Astronomy 1001: Exploring the Universe
Spring 2015

Instructor: Dr Tommy Nelson
(612)-624-9804
tnelsen@physics.umn.edu
http://homepages.spa.umn.edu/~tnelson/Home.html

Lecture: 7:15 to 8:30pm, Monday and Wednesday, Tate 166

Office hours: Tate 377
Monday 4:30 to 6:30pm
Or by appointment!

Please read the entire syllabus carefully! You are responsible for all of the requirements and procedures described here. You are also responsible for all announcements, assignments, changes, etc. whether or not you are in class.

Required Texts

Text: The Essential Cosmic Perspective, Bennett, Donahue, Schneider & Voit.

There is a custom UMN version of the 7th Edition available at bookstore that includes online access to Mastering Astronomy. The 6th Edition is also acceptable, although you will be responsible for obtaining access to MA separately from the Pearson website. Note: there are some differences in chapter numbers between the 6th and 7th Editions - please check and make sure you are working on the right chapter.

Online: Mastering Astronomy (for homework: class code is MANELSONS2015)


Exam Dates

Mid-term 1: Wednesday February 25th, during class period, Tate 166
Mid-term 2: Wednesday, April 1st, during class period, Tate 166
Final exam: Monday, May 11th, 6:30 – 8:30pm, location to be announced.

Course Description

Welcome to AST 1001! This semester, we'll be exploring the universe and our place within it. The course is designed to give you a primarily qualitative survey of astronomy, although we will make use of basic math and algebra in places to gain deeper insight. Don’t worry if your math is rusty – there will be plenty of practice throughout the semester, and math on tests will be simple enough to perform without a calculator.
Although you'll be attending lecture twice a week, do not expect to sit back and passively listen/snooze for 75 minutes! Instead, anticipate lots of questions from me and plenty of time for you to ask your own. From time to time, we'll complete worksheets called “Lecture-Tutorials” that will give you an opportunity during class time to explore key concepts in more depth. We'll complete these worksheets in pairs or small groups during class, giving you an opportunity to ask questions and make sure you understand the material as we encounter it.

Finally, it is my goal to create a class that allows a diverse cross-section of students to do well. There are multiple opportunities to succeed in this class. Your grade is distributed fairly evenly across the course requirements. Between labs, homework, the observing project and exams, you'll have numerous opportunities to pick up points. I will not be grading on a curve in this class, so it can never hurt your grade to help a classmate do well.

AST 1001 satisfies the Liberal Education Physical Science w/Lab and the Environmental Theme requirements. A key component of the course is to develop an understanding of how science enables us to explore the physical world around us. Environmental theme topics will be addressed in both lectures and labs.

**Student Learning Outcomes**

By taking this course, students will:

- Develop a sense of the scale of the universe and our place within it.
- Explore the underlying reasons for the Moon’s changing phases and position in the sky.
- Take a visual tour of our solar system.
- Learn about the physics behind the structure and formation of the sun and planets.
- Be introduced to the properties of light and explore them in a variety of astrophysical contexts.
- Encounter fundamental laws of nature that describe the motion of objects and light through space.
- Explore the life cycle of stars from birth to death.
- See how extrasolar planets are discovered and characterized.
- Learn about white dwarfs, neutron stars and black holes—the weird and wonderful objects in the stellar graveyard.
- Know the basic features of galaxy morphology, and be able to connect this to their stellar content.
- Encounter Hubble’s Law and its implications for galaxy motions.
- Explore the history of the universe from the moment of the big bang to its eventual fate.

Beyond the specific astronomy content, students will also develop the following general skills:

- Using equations and arithmetic to solve simple physical problems.
- Interpreting information presented in graph or chart form.
- Working effectively in small groups.
- Recording experimental results and presenting them graphically and in a report.
Homework

We will be using Mastering Astronomy for homework. The goal of homework is to give you a chance to develop your understanding of the course material, and an opportunity to practice the types of questions that will appear on your exams. Mastering Astronomy is included in the textbook available at the bookstore. If you have obtained your own textbook elsewhere, you will need to purchase MA access directly from Pearson (www.masteringastronomy.com $60.50). The course code to join the class is: MANELSONS2015. **Be sure to select “The Essential Cosmic Perspective, 7th Edition” as your text.**

Homework assignments will be due on Fridays at 5pm. Questions will include tutorial activities, multiple-choice questions and some calculations (included to provide practice for lab activities). We will do 11 assignments with 20 questions each over the course of the semester. Your final homework grade (out of 200) will be determined by dropping your lowest homework score.

Some of the homework questions will appear on the exams. **I encourage you to attend office hours on Monday if you have any questions about your homework.**

Labs

See your TA’s syllabus for specific information about the labs.

