

Astronomy 3: The Solar System Fall 2006, TTh 1:30-3

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Books:

- Bennett *et al.* **The Cosmic Perspective: the Solar System**, 4th edition, Addison Wesley 2006. Our textbook.
- Ward & Brownlee, **Rare Earth**, New York: Springer Verlag, 2000. A popular-level book with strong views on how common advanced life is in the Universe.

Homework assignments, notes, old exams, review materials, useful links, and other information will be posted on the Blackboard site for this course. Images shown in lecture will be available at <http://www.physics.upenn.edu/~garyb/Astro3/>.

Course Goals:

First, this is a science course, so we will try to understand the scientific method for answering questions and understanding the Universe, with its emphasis on testing and experimentation. We will try not simply to memorize words and facts, but instead to understand *why* you should believe astronomical theories — you are encouraged to ask questions during lecture if there is anything that is not clear. You should be able to recognize valid scientific arguments and be comfortable making quantitative estimates. I hope you will gain an appreciation of how the laws of physics learned here on Earth have helped us understand the entire Universe.

The subject of this course is the structure and formation of the Earth, the Sun, and the contents of the Solar System. In just the past ten years we are also able to study planetary systems around stars beyond our Sun. One main goal will be to decide which qualities of our Solar System, Earth, and life on Earth are likely to be common through the Universe, and which qualities arise from unusual coincidences or accidents and will be rare or unique to Earth.

The first weeks will be devoted to understanding those astronomical phenomena visible to the naked eye, such as eclipses and the phases of the Moon. We will next study the motion of the planets around the Sun, and Newton's laws, which explain the motion. We will also see what energy is, and how the Sun produces energy. We will study the planets, their moons and rings, and the asteroids, comets, and Kuiper Belt objects, emphasizing their formation and evolution. Finally we will examine planetary systems around other stars, and consider the rarity or abundance of Earth-like planets and life.

Course Requirements:

- 1) There will be 2 **midterms**, each one hour long (see schedule below), each counting for **20%** of the course grade. No makeup midterms or finals will be given except in cases of dire illness, or of severe schedule conflicts brought to my attention at least a week in advance. The exams will be *open book*, to help you focus on *ideas*

instead of memorization. Questions are a mix of multiple-choice, short answer, and short essays.

- 2) There will be a **final exam**, 1.5 hours long, which counts for **25%** of your course grade. The final will cover the whole semester, with emphasis on the last third of the course.
- 3) **Homework** will comprise **25%** of your grade. This will include one lab requiring an evening visit to the observatory atop DRL.
- 4) **In-class questions** will comprise **10%** of your grade. You will be a member of a group of 3-4 students who will work together to come up with an answer to a question I pose in class. Most lectures will include one such question.

Course Schedule:

The schedule of material covered may be adjusted, but exam dates will not change.

Week:	Topics:	Textbook Chapters:
September 7	Introduction; the Big Picture	1; 2.1
September 11	Naked-Eye Astronomy	2; 3.1-3.2; S1.1, S1.3
September 18	Motion of the Planets	3
September 25	Energy, Gravity, and Light	4, 5
October 2	The Sun	14
October 5: First Midterm Exam		
October 9	Formation of Planetary Systems	7, 8
October 16	Formation (cont'd)	
October 23 (Fall Break 10/24)	Rocky Planets: Interiors & Geology	9
October 30	Rocky Planets: Atmospheres	10
November 6	Gas Giants	11.1
November 9: Second Midterm Exam		
November 13	Rings & Moons	11.2-11.3
November 20 (Thanksgiving 11/23)	Minor Planets	12
November 27	Extrasolar planets	13
December 4	Life on Earth & elsewhere	24
(time permitting:)	Telescopes	6
Final Exam: December 13, 9 AM		