SYLLABUS: ASTRONOMY 3010, SPRING 2003
TOPICS IN MODERN ASTRONOMY

Prof. Paul J. Wiita

Lecture Timings: Tuesdays & Thursdays: 1:00 PM — 2:15 PM
Room: 272 Natural Sciences Building

To contact Dr. Wiita: Rm. 715 One Park Place; Ph: 404 651-1367;
e-mail: wiita@chara.gsu.edu; some material may be posted on my web-site,
URL: www.chara.gsu.edu/~wiita/wiita.html

Office Hours: Tues. Wed. and Thurs. 11:00 AM – noon & by appointment.

Usually, the best way to contact me is by e-mail. Note that I will not
normally be in the office on Fridays this semester, as I will be spending most
weekends in Princeton, NJ with my family. If you need to contact me over
the weekend you can call me in my office at Princeton University on Friday
at 609 258-1164 or at home at 609 683-3834; I will be reading my e-mail
frequently on Fridays and sporadically on Saturdays and Sundays. My home
number in Atlanta is 404 681-5993 if you have an urgent question at other
times when I’m not in my office.

Required Textbooks:
1) Understanding Cosmology, A Scientific American book, Sandy
2) The Once and Future Cosmos, A Scientific American Special Edi-
tion, October 2002

GENERAL INFORMATION:

The two inexpensive texts will comprise most of the readings for the
second half of the semester, but you should buy them at the beginning of the
term since they might otherwise not be available. Most of the material for
the first half of the semester can be downloaded from the Web, either for free
from URL: www.scientificamerican.com or via the Scientific American
Archives (at the same web-site). Download this material as soon as
possible, as some of it may become unavailable (or unavailable for
free) at any time. Material that cannot be obtained in that fashion will
be provided as handouts.
All students are expected to be familiar with the Policy on Academic Honesty, section 1380 (pp. 66–69) of the 2002–2003 Undergraduate General Catalog, which can be downloaded from the web at: http://www.gsu.edu/~wwwreg/ugcat2003/undergrad0203home.htm; furthermore, you are expected to abide by it. Cheating will certainly earn you a zero on that exam, and the penalties can be substantially more severe.

You are expected to be considerate and respectful of other students; talking while others are speaking or eating in class are obvious forms of discourtesy. Cell phones and pagers are to be turned off (or at most, set to give tactile, rather than audible, signals) while in class.

COURSE GOALS:

This is a nominally junior level topics course in astronomy designed for non-science students (though science majors are welcome). I will assume that all students taking this course have had Astr 1010 and Astr 1020 (or equivalent), that they really enjoyed those courses and that they want to learn about certain aspects of astronomy in more detail. However, enthusiastic students who have not taken these courses are also welcome. Because this class is designed for non-science majors, the use of mathematics in this course will be limited to algebra and geometry, and will not require the calculus or any higher math.

We will begin with a discussion of some recent discoveries in planetary astronomy in the broad sense: not just what has been learned about planets in our solar system through space probes, but also about the discovery of many planets around other stars over the past decade. Depending on class interest, we will then discuss some topics related to compact stars: pulsars, black holes, microquasars, gamma ray bursts. Also depending upon class interest, we may discuss some important properties of galaxies, such as the presence of supermassive black holes and activity in quasars and radio galaxies. Because of the revolution currently going on in the subject of cosmology, coupled with the fact that this subject usually gets short shrift in Astr 1020, much of the second half of this course will be devoted to this critical and exciting subject. We will learn about the big bang, inflation, and the recent claims of an accelerating universe.

I expect that most of the semester’s classes will alternate between a lecture and a discussion format. In other words, I will give an introduction to the various topics and will expect students to carry on intelligent discussions
about them during the next session(s). Sometimes my lecture will cover just a part of the period, with the rest reserved for discussions.

Aside from learning a significant amount of exciting and important factual material, comprising a summary of our best current knowledge of some of the most active areas of astronomy, students should come away from this course with an appreciation of the techniques and thinking styles employed by scientists when they attempt to understand what is going on in very distant places which they cannot actually visit to perform experiments.

**COURSE REQUIREMENTS:**

You should be generally familiar with the material in Astr 1010 and 1020, though you’re not expected to remember everything covered in those courses. Access to a recent text for Astr 1010/1020 will be very helpful when you need to review some of that material.

You are responsible for all the material in the assigned readings and in the lectures unless you are specifically told otherwise. While attendance at every session is not required, it is expected, and it will be extremely difficult for any student to get a grade of C or better if (s)he does not attend nearly every class. If you must miss a class, you should be certain to hand copy the notes of another student as soon as possible.

This class requires preparation and participation. You will be expected to carefully read the materials **BEFORE** the respective class and to be able to answer questions about them. You are also strongly encouraged to ask questions before or after class if something is not clear. If my office hours are not convenient for you, just make an appointment to meet with me.

There will be two one-hour exams. Some questions will be short answer, others short essays and others mathematical problems; however, no more than 30% of any exam will comprise questions involving simple mathematics. The examination questions will stress the material covered in class, so punctual attendance and careful notetaking will be keys to doing well; however, there will typically be some questions asked that are covered in the readings but not the discussions.

**GRADING:**

Each of the two hour exams will count as 25% of your grade. A few short assignments will comprise a total of 15%, your class participation 10%, your written term paper 15% and your oral
presentation based on that paper, 10%.

There will be no make-up exams; if you miss either exam your final grade will be weighted: 40% the one exam you took, 20% assignments, 15% participation, final paper 15% and presentation based on that paper, 10%. If you miss both exams, your grade cannot exceed 60% and you will fail the course. Assignments cannot be made up, and since the answers to them will typically be given during the class during which they are due, they will not be graded if handed in late.

