

Exploration of the Solar System – ASTR 202

Spring Semester 2008

3 Credits

<http://www.owl.net.rice.edu/~astr202/>

Version: Jan/8/2008

Course Instructor: Dr. Uwe Oberlack, Assistant Professor, Dept. of Physics & Astronomy
Herman Brown Hall 320 (office) or Space Science Bldg 002 (laboratory)
Tel: x3640
email: astr202 <at> rice <dot> edu

TA's: TBA

Lectures: Monday/Wednesday/Friday 10:00 am – 10:50 am
Room 227, Herman Brown Hall
Start: January 7, 2008

Office Hours: 1 hour after each class, or by email appointment.
Don't be shy to come and ask questions!

Course Description:

This is an introductory course to astronomy for students in academic programs and fulfills Group III distribution requirements. ASTR 202 covers such fundamentals in astronomy as distances, coordinates, and timekeeping, as well as basic physical principles required for the understanding of astrophysical phenomena, e.g., energy, gravitation, and the physics of light. The focus of this course will be on the solar system and its origin, as we understand it today. This course is not part of the requirements for students majoring in Astronomy/Astrophysics, as they take the more in-depth courses ASTR-350/360. (A complementary course, ASTR 201, concentrates on the structure and evolution of stars and galaxies, and on the structure, origin, and fate of the universe.)

Prerequisites:

High school algebra and physics are sufficient. This course will not use calculus. However, homework and test problems will involve equations and calculations.

Required Textbooks/Media:

The Cosmic Perspective, 4th edition, Media Update, by Bennett, Donahue, Schneider, and Voit (ISBN 0805366474). Depending on your interest, and whether you plan to also take ASTR-202 in this or the next semester, you have a choice of buying the complete edition, which covers both this course and ASTR 201 (providing a rather complete introduction to astronomy), or the reduced version, *The Cosmic Perspective: The Solar System* (Fourth edition, 4/E, Media Update; ISBN: 0321499700), which covers all topics of this course. Each new copy comes with a personal access kit for the “Mastering Astronomy” website and the SkyGazer CD. If you purchased a used copy of the book, you can buy access to the website online at <http://masteringastronomy.com>

Older editions: these 2007 editions are practically identical to the 2006 Fourth Edition, 4/E editions, ISBNs 0805392696 and 0805392955, respectively, that you should be able to find used. There are no changes to the textbook itself, just modest updates to the accompanying media. Editions older than 4/E are significantly different.

Assessment:

Your grade will be based on:

Homework problem sets:	Average counts 40%
3 in-class exams:	Average counts 50%
Web project or Observing Project:	10%

Homework problems will be due typically 1 week after being assigned. You may discuss general concepts with fellow students and you are encouraged to do so. However, *the specific homeworks have to be done individually*, and the honor code applies. You can always ask questions to your professor or the TA's. Always study the relevant sections in the textbook and it is recommended that you use the tutorials on the textbook website to deepen your understanding.

Exams will be closed book, closed notes, (non-programmed) calculator allowed.

Web project: Students submit a report on a recent (from this year) news article pertaining to some discovery or event in astronomy, related to this course. The report will be submitted to the professor by email in the form of a "pdf" or "doc" file. Therefore, start watching out for relevant news, and check with your professor whether the article you have in mind is suitable. (See "Guidelines for the Web Project" posted on the course webpage.)

Observing Project: It will consist of performing a few observations of solar system objects, assisted by the instructor and/or TA's, mainly using the Rice Campus Observatory. More information will be posted on the class website. Check regularly.

Class participation: Due to the typically considerable size of this course, I will not attempt to grade class participation. Nevertheless, please do *participate actively* in class. It will help you (and others) learn better, and it also makes for a more lively and enjoyable class experience.

Grades:

You can get the grade you want without having much of a scientific background yet. You will find, however, that you have to put in a good amount of work regularly to achieve good grades. Always study the book before lectures, and make use of the helpful tutorials and other materials available on the textbook website! Come see me for questions or any concerns during my office hours, or send email to meet me at other times. I share my time between the office and the lab. During office hours, you will usually find me in the office, but else you may also try my lab (addresses on top). Be warned that you will fail the course if you end up with less than 50% of the score. For students taking the class pass/fail, please be advised to leave a large safety margin before entering the last exam.

