

PTYS 505B - Principles of Planetary Physics

This class is scheduled to be taught in the in person modality.

Class Website: d2l.arizona.edu (student login required)

Instructor

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Office hours: Please email me to arrange an in person or a remote meeting time

Class meetings: Tuesdays and Thursdays, 11AM - 12:15PM, Kuiper Space Sciences Building, Room 312

Textbook

There is no required textbook. The following textbooks are recommended:

- [An introduction to Planetary Physics, Kaula](#)
- [Solar System Dynamics, Murray and Dermott \(Errata\)](#)
- [Planetary Sciences, de Pater and Lissauer](#)
- [Lecture notes on the formation and early evolution of planetary systems, Armitage](#)

Copies of these books are on reserve at the LPL library (Kuiper Space Sciences 409) and are also available for in-library use in the UA Library's Special Collections.

Objectives and expected learning outcomes

The students will develop a broad understanding of the importance of physical processes that shape planetary systems. For example, they will acquire a quantitative understanding of the two-body problem, Kepler's laws of motion, planet formation by core accretion and gravitational instability, rotational and tidal distortions, and energy dissipation. At the end of the course, students will know how to derive Kepler's laws of motion by solving the two-body problem; understand the dynamical origin and evolution of planetary systems; and understand the physical processes that shape planetary interiors.

Topics Covered

- **Celestial mechanics:** Kepler's laws of planetary motion, equations of motion, the two-body problem, the restricted three-body problem.
- **Planet formation:** protoplanetary disks, aerodynamic drag, planetesimal formation by coagulation, planetesimal formation by gravitational instability, time scales for formation, gravitational focusing.
- **Planetary interiors:** hydrostatic equilibrium, relation between pressure-density and mass-radius, spherical harmonic representations, gravity anomalies, moments of inertia, Radau-Darwin approximation, moments of inertia, tides, tidal energy dissipation.

Class structure and approach

In this course, we will foster a dynamic and engaging learning environment that centers around active learning strategies. Class meetings will revolve around assigned readings, placing a strong emphasis on participatory learning. By actively participating in your learning process, you will not only deepen your understanding but also develop critical thinking skills that extend beyond the classroom. The classroom environment will feature a blend of traditional lectures, open discussions, and student-led presentations, accommodating diverse learning styles and fostering a dynamic atmosphere.

Expectations

- **Preparation:** Engage with the assigned materials before each class to fuel insightful discussions and activities, enhancing your overall learning experience.
- **Participation:** While formal attendance will not be recorded, your active engagement in class discussions, and hands-on exercises will significantly contribute to your learning journey. Participation will be a part of your final grade.
- **Homework:** Homework assignments are designed to reinforce the concepts covered in class. Attending classes will enhance the relevance and effectiveness of these assignments.
- **Collaboration:** Collaboration is integral to this course. Partnering with peers provides diverse perspectives, deepening collective understanding. However, please note that homework assignments should be submitted individually.

Grading

Grades will be assigned based on the following components:

- Class participation: 25%
- Homework assignments: 25%
- Three exams: 50% (16.7% each)

Due dates, late work, absences

Assignments are due in class on the specified date. Late submissions are accepted with a 10% points deduction per day. If an absence is anticipated on an assignment due date, submit the work beforehand or discuss alternative arrangements with the instructor.

Academic integrity

You are expected to know and to abide by the [University's Academic Integrity policy](#). Two primary points you need to know are these: (1) When you turn in (or present) work that uses published material (journal articles, web sites, etc.), you are expected to give the appropriate credit and cite the source(s). (2) Collaboration is encouraged on most assignments, as I strongly believe that we learn more by asking questions and explaining our answers to others' satisfaction. However, if you do work with someone, the work you turn in for grading must be written by you *in your own words*; if I get identical answers, I will divide the credit evenly.

Students with Disabilities

If you anticipate barriers related to the format or requirements of this course, please meet with me so that we can discuss ways to ensure your full participation in the course. If you determine that disability-related accommodations are necessary, please register with Disability Resources (621-3268; <http://drc.arizona.edu>) and notify me of your eligibility for reasonable accommodations. We can then plan how best to coordinate your accommodations.

Other classroom issues

We try to keep the classroom clean, and ask for your help. Please do not bring any food or drink (other than bottled water) into the classroom. If there are problems with a seat or with its writing table, please let me know, so that the problems can be addressed as soon as possible. Also, the common-sense rules of good conduct apply, such as cell phones turned off and no web-surfing or irrelevant extra-curricular activity during class.

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.

Nondiscrimination and Anti-harassment Policy

The University of Arizona is committed to creating and maintaining an environment free of discrimination. In support of this commitment, the University prohibits discrimination, including harassment and retaliation, based on a protected classification, including race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information. For more information, including how to report a concern, please see: <http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>

University Policies

All university policies related to a syllabus are available at: <https://catalog.arizona.edu/syllabus-policies>.

Subject to Change Notice

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

Graduate Student Resources

Please consider including a link to the University of Arizona's Basic Needs Resources page: <http://basicneeds.arizona.edu/index.html>