

# ASTR630: Planetary Science, Fall 2014



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**Office:** PSC 1153  
**Office Hours:** Drop by Anytime!

**Textbook:** Planetary Sciences by I. de Pater and J.J. Lissauer

**Webpage:** <http://www.astro.umd.edu/~hamilton/ASTR630>

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This course will survey our Solar System with an emphasis on physical processes that help us understand its origin and connection to other planetary systems. According to the authors of our award-winning textbook "Planetary Sciences," the amount of material in the book "is difficult to cover in a one-year graduate-level course", so we will choose topics selectively to fit into one semester. Topics to be covered in the first two months of the course include orbital dynamics, the physics of planetary atmospheres, and radiative transfer (chapters 1-4). We will emphasize techniques of problem solving and will focus a number of topics including the three-body problem, orbital resonances, hydrostatic equilibrium, equations of state, thermal structure of an atmosphere, and winds.

During the final month of the course we will discuss three additional chapters from the textbook: Meteorites (Ch. 8), Comets (Ch. 10), and Planetary Rings (Ch. 11). Since we will be covering a lot of material in a short amount of time, you will get the most out of class lectures if you read and think critically about the relevant book chapters before we go over them in class. All material from chapters 1-4,8,10, and 11 is fair game for tests.

We will have two in-class midterms, a final exam, and five homework assignments, largely but not exclusively drawn from the text. There will also be a class research project, with abstracts due in the middle of the semester and an oral presentation at the end of the semester. The presentations will be made at the TERPS 2014 Conference, to which the entire department is invited. Giving a talk to a friendly local audience is the best way for you to prepare to give a talk on your own scientific research at a professional meeting.

## Grading Policy:

The grading for the class will be according to the following table.

Assignment	ASTR630
Homework	250
Midterm #1	75
Midterm #2	75
Final	200
Research Project	150
Total	750

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# ASTR630 LECTURE SCHEDULE

Lecture Date	Lecture Topic	Reading
Tue. Sep. 2	Introduction to Planetary Science	Read Chap. 1
Thu. Sep. 4	Central Forces	Read Chap. 2
Tue. Sep. 9	Orbital Elements	
Thu. Sep. 11	The 2- and 3-Body Problems	
Tue. Sep. 16	Circular Restricted 3-Body Problem	
Thu. Sep. 18	Precession and Tides	HW #1 due
Tue. Sep. 23	Tides and Resonances	
Thu. Sep. 25	Non-Gravitational Forces	
Tue. Sep. 30	Solar Heating	Read Chap. 3
Thu. Oct. 2	Planetary Atmospheres	Read Chap. 4 HW #2 due
Tue. Oct. 7	Planetary Atmospheres	
Thu. Oct. 9	Adiabatic Lapse Rate	TERPS Abstracts due
Tue. Oct. 14	Atmospheric Structure	
Thu. Oct. 16	<b>MIDTERM</b>	
Tue. Oct. 21	Spectroscopy	
Thu. Oct. 23	Cloud Formation & Hadley Cells	
Tue. Oct. 28	Hurricanes & Lightening	
Thu. Oct. 30	Meteorites: Finds, Falls, and Sources	Read Chap. 8 HW #3 due
Tue. Nov. 4	Meteorites: Radioactive Decay	
Thu. Nov. 6	Meteorites: Radioactive Decay	
Tue. Nov. 11	<b>NO CLASS TODAY</b>	Classtime made up with extra long Dec. 11!
Thu. Nov. 13	<b>MIDTERM</b>	
Tue. Nov. 18	Comets: Dynamics	Read Chap. 10
Thu. Nov. 20	Comets: Composition	HW #4 due
Tue. Nov. 25	Comets: Nucleus	
Thu. Nov. 27	<b>THANKSGIVING</b>	
Tue. Dec. 2	Planetary Rings: Dynamics	Read Chap. 11
Thu. Dec. 4	Planetary Rings: Observations	HW #5 due
Tue. Dec. 9	Planetary Rings: Interactions with Moons	

Thu. Dec. 11	TERPS Conference	Open to the Department
Thu. Dec. 18	FINAL EXAM (10:30am-12:30pm)	

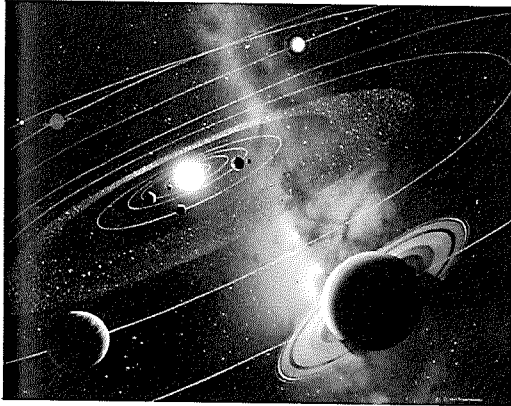
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# ASTR630 Assignments

