

## GEOL 470/670: Planetary Geology (3 credits)

**Instructor:** Arya Udry

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(email is the best way to contact me, don't rely on the phone)

**Lectures:** Mondays and Wednesdays 10:00-11:15 am in LFG 202

**Prerequisites:** GEOL 327 (only for undergraduate students)

**Textbook:** Planetary Geoscience, by McSween et al., 2019, Cambridge University.  
Papers will be assigned throughout the semester (mandatory reading)

**Office hours:** Mondays and Wednesdays 9:00-10:00 am in LFG 204A (or by appointment)

**Course Description:** This course introduces geologic processes throughout our solar system. We will compare geologic processes on extraterrestrial bodies to those that occur on Earth. We will also cover missions that allow us to study those processes.

**Learning Objectives:** At the end of this course, students should be able to:

- Understand how and why other planetary bodies differ from Earth and what they can tell us about the Earth;
- Understand the differences and connections between geological and planetary sciences;
- Read and discuss planetary scientific papers;
- Identify different types of meteorites;
- Present research through a final presentation of a paper (with different topic levels for undergraduate versus graduate students).

**Grading policy:** Final grades will be assigned according to the following schedule. The instructor may also elect to curve the **final** grades in the students' 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, paper or proposals, and final oral presentations

Exam I	20%
Final	25%
Final Paper	30%
Presentation	25%
Participation	5%

## Course Schedule

Date	Lecture	Book chapters	Missions
Aug. 23	1. Intro — Planetary missions	1	NASA missions
Aug. 25	2. Toolkits for planetary scientists	2 + 3	MRO
Aug. 30	3. Universe formation and cosmochemistry	4	Planck
Sept. 01	4. Formation of the solar system	5	Genesis
<b>Sept. 06</b>	<b><i>No class — Labor Day recess</i></b>		
Sept. 08	5. Differentiation and composition of planets I	6 + 7	Voyager 1 + 2
Sept. 13	5. Differentiation and composition of planets II	6 + 7	New Horizons
Sept. 15	5. Differentiation and composition of planets III	6 + 7	Hayabusa 1 + 2
Sept. 20	6. Asteroid belt	X	Psyche + Lucy
Sept. 22	6. Asteroid belt – Meteorites	X	Osiris-Rex
Sept. 27	7. Planetary surface processes I — Volcanism I	10	Insight
Sept. 29	7. Planetary surface processes I — Volcanism II	10	MESSENGER + BC
Oct. 04	7. Planetary surface processes I — Volcanism III	10	Vega and Venera
<b>Oct. 06</b>	<b><i>Exam I</i></b>		
Oct. 11	7. Planetary surface processes I — Volcanism IV	10	Apollo + Luna
Oct. 13	7. Planetary surface processes II — Tectonics + Impact	9 + 11	LRO
Oct. 18	7. Planetary surface processes III — Atmospheres + Aeolian + Fluvial + Physical changes	12 – 15	MAVEN
Oct. 20	7. Planetary surface processes III — Atmospheres + Aeolian + Fluvial + Physical changes	12 – 15	MER + MSL
<b>Oct. 25</b>	<b><i>8. Meteorite lab</i></b>	X	<b><i>LAB</i></b>
<b>Oct. 27</b>	<b><i>8. Meteorite lab</i></b>	X	<b><i>LAB</i></b>
Nov. 01	9. Mars 2020 and Jezero crater — <i>Presentation explanations</i>	17	M2020
Nov. 03	11. Outer planets + icy worlds + Comets + Exoplanets	12	Juno
Nov. 08	11. Outer planets + icy worlds + Comets + Exoplanets — <i>Final paper due November 8<sup>th</sup> at midnight</i>	11	Cassini
Nov. 10	11. Outer planets + icy worlds + Comets + Exoplanets	Epilogue	Europa Clipper / Dragonfly
Nov. 15	<i>Overflow day</i>		
<b>Nov. 17</b>	<b><i>Student Presentations (n= 4)</i></b>		
<b>Nov. 22</b>	<b><i>Student Presentations (n= 4)</i></b>		
<b>Nov. 24</b>	<b><i>Student Presentations (n= 4)</i></b>		
<b>Nov. 29</b>	<b><i>Student Presentations (n= 4)</i></b>		
<b>Dec. 1</b>	<b><i>Student Presentations (n= 4)</i></b>		

**Final exam: Monday December 6<sup>th</sup> 10:10am - 12:10pm**

**Paper and presentation:** Students will write a paper presenting a planetary topic (from selection of the instructor), which will include 5 (undergraduate students) or 10 pages (graduate students) single-spaced figures, not including figures nor references (Times New Roman in font 12, justified text). Expectations will be higher for the graduate students. The first version of this paper will be corrected and gave back to the student for corrections. All students will present their paper at the end of the course (12 minute-presentations and 3 minute questions). **Final paper due November 10.**

**Recommended read for paper writing:** Irvine, T. N., Rumble, D., & Irvine, L. M. (1992). *A writing guide for petrological (and other geological) manuscripts*. Oxford University Press.

