PTYS 595B Science and Exploration of the Moon

Kuiper Space Sciences Building, Room 312, MW 11:00 am -12:15 pm

Description of Course

This course is an in-depth look at the Moon and lunar exploration. We will cover lunar composition, geology and geophysics, and will discuss lunar evolution. Students will gain a broad introduction to the lunar literature and datasets and have a chance to spend time specifically delving into topics relevant to their research interests. We will also discuss lunar exploration, including current plans by NASA and commercial space. Assignments will include paper presentations/discussions, project interim reports, and a final team-based project to develop a mission/instrument concept that could be used to advance our understanding of the Moon.

Instructor and Contact Information

Instructor: Lynn Carter, Room Kuiper 533A, lmcarter@arizona.edu
Office Hours: Mondays 10:00-10:50 am, or by appointment
Website: d2l.arizona.edu

Course Objectives

The objective of this course is to provide students with an in-depth understanding of the evolution and geology of the Moon, current open science questions, methods of lunar science, and past and future lunar exploration.

Expected Learning Outcomes

At the end of the course, students should be able to:

- Broadly describe some of what we know about lunar evolution, composition, and surface geology.
- Demonstrate an understanding of the methods used to study the lunar surface/interior.
- Describe and discuss some of the current major science questions about the Moon.
- Describe and discuss some of the current lunar spacecraft missions as well as future planned missions.
- Use remote and laboratory-derived datasets to address science problems.
- Present and lead a discussion on peer-reviewed lunar science journal articles.
- Describe what goes into proposing a scientifically-motivated lunar spacecraft missions.

For the graduate students:

- Produce a compelling, well-described, and well-justified science justification and instrument descriptions for a lunar science mission.

Required Texts or Readings

There is no textbook for this class. The required readings will be provided in a folder on the D2L site, along with links to relevant reference books.

Assignments and Examinations: Schedule/Due Dates

Students will be required to read and present on either one (undergraduates) or two (graduate students) scientific papers. The students will sign up for an in-class time based on their interests and the class schedule.

This class centers around a final group project to design a lunar mission concept that would address some aspect of lunar science. As part of that, there will be two interim reports (or homeworks), where each student will report on their current progress and receive an individual grade. These reports will receive a 10% penalty if turned in more than a day late, and a 25% penalty if more than 2 weeks late.

Student teams will submit a Notice of Intent and Science Traceability Matrix before spring break. At the end of the class, a Final Project written proposal will be due, and the teams will present on their proposal. There will be both

group and individual grades assigned as part of this work, to be explained in detail with the project discussion in the second week of class. The group writing (Notice of Intent, Science Traceability Matrix, and Final Project written proposal) need to be submitted before the deadline, just like real NASA proposal. If there is a problem with these deadlines or an emergency, the groups should contact the instructor as soon as possible to discuss a solution/extension.

There are no exams in the class. Deadlines will be posted on D2L.

Final Examination or Project

There is not a final exam in this class. Instead the course will have a final project that will be discussed in class.

Grading Scale and Policies

The course grading scale is (%):

A	≥ 90
B	80 to 89
C	70 to 79
D	60 to 69
E	< 60

The grades for this course will be determined as follows for undergraduate and graduate students:

Grade Item	**Undergraduates % final grade**	**Graduate students % final grade**
Class participation	10	10
Paper presentation(s)	10	20
Round 1	*10*	*10*
Round 2	*N/A, only 1 required*	*10*
Project interim reports	30	20
Report 1	*15*	*10*
Report 2	*15*	*10*
Final group project:	50	50
Notice of Interest (NOI)	*5*	*5*
Draft Science Traceability Matrix	*10*	*10*
Presentation of proposal	*15*	*15*
Written proposal	*20*	*20*

In addition to the differences listed above, graduate students and undergraduate students will have different rubrics for the final group project grading.

Incomplete (I) or Withdrawal (W):

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policy, which is available at https://catalog.arizona.edu/policy/courses-credit/grading/grading-system.

Scheduled Topics/Activities

The topics covered in the class are listed below. Topics are subject to change based on guest lecture availability and student interests

Week	**Topic**
1	Introduction and history of lunar exploration
2	Lunar formation
3	Lunar interior
4	Lunar crater age dating and impact record

5	Lunar remote sensing and impact crater geology
6	Lunar basaltic volcanism
7	Lunar pyroclastics
8	Lunar volatiles and space weathering
9	Lunar polar geology
10	Regolith properties and evolution
11	Ancient lunar terrains and rocks
12	Lunar lava tubes, caves and oddities
13	Lunar magnetic field and exosphere
14	Current and future lunar exploration
15	Final project presentations
16	Final project presentations and debrief

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.

Safety on Campus and in the Classroom

For a list of emergency procedures for all types of incidents, please visit the website of the Critical Incident Response Team (CIRT): https://cirt.arizona.edu/case-emergency/overview

Also watch the video available at https://arizona.sabacloud.com/Saba/Web_spf/NA7P1PRD161/common/learningeventdetail/crtfy0000000000003560

University-wide Policies link

Links to the following UA policies are provided here, http://catalog.arizona.edu/syllabus-policies:

- Absence and Class Participation Policies
- Threatening Behavior Policy
- Accessibility and Accommodations Policy
- Code of Academic Integrity
- Nondiscrimination and Anti-Harassment Policy
- Subject to Change Statement