

# Physics of the Solar System

Astronomy 405/805: Spring 2018

**Class:** 2:00 PM to 3:15 PM, 115 Jorgensen Hall

**Prerequisites:** ASTR 204; MATH 107 or 107H; PHYS 142, 142H, 212 or 212H

**Textbook:** Fundamental Planetary Science, Lissauer and dePater

**Final:** Thursday May 3rd, 1 PM - 3PM

**Instructor:** Dr. Rebecca Harbison

**Office:** 244G Jorgensen Hall

**Office Hours:** MWF 2-3 PM, TTh 10-11 AM

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## Course Description

Our Solar System is our cosmic backyard, and provides the nearest examples of planets, dwarf planets, small solar system bodies of various sorts, moons, and planetary rings. Unlike many areas of astronomy, we can send our robotic messengers to study such things up close, and even return samples to Earth. In the age of exoplanets and the increased awareness of the diversity of planetary systems, our own system remains relevant.

Physics of the Solar System will introduce the physics and chemical laws that govern planets and other objects in the solar system, including their atmospheres, surfaces and interiors. We will also discuss the classes of small bodies in the solar system (asteroids, comets and Kuiper Belt Objects) as well as moons and planetary rings. Finally, we will look at how our own solar system formed and touch briefly on extrasolar planets.

## Class Expectations

### Before Class (Preparation)

Our reading schedule and topic list is included in the syllabus, and will be made available on the course website. Before each class, please review the sections listed in the textbook.

Occasionally we will spend the class discussing papers from the scientific literature. It is the students' responsibility to read the work and prepare for the discussion.

### During Class (Lecture, Discussion and Demos)

Slides will be posted to the course page before class. Lecture will clarify concepts from the reading or homework, and expand on concepts. Feel free to raise your hand and ask questions or clarification. We will also do in-class activities that often will involve discussion of scientific papers or problem-solving sessions. Please bring a pencil or pen

and a calculator. These will be graded for participation. I will provide solutions for these activities online.

Please be in your seats, ready to go at the start of class so we can start class promptly. Cell phones should be kept (on silent) in your bags to avoid distractions to yourself and the students around you. You may have a tablet or laptop for note-taking or to follow slides online. It is up to you to decide if the benefit of using a tablet or laptop is worth the potential distraction it poses.

## After Class (Homework and Study)

I will be assigning regular homework assignments to practice concepts learned in class. I encourage you to work together on homework assignments, but please turn in work in your own words.

I am available to answer questions via email or in office hours. I will answer email within 24 hours during the school week, but may be later during the weekend. You may call my office, but email is far more reliable than voice mail.

## Grading

Grades will be recorded on the course Canvas page. Please allow for a week delay for grades. The grading breaks down as follows:

10% In-class work  
30% Homework  
30% Midterm  
30% Final Exam  
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100 %

- **In-Class Activities:** We will regularly work problems, or discuss scientific papers (read outside of class) that will be graded for participation. These will serve as an attendance policy and cannot be made up. Excused absences for illness, family emergencies and university activities will have in-class activities waived.
- **Homework:** Homework will be due regularly (at least every two weeks). You will have at least a week to work on it. Late work is accepted for half credit. Homework will typically involve working problems similar to ones discussed in class, but may also involve reading and answering short answer questions. Students can turn in problem sets at the start of class, but I prefer students turn in written homework to the course Canvas page. Turn-in instructions will be included when assignments are given.
- **Midterms:** We will have one midterm. Questions will be similar to homework and in-class questions, and will focus on quantitative problem solving and the occasional qualitative short answer. It will take the full class period that day. You may use a calculator on the exam, and a formula sheet will be provided.

- **Final Exam:** The final exam will be similar in format to the midterm and will act as a second midterm.

## Testing

We will have one midterm and a final exam. If you can't make one of the midterms, due to illness, family emergency, or university activity, please contact me for a make-up. You must contact me by one week after the scheduled exam date, earlier (including before the exam) is always better.

Exam problems will be similar to homework or in-class activity problems in structure and difficulty. Exam problems are graded by the following rubric. Note this evaluates work shown. Answers with no work shown will be graded on an all-or-nothing approach.

5 pts: The solution is correct, including proper notation, units, etc.

4 pts: The solution uses improper units, notation or an arithmetic error is made, but the physics is fundamentally sound.

3 pts: The solution uses the right method and has a final answer but the problem has one minor mistake in solving.

2 pts: The solution uses the right method and has a final answer, but has multiple minor mistakes, or one major mistake; i.e., missing or a wrong key conceptual part or step, using a similar but wrong equation, etc.

1 pt: The solution starts with the right method but is not finished, or has multiple major mistakes.

0 pt No attempt is made, or a very limited attempt is made with an incorrect method.

Qualitative questions will be also graded for partial credit.

During an exam, you may have only a pencil or pen, the exam, and a calculator (you may use any calculator, but NOT a cell phone or tablet's app). I will provide an equation sheet; it will be available beforehand for preparation.

## Academic Honesty

It is very important that you do your own work on homework to create an accurate picture of your performance in class, and to reinforce concepts learned in class so that you may recall and apply them on exam. You may (and should) discuss material in the class with your peers or me, but please submit answers on your own. Please use your own words when asked to write things.

For details about UNL's policies on Academic Honesty, including what qualifies as Academic Dishonesty, please see the Student Code of Conduct, Article III.B.1 at <http://stuafs.unl.edu/dos/code>.

## Resources

**Textbook:** We will be using Fundamental Planetary Science, Lissauer and dePater. Please read the sections we will be covering before class. Other readings will be posted on the course website.

## **Students with Disabilities**

<http://www.unl.edu/ssd/>

Students with disabilities are encouraged to contact me (directly or through the SSD office as an intermediary) for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University of Nebraska-Lincoln to provide individualized accommodations to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Services for Students with Disabilities (SSD) office, 232 Canfield Administration, 472-3787 voice or TTY.