**Attendance and Make ups:** On time attendance to class lectures is required. We will make accommodations for reasonable absences (illness for example) but will require communication with the instructor. Please notify the instructor as soon as possible that you will be missing a class and especially an exam. Please do not come to class if you are sick. 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 the instructor before the event with an acceptable excuse with required documentation. Make-up exams must be taken within one week of the scheduled test. No extra-credit will be given.

**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).

**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.

**Administrative Drops/Classroom conduct:** You are required to be familiar with university policies and procedures in the current UNLV undergraduate Catalog. Importantly, we follow the policies on Administrative Drops/Classroom Conduct as stated in the most recent UNLV Undergraduate Catalog. Any student that does not comply with these requirements, and conduct themselves in a manner that is disruptive and interferes with the right of other students to learn, or of the instructor to teach will be administratively dropped from the course.

**Academic Misconduct:** Academic integrity is a legitimate concern for every member of the University community. We all share in upholding the fundamental values of honesty, trust, respect, fairness, responsibility, and professionalism. By choosing to join the UNLV community, students accept the expectations of the Student Academic Misconduct Policy, and are encouraged to always take the ethical path whenever faced with choices. Students enrolling at UNLV assume the obligation to conduct themselves in a manner compatible with UNLV's educational mission. An example of academic misconduct is plagiarism. Plagiarism is using the words or ideas of another person, from the Internet or any other source without

proper citation of the source(s). See the [Student Conduct Code](https://www.unlv.edu/studentconduct/student-conduct), <https://www.unlv.edu/studentconduct/student-conduct>.

**Auditing a Course:** Auditing a course allows a student to continue attending the lectures and/or laboratories and discussion sessions associated with the course, but the student will not earn a grade for any component of the course. Students who audit a course receive the same educational experience as students taking the course for a grade, but will be excused from exams, assessments, and other evaluative measures that serve the primary purpose of assigning a grade.

**Classroom Conduct:** Students have a responsibility to conduct themselves in class and in the libraries in ways that do not interfere with the rights of other students to learn, or of instructors to teach. Use of devices such as cellular phones and pagers, or other potentially disruptive activities are only permitted with the prior explicit consent of the instructor. Students are specifically prohibited to record classes without instructor authorization, including online/remote classes (either audio only, or video and audio). The instructor may rescind permission at any time during the class. If a student does not comply with established requirements or obstructs the functioning of the class, the instructor may initiate an administrative withdrawal of the student from the course.

**Copyright:** The University requires all members of the University Community to familiarize themselves with, and to follow copyright and fair use requirements. You are individually and solely responsible for violations of copyright and fair use laws. The University will neither protect nor defend you, nor assume any responsibility for student or employee violations of fair use laws. Violations of copyright laws could subject you to federal and state civil penalties and criminal liability, as well as disciplinary action under University policies. Additional [copyright policy information](https://www.unlv.edu/provost/copyright) is available at <https://www.unlv.edu/provost/copyright>.

**Disability Resource Center (DRC):** The [UNLV Disability Resource Center](https://www.unlv.edu/drc) (Student Services Complex, SSC-A, Room 143, <https://www.unlv.edu/drc>, telephone 702-895-0866) provides resources for students with disabilities. Students who believe that they may need academic accommodations due to a permanent disability, temporary or permanent medical need, or academic support due to pregnancy are encouraged to contact the DRC as early as possible in the academic term. A Disabilities Specialist will discuss what options may be available to you. Students who are already registered with the DRC should request their accommodations online each semester, and make an appointment to discuss their accommodations with their instructors.

**Final Examinations:** The University requires that final exams given at the end of a course occur on the date and at the time specified in the Final Exam schedule. The Final Exam schedule is typically available at the start of the semester, and the classroom locations are available approximately one month before the end of the semester. See the [Final Exam Schedule](https://www.unlv.edu/registrar/calendars), <https://www.unlv.edu/registrar/calendars>.  
**Our Final exam: Monday December 6<sup>th</sup> 10:10am - 12:10pm**

**Public Health Directives:** Face coverings are 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), <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](https://www.unlv.edu/sites/default/files/page_files/27/StudentConduct-Code.pdf), including being administratively withdrawn from the course.

Please stay home if you feel sick!

**Identity Verification in Online Courses:** All UNLV students must use their Campus-issued ACE ID and password to log in to WebCampus-Canvas.

