Astronomy 121 – Course Information

The Solar System CRN 38468 March 28, 2005

This first term of introductory astronomy covers the early history of astronomy, the origin of the solar system, and what is known about the Sun, Earth, Moon, and other planets. This course requires minimal mathematics – some arithmetic and a little algebra.

Classes: Mondays, Wednesdays and Fridays 09:00 to 09:50 in Room 182 Lillis.

Instructor: Roger Haydock (haydock@darkwing), 172 Willamette Hall, 346-5221. Office hours – Tuesdays and Thursdays 08:00 to 09:00 or by appointment.

Assistants: Adam Clausen (aclausen@darkwing), office hours – Mondays and Wednesdays 13:00 to 14:00, Room 443, Willamette Hall, 346-1058; and Josh Turner (jturner5@darkwing), office hours – Tuesdays and Thursdays 11:00 to 12:00, Room 155A, Willamette Hall, 346-5240.


Alternative: Instead of buying the text, students may choose to attend all classes and take thorough notes. Review and Discussion questions and Problems will be posted at the above website. Approval from the instructor is required for this option.

Homework: Prepare for each class by reading the assigned material in the text and answering the appropriate questions from the self-tests. After class reread the material and write out the answers to the questions on that material in Review and Discussion. Try a few of the relevant Problems. Be sure to use complete sentences as well as diagrams and formulas in answering the questions and problems. You should be spending about 6 hours per week, outside of class, studying the text, answering questions, and solving problems.

Midterms: Friday, April 15, and Friday, May 6, there will be midterms in class. Each midterm will consist of ten questions similar to Review and Discussion questions or the simpler Problems. The purpose of the midterms is to tell you how you are progressing with the course. Only your midterms which are better than your final examination will be averaged into your final grade.

Final Exam: Monday, 6 June, at 16:15 in Room 182 Lillis is Required for a pass or a grade. This examination will consist of twenty questions similar to Review and Discussion questions or the simpler Problems.

Project: Because this is a four credit course meeting three hours per week, each student is required to plan, conduct and report on a quantitative test of an astronomical principle covered by the course. Examples of the kind of observations appropriate for this project, are measurement of positions at various times for the sun, moon, satellites, or planets. Other kinds of observations are possible, but should be discussed in advance with the Instructor. Examples of principles appropriate for testing in these projects are rotational or orbital periods of the Earth, Moon, other planets, satellites, and so forth. Again, other ideas are encouraged but should be discussed in advance with the Instructor. Data obtained other than by direct observation, for example data downloaded from the internet, is not acceptable.

The grade for each project will be based on a written report, due at the final exam, of not more than 1,000 words, but which may contain sketches, graphs, photographs, equations, and so forth. Reports should be written so as to be understandable to other

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members of the class and should include an introduction to the principle being tested, a
description of how the observations were made, the data obtained, and a discussion of
whether or not the results support the principle under investigation.
The total effort on the project should be about 3 hours per week, or a total of
30 hours for the course.

**Grading:** The Final grade is 75% Exams + 25% Project. The exam grade is the average
(weighting individual questions equally) of the Final Exam and any Midterms which were
better than the Final. The principle for grading exams is that demonstration of
understanding of 2/3 or more of the material is at least an A-, ½ or more at least a B-, and
1/3 or more at least a C-. The project is graded on the principle that a coherent report
reflecting 30 hours of effort earns a B (A if the project is outstanding in some respect).

**Reading:** If you have time, visit the Science Library and read about what is new in
science and astronomy. Some interesting magazines are *The New Scientist, Nature,