The term paper will be a 4 to 6 page (1000-1500 word) summary and discussion of a topic in astronomy not covered in class. Choose an article of the roughly the same level that we use in class as your primary source. Your proposed topic and a copy of the article you plan to use as a primary source must be handed in no later than March 11th; I will let you know by the next class if that topic is acceptable. You must also read at least two other articles on that subject and cite them in your paper (only one of which can be web-based). The paper will be due at the beginning of class on April 15th. Content, accuracy, organization, logic, reference choice and citation, grammar and spelling will all be considered when I assign a grade to this paper. If turned in late, it loses 10 points of 100 per day (or part thereof).

The oral presentation will be between 7 and 20 minutes long, depending on the number of students in the class. You will be informed at least two weeks in advance when you will give your talk and how long it will be. These presentations will be given during the last two weeks of class. The grade will be based upon the talk’s content and accuracy, and upon the speaker’s clarity and style.

Course grade determination: A weighted average grade of 90% or better guarantees an A, an average grade of at least 80% gives a B, 70% or better yields a C, and an average 60% or better is enough for a D. If the mean class grade on an exam or an assignment falls below 70% I will ‘curve’ the scores so as to bring the mean up to between 70% and 75%.

Feel free to give me suggestions at any time (in person after class, or via phone or e-mail) on how we might work together to make this class better.
<table>
<thead>
<tr>
<th>Date(s)</th>
<th>Topic</th>
<th>Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 7</td>
<td>Introduction &amp; Choice of Topics</td>
<td>Mars Special, SA^† 3/00</td>
</tr>
<tr>
<td>Jan. 9, 14</td>
<td>Missions to Mars</td>
<td>Gallileao Mission, SA 2/00</td>
</tr>
<tr>
<td>Jan. 16, 23</td>
<td>Missions to Jupiter</td>
<td>&amp; Europa’s Ocean, SA 10/99♠</td>
</tr>
<tr>
<td>Jan. 21</td>
<td>NO CLASS: Dr. Wiita is away</td>
<td></td>
</tr>
<tr>
<td>Jan. 28, 30</td>
<td>The Outer Solar System</td>
<td>Pluto Mission (Stein), SA 5/02 &amp;</td>
</tr>
<tr>
<td>Feb. 4, 6</td>
<td>Other Planetary Systems</td>
<td>Moons &amp; Rings (Burns), SA 2/02♠</td>
</tr>
<tr>
<td>Feb. 11, 13</td>
<td>Brown Dwarfs</td>
<td>Migrating Planets, SA 9/99 &amp;</td>
</tr>
<tr>
<td>Feb. 18, 20</td>
<td>Close Binaries and Supernovae</td>
<td>Shadows of Other Earths, SA 9/00♠</td>
</tr>
<tr>
<td>Feb. 25</td>
<td>FIRST HOUR EXAMINATION</td>
<td>Brown Dwarfs, SA 4/00</td>
</tr>
<tr>
<td>Feb. 27</td>
<td>Black Holes</td>
<td>Nova Cygni, SA 1/95♠,</td>
</tr>
<tr>
<td>Mar. 4, 6*</td>
<td>NO CLASSES, SPRING BREAK</td>
<td>X-ray binaries, SA 11/93♠,</td>
</tr>
<tr>
<td>Mar. 11°</td>
<td>γ-ray Bursts</td>
<td>Supersoft X-ray &amp; Supernovae, SA 2/99♠</td>
</tr>
<tr>
<td>Mar. 13</td>
<td>Active Galactic Nuclei</td>
<td>On Planets and some Star Stuff</td>
</tr>
<tr>
<td>Mar. 18, 20</td>
<td>Galaxy Evolution</td>
<td>Father of Black Holes, SA 6/96♠,</td>
</tr>
<tr>
<td>Mar. 25, 27</td>
<td>The Big Bang</td>
<td>Inconstant Cosmos, SA 5/93♠</td>
</tr>
<tr>
<td>Apr. 1, 3</td>
<td>An Accelerating Universe?</td>
<td>“Brightest Explosions” SA 12/02</td>
</tr>
<tr>
<td>Apr. 8, 10</td>
<td>Observational Cosmology</td>
<td>New Look at Quasars, SA 6/98♠</td>
</tr>
<tr>
<td>Apr. 15°, 17</td>
<td>Student Presentations</td>
<td>Cosmos: Larson/Kauffmann articles</td>
</tr>
<tr>
<td>Apr. 22, 24</td>
<td>Student Presentations</td>
<td>Under. Cosmo.: Peebles/Linde articles</td>
</tr>
<tr>
<td>Apr. 29</td>
<td>SECOND HOUR EXAMINATION</td>
<td>Cosmos: Hogan, Krauss♠</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and Ostriker♠ articles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cosmos: Bennett, Caldwell</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and Rees articles</td>
</tr>
</tbody>
</table>

^†SA means Scientific American; use the web-site to download for free or copy the article from the magazine in a library. The Mars Special (to be discussed on Jan 14th) refers to five short articles by Zorpette, Zubin, Musser & Alpert, Oberg & Aldrin, and Singer.

♠Must be purchased from Scientific American Digital; or copy the article from the magazine in a library or download w/o figures through Galileo.

*March 10th is the last day to withdraw with a grade of W possible; see Section 1332.10 of the Undergraduate General Catalog, p. 48.

°Your proposed topic and main source for the term paper are to be turned in for approval.

♣These articles are also in Understanding Cosmology.

DiamondTerm papers due at the beginning of class.

Of course, modifications to the above schedule may be necessary.