**Incomplete Grades:** The grade of “I” (Incomplete) may be granted when a student has satisfactorily completed three-fourths of course work for that semester/session, but cannot complete the last part of the course for reason(s) beyond the student’s control and acceptable to the instructor, and the instructor believes that the student can finish the course without repeating it. For undergraduate courses, the incomplete work must be made up before the end of the following regular semester. Graduate students receiving “I” grades in 500-, 600-, or 700-level courses have up to one calendar year to complete the work, at the discretion of the instructor. If course requirements are not completed within the period indicated, a grade of “F” will be recorded, and the student’s GPA will be adjusted accordingly. Students who are fulfilling an Incomplete grade do not register for the course, but make individual arrangements with the instructor who assigned the “I” grade.

**Library Resources:** Librarians are available to consult with students on research needs, including developing research topics, finding information, and evaluating sources. To make an appointment with a subject expert for this class, please visit the [Libraries’ Research Consultation](https://guides.library.unlv.edu/appointments/librarian) website, <https://guides.library.unlv.edu/appointments/librarian>. You can also [ask the library staff](https://ask.library.unlv.edu/) questions via chat and text message at <https://ask.library.unlv.edu/>.

**Missed Classwork:** Any student missing class, quizzes, examinations, or any other class or laboratory work because of observance of religious holidays will be given an opportunity during that semester to make up the missed work. The make-up opportunity will apply to the religious holiday absence only. It is the responsibility of the student to notify the instructor within the first 14 calendar days of the course for Fall and Spring courses (except for modular courses), or within the first 7 calendar days of the course for Summer and modular courses, of their intention to participate in religious holidays which do not fall on state holidays or periods of class recess. For additional information, please visit the Missed Classwork policy, under Registration Policies, on the [Academic Policies](https://catalog.unlv.edu/content.php?catoid=32&navoid=8271&hl=) webpage, <https://catalog.unlv.edu/content.php?catoid=32&navoid=8271&hl=>.

In accordance with the policy approved by the Faculty Senate regarding missed class time and assignments, students who represent UNLV in any official extracurricular activity will also have the opportunity to make up assignments, provided that the student submits official written notification to the instructor no less than one week prior to the missed class(es).

The spirit and intent of the policy for missed classwork is to offer fair and equitable assessment opportunities to all students, including those representing the University in extracurricular activities. Instructors should consider, for example, that in courses which offer a “Drop one” option for the lowest assignment, quiz, or exam, assigning the student a grade of zero for an excused absence for extracurricular activity is both contrary to the intent of the Faculty Senate’s policy, and an infringement on the student’s right to complete all work for the course.

This policy will not apply in the event that completing the assignment or administering the examination at an alternate time would impose an undue hardship on the instructor or the University that could be reasonably avoided. There should be a good faith effort by both the instructor and the student to agree to a reasonable resolution. When disagreements regarding this policy arise, decisions can be appealed to the Department Chair/School Director, College/School Dean, and/or the Faculty Senate Academic Standards Committee.

For purposes of definition, extracurricular activities may include, but are not limited to academic recruitment activities, competitive intercollegiate athletics, fine arts activities, liberal arts competitions, science and engineering competitions, and any other event or activity sanctioned by a College/School Dean, and/or by the Executive Vice President and Provost.

**Rebelmail:** Rebelmail is UNLV’s official email system for students and by University policy, instructors and staff should only send emails to students’ Rebelmail accounts. Rebelmail is one of the primary ways in which students receive official University communications, information about deadlines, major Campus events, and announcements. All UNLV students receive a Rebelmail account after they have been admitted to the University. Sending emails within WebCampus-Canvas is also acceptable.

**Tutoring and Coaching:** The Academic Success Center (ASC), at the Claude I. Howard Building, provides tutoring, academic success coaching, and other academic assistance for all UNLV undergraduate students. For information regarding tutoring subjects, tutoring times, and other ASC programs and services, please visit the [ASC website](https://www.unlv.edu/asc), <https://www.unlv.edu/asc>, or call 702-895-3177. The ASC is located across from the Student Services Complex (SSC). Academic success coaching is located on the second floor of SSC A, Room 254. Drop-in tutoring is located on the second floor of the Lied Library, and on the second floor of the College of Engineering building (TBE A 207).

**UNLV Writing Center:** One-on-one or small group assistance with writing is available free of charge to UNLV students at the [Writing Center](https://writingcenter.unlv.edu/), <https://writingcenter.unlv.edu/>, located in the Central Desert Complex, Building 3, Room 301 (CDC 3–301). Walk-in consultations are sometimes available, but

students with appointments receive priority assistance. Students may make appointments in person or by calling the Center, telephone 702-895-3908. Students are requested to bring to their appointments their Rebel ID Card, a copy of the instructions for their assignment, and two copies of any writing they have completed on their assignment.

### **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.