Due Dates:

Striktly enforced! Requests for extensions must be cleared with the professor (by email) *before* the due date, and you need valid reasons for them to be accepted. If you have concerns regarding the grading of homeworks, exams, or any other course work, bring them to the attention of your professor *within one week* after the corresponding work was returned. Later claims will not be considered. Should important circumstances prevent you from participating in an exam, contact your professor by email *well in advance* of the exam.

Websites:

You can access the course website through <http://www.owl.net.rice.edu/~astr202/>

(We will actually use Owl-Space, but this page will provide a link to the syllabus and Owl-Space.)

The textbook website <http://masteringastronomy.com/> contains tutorials, study guides, exercises, etc.

Emails:

Please send email to `astr202<at>rice<dot>edu`. (Replace <at> by @, <dot> by .)

This email alias will make sure that your email gets proper attention.

Special Needs:

Any student with a documented disability needing academic adjustments or accommodations is requested to speak with the professor during the first two weeks of class. All discussions will be confidential. Students with disabilities should also contact Disability Support Services in the Ley Student Center.

The Solar System - ASTR 202 - Outline

A schedule will be posted and updated throughout the semester on the course website.

1. Course overview, Our Place in the Universe (ch.1)
2. Discovering the Universe, Celestial Timekeeping (ch.2, S1)
3. The Science of Astronomy, The Copernican Revolution. (ch.3)
4. Motion, Energy, and Gravity (ch.4)
5. Light and Matter (ch.5)
6. Telescopes (ch.6)
7. Our Planetary System
 - a. Comparative planetology
 - b. Layout of the Solar system
 - c. Two types of planets
 - d. Asteroids and comets
8. Formation of the Solar System
 - a. The Nebular Theory
 - b. Two types of planets
 - c. Condensation, frost line
 - d. Accretion
 - e. Gas capture
 - f. Clearing of the nebula
 - g. The age of the Solar System. Radiometric dating
9. Planetary Geology
 - a. Planetary surfaces
 - b. The interior of terrestrial planets
 - c. Internal heat and heat transfer
 - d. Magnetic fields
 - e. Basic geological processes (Impact cratering, Volcanism, Tectonic, Erosion)
 - f. Comparison: Moon, Mercury, Mars, Venus, Earth
10. Planetary Atmospheres
 - a. Gaining and losing an atmosphere
 - b. Mercury and the Moon
 - c. Climate history of Mars
 - d. Climate history of Venus
 - e. Earth's unique atmosphere.
 - f. The balance of Nature.
 - g. Carbon dioxide cycle.
 - h. Earth's thermostat.
 - i. Long-term climate changes and stability. Global warming
11. The Sun
 - a. Hydrostatic equilibrium
 - b. The structure of the Sun
 - c. Nuclear fusion and the p-p chain
 - d. Solar thermostat
 - e. How the Sun radiates energy
 - f. The solar spectrum
 - g. Magnetic field and Sunspots
 - h. Solar wind, flares, Coronal Mass Ejections (CME)
 - i. How the Sun affects the Earth
12. Jovian Planets
 - a. General properties. Differences to terrestrial planets.

- b. Internal Heat.
 - c. Comparison of Jovian Atmospheres.
 - d. Climate, weather
 - e. Magnetospheres and aurorae
 - f. Jovian moons, large and small. Io, Europa, Titan
 - g. Ring systems
13. Asteroids & Comets
- a. Small bodies in the solar system.
 - b. Asteroid belt, and orbital resonances.
 - c. Asteroids: size, shape, mass, density, composition.
 - d. Meteorites: primitive, processed
 - e. Comet: populations, structure and interaction with the Sun
 - f. Pluto and Charon
 - g. Pluto and Kuiper Belt objects
 - h. Cosmic collisions.
 - i. Meteors and meteor showers
 - j. Impacts on Earth
14. Life on Earth