



SYLLABUS

PTYS/GEOS/HWRS 441: Geology and Geophysics of the Solar System (3 Credits)

**Tuesdays and Thursdays, 2:00–3:15 P.M.
Room 312 Kuiper Space Sciences Building**

Description of Course

This class will explore a variety of geologic processes and how they have shaped planetary landscapes and environments. Specifically, the course focuses on developing a quantitative understanding of the major geophysical and geochemical processes associated with planetary bodies in our Solar System. Students will be also expected to develop their scientific reasoning and writing skills as well as conduct independent literature reviews and synthesize their findings.

Course Prerequisites

There are no explicit course prerequisites and anyone may enroll; however, this course is intended for juniors and seniors and as such contains advanced material. Many of the lectures and homework assignments will contain material of a mathematical nature and at least a basic knowledge of calculus will be necessary to understand it. Students will also be expected to conduct weekly readings and develop written assignments. Please speak to the instructor if you have any questions.

Instructor and Contact Information

Instructor: Dr. Christopher Hamilton
Office: Room 430 Kuiper Space Sciences Building
Office Telephone: 301-305-3818
E-mail: hamilton@lpl.arizona.edu

Office Hours: Dr. Hamilton will be available for questions and discussion after lectures on Tuesdays (3:15–4:15 P.M.). If you require additional assistance, please contact me to schedule an appointment.

Course Website: Lectures, homework assignments and general information on the course will be available online on a class website on D2L.

Course Objectives and Expected Learning Outcomes

It is expected that students will read one chapter a week from the course textbook as well as one additional reading element, which may include a book chapter, peer-reviewed scientific article or other reading assignment. This information will then be synthesized into a Term Project. Students are also expected to attend lectures and complete homework assignments. Together these activities are intended to provide students with improved fundamental understanding of geological and geophysical processes and develop skills related to critical thinking.

Absence and Class Participation Policy

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: <http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop>

The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, <http://policy.arizona.edu/human-resources/religious-accommodation-policy>.

Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: <https://deanofstudents.arizona.edu/absences>

Participating in the course and attending lectures and other course events are vital to the learning process. As such, attendance is required at all lectures and discussion section meetings. Students who miss class due to illness or emergency are required to bring documentation from their health-care provider or other relevant, professional third parties. Failure to submit third-party documentation will result in unexcused absences.

Assignments are due at the beginning of class on the due date (or before). If an assignment is due, you are responsible for turning it in, even if you are absent from class. Late work will generally not be accepted. However, if it is accepted, a penalty of 25% will be applied to the assignment's score for each day that the assignment is late (i.e., if your score on the homework assignment would have been 85%, but it was handed in a day late, you will receive a score of 60%). For exams, if you have reason to believe you will be absent from class please let the instructor know in advance.

Course Communications

Communications will be made in class and through D2L. Therefore, please verify that your D2L email address is valid.

Required Texts or Readings

The following textbook is required and is available through the University of Arizona bookstore:

Melosh, H. J. (2011) "Planetary Surface Processes", Cambridge University Press, New York, 500 pp.

Required or Special Materials

Students are expected to have access to Microsoft Word and Excel (or equivalent) to complete homework assignments.

Assignments and Examinations: Schedule/Due Dates

We will endeavor to follow this class schedule as closely as possible throughout the term:

Week 1 Course Overview and Introduction to the Solar System

Reading: "Planetary Surface Processes", Chapter 1: The Grand Tour

Homework 1 Issued: Scientific Writing, Due Thursday, January 18

Tuesday, January 16: Syllabus review and introduction to the Term Project

Thursday, January 18 Solar System overview (Homework 1 Due)

- Week 2** ***The Fundamental Properties of Geologic Materials***
Reading: “Planetary Surface Processes”, Chapter 3: Strength vs. Gravity
- Tuesday, January 23: Stress, Strain, and Structure (Paper 1 Summary Due)
Thursday, January 25: Flow, Flexure, and Failure
- Week 3** ***Tectonic Processes***
Reading: “Planetary Surface Processes”, Chapter 4: Tectonics
- Tuesday, January 30: Faults and Folds (Paper 2 Summary Due)
Thursday, February 1: Plate Tectonics vs. Other Forms of Tectonics
- Week 4** ***Magmatic Processes***
Reading: “Planetary Surface Processes”, Chapter 5: Volcanism
Homework 2, Quantitative Exercise 1, Due on Thursday, February 15
- Tuesday, February 6: Melt, Mush, and Magma (Paper 3 Summary Due)
Thursday, February 8: Magmatic Intrusions and Conduit Ascent Processes
- Week 5** ***Volcanic Processes***
Reading Selections will be posted on D2L
- Tuesday, February 13: Explosive Eruptions (Paper 4 Summary Due)
Thursday, February 15: Effusive Eruption
- Week 6** ***Impact Cratering Processes***
Reading: “Planetary Surface Processes”, Chapter 6: Impact Cratering
Homework 3 Issued: Quantitative Exercise 2, Due Thursday, March 1
- Tuesday, February 20: Impact Cratering Mechanics (Paper 5 Summary Due)
Thursday, February 22: The Impact Cratering Record
- Week 7** ***Weathering and Erosion Processes***
Reading: “Planetary Surface Processes”, Chapter 17: Regoliths, Weathering, and Surface Texture
- Tuesday, February 27: Weathering: A Chemical Process (Paper 6 Summary Due)
Thursday, March 1: Erosion: A Physical Process (Homework 2 Due)
- Week 8** ***Spring Break***
No Reading Assignments or Lectures on March 6 and 8
- Week 9** ***Hydrological, Oceanic, and Atmospheric Processes***
Reading: “Planetary Surface Processes”, Chapter 10: Water
Homework 3 Issued: Quantitative Exercise 2, Due Thursday, April 5
- Tuesday, March 13: Hydrology (Paper 7 Summary Due)
Thursday, March 15: Oceans and Atmospheres

Week 10 *Lunar and Planetary Science Conference (LPSC)*

Reading Assignments Based on LPSC Program.