### Course Plan

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<td>Basic Astronomy</td>
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<td>April</td>
<td>1</td>
<td>Ancient Astronomy</td>
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<td>6</td>
<td>Origin of the Solar System</td>
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<td>Formation of the Planets</td>
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<td>11</td>
<td>Planetology</td>
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<td>13</td>
<td>Exploration of the Solar System</td>
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<td></td>
<td>15</td>
<td><strong>First Midterm</strong> covering Chapters 1, 2, 15 and 6</td>
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<td>18</td>
<td>The Outer Earth</td>
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<td>Mercury</td>
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<td>The Planet Venus</td>
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<td>The Atmosphere and Surface of Venus</td>
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<td>May</td>
<td>2</td>
<td>The Planet Mars</td>
<td>Chapter 10</td>
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<td>4</td>
<td>The Atmosphere and Surface of Mars</td>
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<td><strong>Second Midterm</strong> covering Chapters 7, 8, 9, and 10</td>
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<td>9</td>
<td>Jupiter</td>
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<td>11</td>
<td>The Moons of Jupiter</td>
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<td>Saturn</td>
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<td></td>
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<td>Review I</td>
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<td><strong>Memorial Day – no class</strong></td>
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<td>June</td>
<td>1</td>
<td>Review II</td>
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<td>Review III</td>
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<td>6</td>
<td><strong>Final Exam</strong> at 10:15 in Room 182 Lillis covering Chapters 1, 2, 6-15.</td>
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Instructions: Print your name and student identification number at the top of this page. Answer each of the ten parts of questions A through F in the numbered spaces with at most a sentence or two, a formula, and a sketch. Note that the questions continue on the back of this page. Each answer is worth 2 points.

A. Why are there seasons on the Earth?
   1.

B. State Kepler's three laws.
   2.

C. What is a 'hot Jupiter'?
   5.
D. *Describe* three important differences between the properties (not location) of Terrestrial and Jovian planets.

6.

7.

8.

E. What is the main flaw of the Copernican model?

9.

F. Light travels at a speed of $3 \times 10^5$ km/s. How long does it take light to reach the Earth from Jupiter when it is $6 \times 10^8$ km from the Earth?

10.
Instructions: Print your name and student identification number at the top of this page. Answer each of the ten parts of questions A through G in the numbered spaces with at most a sentence or two, a formula, and a sketch. Note that the questions continue on the back of this page. Each answer is worth 2 points.

A. What conditions are necessary for there to be a dynamo in the core of the Earth, and what does this dynamo produce?
1. 

2. 

B. What is a synchronous orbit, and how did the orbit of the Moon come to be this way?
3. 

4. 

C. Explain why Mercury is never seen overhead at midnight in the Earth's sky?
5. 

Continued on Back
D. What are the main components of Venus's atmosphere, and what are the clouds in the upper atmosphere made of?
6.

E. Why are some Martian oppositions better than others for viewing Mars?
8.

F. Why is Mars red?
9.

G. If a planet had a mass about one sixteenth that of Earth, and a diameter about one half that of Earth, what would be the ratio of its density to that of Earth?
10.
The Solar System – ASTR 121
Final Examination – June 6, 2005, 10:15-12:15

Instructions: Print your name and student identification number at the top of this page. Answer each of the twenty parts of questions A through O in the numbered spaces with at most a sentence or two, a formula, and a sketch. Note that the questions continue on the back of this page and on the front and back of the following page. Each answer is worth 2 points.

A. State Kepler's three laws of planetary motion.

1.

2.

3.

B. List four properties of the solar system any model of its formation must explain.

4.

5.

Continued on Back
C. What happens during a Lunar Eclipse?
6.

D. Compare and contrast P-waves and S-waves (seismic), and explain how they tell us about the interior of the Earth.
7.

8.

E. What does it mean to say that Mercury is in a 3:2 spin-orbit resonance? Why didn't Mercury settle into a 1:1 spin-orbit resonance with the Sun like the Moon did with Earth?
9.

10.

Continued on Next Page
F. From a position on the Moon from which the Earth is visible, would the position of the Earth change in the sky over the course of a month? What changes in the appearance of the Earth would occur?
   11.

G. Given that Venus like Earth has a partially melted iron core, why doesn't it have a magnetic field like Earth's?
   12.

H. Why are Martian volcanoes so large?
   13.

I. Why has Jupiter most of its original atmosphere?
   14.

J. What is the cause of Io's (Jupiter's innermost Galilean moon) volcanic activity?
   15.

Continued on Back
K. What is the mechanism responsible for the relative absence of helium in Saturn's atmosphere, compared with Jupiter's atmosphere?

16.

L. What are shepherd satellites?

17.

M. Describe a day on Titania (Uranus's largest moon).

18.

N. What is the predicted fate of Triton? Explain.

19.

O. What causes a meteor shower? Why do the meteors seem to come from the same point in the sky?

20.