make up an assignment. However, you must provide official written notification to me at least 1 week prior to the missed class(es).

Non-enrolled guests: Students are not allowed to bring guests to lecture, laboratory, or the field trip.

Changes to syllabus: The lecture schedule is tentative; adjustments to the schedule of topics and readings may be made in accordance with the rate of progress in the classroom. Students will be provided with an updated syllabus if significant changes are necessary.

UNLV Academic Policies: Students taking this course are required to be familiar with the UNLV academic polices at the URL shown below. **Please see this link for select, useful information for students:** https://www.unlv.edu/sites/default/files/page_files/27/SyllabiContent-MinimumCriteria-2018-2019.pdf

Course Schedule

Date	Lecture	Readings Chapter #	Lab
Jan 21	***No Class – MLK day***		**MLK Holiday – No lab**
Jan 23	Intro to Petrology, Mineralogy review	1	
Jan 28	Igneous structures and field relationships	4	Lab #1: Igneous mineral and microscope review
Jan 30	Classification and textures of igneous rocks	2 + 3	
Feb 4	Chemical petrology – Major + Trace element geochemistry	8 + 9	Lab #2: Igneous rock classification
Feb 6	Isotopes and geochronology I	9.7.2	
Feb 11	Isotopes and geochronology II	9.7.2	Lab #3: Phase diagrams
Feb 13	Thermodynamics + Phase diagrams	5	
Feb 18	***No Class – Presidents day***		**President's day – No lab**
Feb 20	Generation of basaltic magmas	10	
Feb 25	Magma diversity – Differentiation and contamination	11	Lab #4: Chemical variation diagrams and norms
Feb 27	Magma diversity – Differentiation and contamination – Review before exam	11	
Mar 4	***Exam I***		Lab #5: Intro minerals in thin section
Mar 6	Basaltic volcanism at mid-ocean ridges, ophiolites	13	
Mar 11	Petrogenesis of OIB	14	Lab #6: Ultramafic and Mafic rocks
Mar 13	Subduction I: Island arc volcanism	16	
Mar 18	***Spring Break***		
Mar 20			
Mar 25	Subduction II: Continental arc volcanism	17	Lab #7: Intermediate and Felsic Rocks + Field trip week
Mar 27	Continental magmatism I	15, 19	
Apr 1	Continental magmatism II	18, 20	Lab #8: Pyroclastic rocks
Apr 3	Introduction to metamorphic rocks	21	
Apr 8	Phase diagrams and Metamorphic reactions – Review before exam	24	Lab #9: Introduction to metamorphic rocks in hand samples
Apr 10	***Exam II***		
Apr 15	Metamorphic zones and facies	25	Lab #10: Introduction to metamorphic rocks in thin sections
Apr 17	Metamorphism of mafic rocks	25	
Apr 22	Metamorphic textures	23	Lab #11: Metamorphic Phase diagrams
Apr 24	Metamorphism of pelites	28	
Apr 29	Thermobarometry	27	Lab #12: Metapelite rocks
May 1	Calc-silicate rocks and fluids	29	
May 6	Planetary science + Meteorites	X	Lab #13: Metabasic rocks
May 8	Meteorites – Review before exam	X	
May ??	***Final exam***		

FIELD TRIP: March 30th