Tuesday, March 20: Planetarium Show. (Paper 8 Summary Due)

Thursday, March 22: Planetarium Show.

Week 11 *Aeolian Processes*

Reading: "Planetary Surface Processes", Chapter 9: Wind

Reading: "Planetary Surface Processes", Chapter 11: Ice

Tuesday, March 27: Aeolian Processes (Presented by Dr. Stephen Scheidt)

Thursday, March 29: Planetary Ices (Presented by Dr. Mike Sori)

Week 12 *Review and Mid-Term*

Tuesday, April 3: Mid-Term Review (Paper 9 Summary Due)

Thursday, April 5: Mid-Term (Homework 3 Due)

Week 13 *Concepts in Machine Learning Techniques*

Reading Selections will be Posted on D2L

Tuesday, April 10: Concepts in Machine Learning I (Paper 10 Summary Due)

Thursday, April 12: Concepts in Machine Learning II

Week 14 *The Inner Solar System*

Reading Selections will be Posted on D2L

First Draft of the Term Paper Due on Tuesday, April 17, and corrections will returned on April 24.

Tuesday, April 17: Inner Solar System I (First Term Paper Draft Due)

Thursday, April 19: Inner Solar System II

Week 15 *The Outer Solar System*

Reading Selections will be Posted on D2L

Homework 4, Quantitative Exercise 3, Due on Thursday, April 21

Tuesday, April 24: Outer Solar System I (First Term Paper Draft Returned)

Thursday, April 26: Outer Solar System II

Week 16 *Term Project Presentations*

No Reading Assignments

Tuesday, May 1: Term Project Presentations I

Thursday, May 3: Term Project Presentations II

Final Examination or Project

There will be no Final Examination. However, there will be an extensive (semester-long) Term Project that will involve reading one additional book chapter or peer-reviewed article per week and submitting a one paragraph summary of what the paper was about, what you found most interesting,

and specifying an additional paper that was referenced in the text that you will read next. This process will be repeated every week for approximately ten weeks, with reports due on Tuesdays. The final project will be a synthesis of each of these reports and the themes that were explored. The final report will be four pages long, plus references. Examples and additional expectations for the Term Project will be posted on D2L. The first draft report is due on Tuesday, January 23, and every Tuesday thereafter (unless otherwise noted). The final draft will be due on or before May 1. There will also be an accompanying five-minute in-class presentations held on May 1 and 3.

Grading Scale and Policies

Homework Assignments: 30%

Term Project 30%

Term Project Oral Presentation 10%

In-Class Exam: 30%

Grades will be assigned as follows: A $\geq 90\%$

B $\geq 75 < 90\%$

C $\geq 60 < 75\%$

D $\geq 50 < 60\%$

E $< 50\%$

Final grades will not be scaled; however, students may receive up to a 5% bonus toward the final grade based on their in-class attendance and participation.

Requests for Incomplete (I) or Withdrawal (W)

Requests for I or W changes must be made in accordance with University policies, which are available at <http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete> and <http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal> respectively.

Honors Credit

Students wishing to contract this course for Honors Credit should email me to set up an appointment to discuss the terms of the contract. Information on Honors Contracts can be found at <https://www.honors.arizona.edu/honors-contracts>.

Scheduled Topics/Activities

See “Assignments and Examinations: Schedule/Due Dates”.

Classroom Behavior Policy

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

Students are asked to refrain from disruptive conversations with people sitting around them during lecture. Students observed engaging in disruptive activity will be asked to cease this behavior. Those who continue to disrupt the class will be asked to leave lecture or discussion and may be reported to the Dean of Students.

Attendance is required from all students at all lectures, and while in class, students are expected to conduct themselves in a considerate manner. Late arrivals and early departures are disruptive and not permitted. Students must disable cell phones for the duration of the class and refrain from answering calls (please take any emergency calls outside and explain them later). Students that persistently disrupt the class may be removed through the administrative drop procedure. Video recording in the

classroom is not permitted without prior approval. No food or drink (except water) is permitted in this room and please clear up your seating area after use.

Threatening Behavior Policy

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See <http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>.

Accessibility and Accommodations

At the University of Arizona we strive to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, you are welcome to let me know so that we can discuss options. You are also encouraged to contact Disability Resources (520-621-3268; ; <http://drc.arizona.edu>) to explore reasonable accommodation.

Code of Academic Integrity

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: <http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity>.

The University Libraries have some excellent tips for avoiding plagiarism, available at <http://new.library.arizona.edu/research/citing/plagiarism>.

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

The instructor reserves the right to utilize electronic means to help prevent plagiarism. Students agree that by taking this course, all assignments are subject to submission for textual similarity review to turnitin.com. Assignments submitted to turnitin.com will be included as source documents into turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents.

UA Nondiscrimination and Anti-harassment Policy

The University is committed to creating and maintaining an environment free of discrimination; see <http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>

Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Additional Resources for Students

UA Academic policies and procedures are available at <http://catalog.arizona.edu/policies>
Student Assistance and Advocacy information is available at <http://deanofstudents.arizona.edu/student-assistance/students/student-assistance>

Confidentiality of Student Records

<http://www.registrar.arizona.edu/personal-information/family-educational-rights-and-privacy-act-1974-ferpa?topic=ferpa>

Subject to Change Statement

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.