**Homework: Read and reread these Problem Solving Hints!**



ASSIGNMENT	Due Date	Format
HW#1	Sep. 18	<a href="#">HTML</a>
HW#2	Oct. 2	<a href="#">HTML</a>
HW#3	Oct. 30	<a href="#">HTML</a>
HW#4	Nov. 20	<a href="#">HTML</a>
HW#5	Dec. 4	<a href="#">HTML</a>

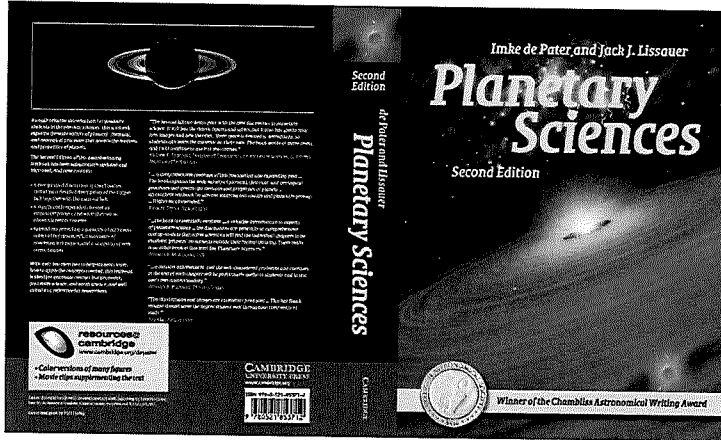
## TERPS 2014 Class Project

You are all invited (required!) to attend The Exciting Results in Planetary Science (TERPS) Conference to be held Dec. 11 in the Astronomy Department at the University of Maryland, College Park. The Abstract Deadline is Thursday, October 9 by 11:59pm EDT. The conference will be attended by top scientists from around the department (professors, researchers, graduate students) and you will be presenting invited 10-minute oral presentations on your recent research results. Start thinking about a Planetary topic that you would like to investigate further and report on to your peers! Your main resource should be a solid *Icarus* paper on your topic (*Icarus* is the most prestigious scientific journal in Planetary Sciences), and you should consult additional papers and the text for backup material. In addition, you will be doing a mini-research project of your own by re-deriving some of your chosen paper's results and then pushing them further. For example, you might replot some figures, derive some equations, run some simulations, or analyze some observational data. You can search for scientific research papers by subject or author with the ADS Astronomy and Astrophysics Abstract Service. Limit your search to *Icarus* papers by typing "Icar." in the box under "**Select References From:**". Your abstract should consist of the reference for your source paper, and a 1-page summary of both its content and how you intend to extend its results. This summary should differ from a standard abstract by providing more context. Describe in your own words the problem that the authors solve, why it is important, and how you will extend it.

Your presentation will be strictly limited to 7 minutes with 3 minutes for questions, so prepare accordingly. Typically you will have time to show 5-6 slides. Pitch your talk to the level others in the class who have not read your paper. Cole Miller's Ten Commandments of Oral Presentations and Further Hints on Giving Talks provide excellent advice! Conference munchies will be provided!

Besides the abstract due in October, a PDF copy of your talk and a ~2 page description of your

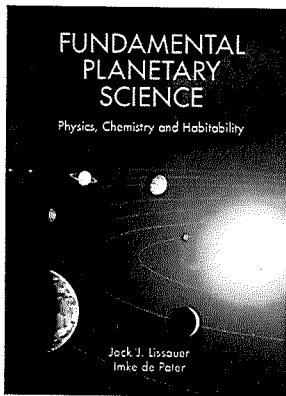
# ASTR630 Textbooks



## Required:

Planetary Sciences (I. de Pater and J.J. Lissauer), 2nd Edition (2010, ISBN-13: 9780521853712), \$80.

A thorough quantitative treatment of the physics of the planets. A good choice if you want to go into more detail in a given area. Errata for the 2010 and 2011 printings.



## Recommended:

Fundamental Planetary Science: Physics, Chemistry, and Habitability (J.J. Lissauer and I. dePater), 1st Edition (2013, ISBN 978-0-521-61855-7), about \$50.

An excellent introduction to the physics of the planets. Covers the same material as the required text at a more accessible level.

## Good General Solar System Information:

- [The Nine Planets.](#)
- [Welcome to the Planets.](#)
- [NASA Photo Gallery.](#)



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