

## **GEOL 327: Igneous and Metamorphic Petrology (4 credits) Spring 2022**

**Lecture:** MW 1-2:15 PM in WRI C237;

**Lab:** Monday 4:00-6:45 PM and Friday 8:30-11:30 AM in LFG 202 (or 107)

**Instructor:** Arya Udry

**Office:** LFG 204      **Phone:** (702) 895-1239      **e-mail:** [arya.udry@unlv.edu](mailto:arya.udry@unlv.edu) (email is the best way to contact me, do not rely on the phone)

**Office Hours:** Mon and Wed 2:15-3:15 PM, or by appointment

**Teaching Assistant:** Dalton McCaffrey

**Office:** TEC 108      **email:** [mccafd1@unlv.nevada.edu](mailto:mccafd1@unlv.nevada.edu)

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

**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.

<u>Grade</u>	<u>Semester Average</u>	<u>Grade</u>	<u>Semester Average</u>
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	35%

**Important notes:**

1. You **MUST** pass both the lecture and the laboratory in order to 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 policies 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/EVPP-Faculty-Policies-Spring-2022-Accessible.pdf](https://www.unlv.edu/sites/default/files/page_files/27/EVPP-Faculty-Policies-Spring-2022-Accessible.pdf)

**Course Schedule**

Date	Lecture	Readings Chapter	Lab
<i>Jan 17</i>	<i>No Class – MLK day</i>		<b>MLK Holiday – No lab</b>
Jan 19	Intro to Petrology, Mineralogy review	1	
Jan 24	Igneous structures and field relationships	4	<u>Lab #1</u> : Igneous mineral and microscope review
Jan 26	Classification and textures of igneous rocks	2 + 3	<u>Lab #2</u> : Igneous rock classification
Jan 31	Chemical petrology – Major + Trace element geochemistry	8 + 9	
Feb 2	Isotopes and geochronology I	9.7.2	<u>Lab #3</u> : Phase diagrams
Feb 7	Isotopes and geochronology II	9.7.2	
Feb 9	Thermodynamics + Phase diagrams	5	
Feb 14	Generation of basaltic magmas	10	<u>Lab #4</u> : Chemical variation diagrams and norms
Feb 16	Magma diversity – Differentiation and contamination	11	
<i>Feb 21</i>	<i>No Class – President’s day</i>		<b>President’s day – No lab</b>
Feb 23	Magma diversity – Differentiation and contamination – Review before exam	11	
<i>Feb 28</i>	<i>Exam I</i>		<u>Lab #5</u> : Intro minerals in thin section
Mar 2	Basaltic volcanism at mid-ocean ridges, ophiolites	13	
Mar 7	Petrogenesis of OIB [Virtual]	14	<u>Lab #6</u> : Ultramafic and Mafic rocks
Mar 9	Subduction I: Island arc volcanism [Virtual]	16	
<i>Mar 14</i> <i>Mar 16</i>	<i>Spring Break</i>		
Mar 21	Subduction II: Continental arc volcanism	17	<u>Lab #7</u> : Intermediate and Felsic Rocks + Field trip week
Mar 23	Continental magmatism I	15, 19	
Mar 28	Continental magmatism II	18, 20	<u>Lab #8</u> : Pyroclastic rocks
Mar 30	Introduction to metamorphic rocks	21	
Apr 4	Phase diagrams and Metamorphic reactions – Review before exam	24	<u>Lab #9</u> : Introduction to metamorphic rocks in hand samples
<i>Apr 6</i>	<i>Exam II</i>		
Apr 11	Metamorphic zones and facies	25	<u>Lab #10</u> : Introduction to metamorphic rocks in thin sections
Apr 13	Metamorphism of mafic rocks	25	
Apr 18	Metamorphic textures	23	<u>Lab #11</u> : Metamorphic Phase diagrams
Apr 20	Metamorphism of pelites	28	
Apr 25	Thermobarometry	27	<u>Lab #12</u> : Metapelite rocks
Apr 27	Calc-silicate rocks and fluids	29	
May 2	Planetary science + Meteorites	X	<u>Lab #13</u> : Metabasic rocks
May 4	Meteorites – Review before exam	X	
<i>May 9</i>	<i>Final exam</i>		

**FIELD TRIP: March 26<sup>th</sup>**

### **Diversity Statement**

As an institution of higher learning, UNLV represents a rich diversity of human beings among its faculty, staff, and students, and is committed to aspiring to maintain a Campus environment that values that diversity. Accordingly, the University supports understanding and appreciation of all members of its community, regardless of race, sex, age, color, national origin, ethnicity, creed, religion, disability, sexual orientation, gender, gender identity, marital status, pregnancy, genetic information, veteran status, or political affiliation. Please see [University Statements and Compliance](https://www.unlv.edu/about/statements-compliance), <https://www.unlv.edu/about/statements-compliance>.

A successful learning experience requires mutual respect and trust between the students and the instructor. Accordingly, the instructor asks that students be willing to listen to one another's points of view, acknowledging that there may be disagreements, keep discussion and comments on topic, and use first person, positive language when expressing their perspectives.

### **Public Health Directives**

Face coverings are currently mandatory for all faculty and students in the classroom. Students must follow all active UNLV public health directives while enrolled in this class. UNLV public health directives are found at Health Requirements for Returning to Campus, <https://www.unlv.edu/coronavirus/health-requirements>. Students who do not comply with these directives may be asked to leave the classroom. Refusal to follow the guidelines may result in further disciplinary action according to the UNLV Student Conduct Code, [https://www.unlv.edu/sites/default/files/page\\_files/27/StudentConduct-Code.pdf](https://www.unlv.edu/sites/default/files/page_files/27/StudentConduct-Code.pdf), including being administratively withdrawn from the course.