

ASTR/GEOL 5800: PLANETARY SURFACES & INTERIORS

University of Colorado Boulder / Fall 2019
Tu/Th 12:30–1:45, Duane E126

Prof: Paul Hayne

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Office Hours: Tu/Th 2:00-3:00 PM, or by appointment.

Welcome to ASTR/GEOL 5800 – Planetary Surfaces & Interiors! This is a graduate-level course covering the processes operating on the surfaces and within the interiors of solid planets and moons. We will learn to apply physics, geology, and remote sensing techniques to understand how these processes lead to features observed on solar system bodies (and potentially on exoplanets). Connections will be made to similar geologic processes on Earth, especially to emphasize the relationships between surface features and planetary interiors.

Course Objective: Develop physical intuition and proficiency using models and remote sensing techniques to understand processes forming and modifying planetary surfaces and interiors.

Course Page: <https://canvas.colorado.edu>

→ Please use the course page to access lecture content, homework, and grades.

Format: The course consists of two 75-minute meetings per week. We will typically have a 45-minute lecture, followed by an example problem, then discussion and/or Q&A.

Reading: Our primary textbook is *Planetary Surface Processes*, by H. J. Melosh. Purchase new, used or electronically. Supplementary reading from the scientific literature may also be assigned. The *Melosh* text often omits derivations, and implicitly assumes knowledge of planetary science and geophysics; therefore, the following texts may also be useful supplements:

- *Planetary Sciences*, by I. de Pater & J. J. Lissauer
- *Geodynamics*, by D. Turcotte & G. Schubert
- *Physics of the Earth*, by F. D. Stacey

These books are available in the CU library, or on Amazon.

Grading Policy: Homework (40%), Midterm Exam (20%), Final Project (30%), Participation (10%). Homework is typically assigned each Tuesday, due the following Tuesday in class. Late homework will be penalized 20% per day.

Important Dates:

Midterm Exam Oct 22, 2019 / in class
Final Project due Dec 3, 2019 / in class
Final Project presentations Dec 5, 2019 / in class

Homework: Homework assignments provide an opportunity for you to reflect on the concepts discussed in lecture, and verify that you can apply them on your own. There will be nominally 9 homework assignments, typically due on Tuesdays at the start of class. Late homework will be penalized 20% per day, until solutions are posted. While you are encouraged to work together on HW, you must

submit your own work.

Midterm Exam: The midterm will consist of problems and short answer questions based on the homework, lecture material, and the assigned readings.

Final Project: Each student will investigate a problem of their choosing relevant to planetary surface or interior processes, and present their results. Further details will be given later in the semester.

Attendance: Regular attendance and active participation is essential and expected. Participation grades will be based classroom attendance and active engagement in the course.

Course Plan

Week	Date	Topic	Reading	HW assigned	HW due
1	8/27	Introduction / Solar System Tour	Ch1	#1	
	8/29	Solar System Formation	Handout		
2	9/3	Planetary Shapes	Ch2	#2	#1
	9/5	Gravity and Topography I	Ch2		
3	9/10	Gravity and Topography II	Handout	#3	#2
	9/12	Heat Transfer	Ch4.3		
4	9/17	Interior Convection	Handout		
	9/19	[No class - DPS/EPSC]	-		
5	9/24	Volcanism I	Ch5	#4	#3
	9/26	Volcanism II	Ch5		
6	10/1	Stress and Strain	Ch3	#5	#4
	10/3	Tectonics	Ch4.1-4.2		
7	10/8	[Planetary field course]	Ch4.4-4.7		
	10/10	[Planetary field course]	-		
8	10/15	Impacts I	Ch6	#6	#5
	10/17	Impacts II	Ch6		
9	10/22	Midterm	-		
	10/24	Age-dating	Handout	FP	
10	10/29	Regolith	Ch7	#7	#6
	10/31	Erosion	Ch8		
11	11/5	Wind	Ch9	#8	#7
	11/7	Water	Ch10		
12	11/12	Ice	Ch11	#9	#8
	11/14	Remote Sensing I	Handout		
13	11/19	Remote Sensing II	Handout		#9
	11/21	Mars or Titan	Handout		
14	11/26	[Fall Break]	-		
	11/28	[Fall Break]	-		
15	12/3	Review	-		FP
	12/5	Final Presentations	-		
16	12/10	[No class - AGU]			
	12/12	[No class - AGU]			
		FP = Final Project			

Honor Code: All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the [Honor Code](#). Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code Council (honor@colorado.edu; 303-735-2273). Students who are found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code Council as well as academic sanctions from the faculty member. Additional information regarding the academic integrity policy can be found at <https://honorcode.colorado.edu>.

Accommodations for Disabilities: Students with a [documented disability](#) should submit to me a letter from Disability Services in a timely manner. For exam accommodations provide your letter at least one week prior to the exam. Contact Disability Services at 303-492-8671 or by e-mail at dsinfo@colorado.edu. If you have a temporary medical condition or injury, see the [Temporary Medical Conditions](#) guidelines and discuss your needs with me.

Learning Environment: Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, color, culture, religion, creed, politics, veterans status, sexual orientation, gender, gender identity and gender expression, age, disability, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. For more information, see the [policies on classroom behavior](#) and the [student code](#).

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation: The University of Colorado Boulder (CU Boulder) is committed to fostering a positive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct (including sexual assault, exploitation, harassment, dating or domestic violence, and stalking), discrimination, and harassment by members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the [Office of Institutional Equity and Compliance](#) (OIEC) at 303-492-2127 or cureport@colorado.edu. Information about the OIEC, university policies, [anonymous reporting](#), and the campus resources can be found on the OIEC website. Please know that faculty and instructors have a responsibility to inform OIEC when made aware of incidents of sexual misconduct, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about options for reporting and support resources.

Religious Observances: Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. Contact me within the first two weeks of the semester to make alternate arrangements. See the [campus policy](#) regarding religious observances for full details.

As your instructor, I take all of the above very seriously, and will do my best to ensure an equitable and inclusive learning environment!

-P.H.