Observational Project

A key component of this course is to undertake an observational project – in this case observing the phases of the moon over the course of the semester. You are required to complete a series of observations and to submit your results in both online and paper format. **You must receive at least 50% of the total available moon project points to pass the course – no exceptions will be made!**

The website for submitting your observations is [http://www.physics.umn.edu/resources/moonproject/](http://www.physics.umn.edu/resources/moonproject/)

Background information and instructions on how to complete this project can be found at the start of the lab manual.

You must submit your observations in three stages:

**Part I:** At least 3 observations entered online and paper photocopies of Observing Form placed in your TA’s box (outside Tate Rm. 256) by **Friday, February 13th at 5 PM.**

**Part II:** At least 9 **total** observations entered online and paper photocopies of Observing Form placed in your TA’s box by **Friday, March 27th at 5PM.**

**Final Report:** Final observations (a **total of 15**) entered online and paper photocopies, and the final report due in your TA’s box by **Friday, April 24th at 5PM.**
START MAKING OBSERVATIONS RIGHT AWAY! Don’t miss a clear night/day! Every term there are a few students who put this off. DO NOT BE ONE!! You will need your three preliminary observations by the end of the third full week of class. Always save the original copy of your observation log, and turn in a photocopy.

Exams

There are three exams in this class – two midterms and the final. The exams will be multiple-choice, with each question worth 2 points. Each midterm exam will have 58 questions, for a total of 116 points per exam. The final will have 94 questions, for a total of 188 points. Exams will focus on the most recent material, with some questions on earlier concepts. Some fraction of the exam questions will be taken directly from the lecture notes and homework assignments. You are allowed one side of 8.5 by 11 paper of notes for each midterm, and two sides for the final. **You must take all three exams to pass the course – no exceptions will be made.**

Grading

<table>
<thead>
<tr>
<th>Component</th>
<th>Total Points</th>
<th>% of grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 labs</td>
<td>240 (20 points per lab)</td>
<td>24</td>
</tr>
<tr>
<td>Observational project</td>
<td>140</td>
<td>14</td>
</tr>
<tr>
<td>Homework</td>
<td>200</td>
<td>20</td>
</tr>
<tr>
<td>Mid-term 1</td>
<td>116 (2 points per question)</td>
<td>12</td>
</tr>
<tr>
<td>Mid-term 2</td>
<td>116</td>
<td>12</td>
</tr>
<tr>
<td>Final exam</td>
<td>188</td>
<td>18</td>
</tr>
<tr>
<td><strong>Total for the course</strong></td>
<td><strong>1000</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

The course will **not** be graded on a curve: it cannot hurt you to help a colleague in this class. Grades will be assigned approximately as follows based on past experience:

A: 920 - 1000
A-: 880 - 919
B+: 860 - 879
B: 820 - 859
B-: 780 - 819
C+: 750 - 779
C: 670 - 709
C-: 600 - 669
D+: 550 - 599
D: 500 - 549

**NOTE!** To receive a passing grade in the class you must
- Earn at least 50% of the total available lab points (120/240)
- Earn at least 50% of the total available moon project points (70/140)
- Attempt at least 50% of the homework assignments (6/11)
- Take all three exams
Keep copies of all materials upon which you are graded (laboratory reports, observational project assignments, and examinations) until the end of the semester. After the first two or three weeks of the semester, grade summaries will be posted weekly under the scores link at http://www.astro.umn.edu/courses/1001/. Students are expected to review their grade summaries for accuracy periodically during the semester and after the final examination.

Discrepancies should be reported to Terry Thibeault in the Office of the Minnesota Institute for Astrophysics (Room 356 Physics; Phone: 612-624-4811; FAX: 612-626-2029; e-mail: tt@astro.umn.edu).

**Course Policies & Procedures**

**Special Needs:** Any students with special learning needs must contact their professor during the first two weeks of class.

**Student Mental Health Services:** As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce your ability to participate in daily activities. University of Minnesota services are available to assist you with addressing these and other concerns you may be experiencing. You can learn more about the broad range of confidential mental health services available on campus via the Student Mental Health Website at http://www.mentalhealth.umn.edu.

**Academic Standards:** The CLA and CSE scholastic conduct and classroom procedures will be followed. You are responsible for being familiar with these. Students are welcome to work together, exchange ideas, etc. However, for the Moon Project, EACH STUDENT MUST MAKE HIS/HER OWN OBSERVATIONS/MEASUREMENTS AND OWN CALCULATIONS. Copying of someone else’s measurements or calculations is equivalent to cheating and will be handled accordingly.

**Examinations:** Room assignments for the exams will be announced in class and posted on the course website. Bring two pencils and a photo-ID to all exams. Exams will consist of multiple-choice questions. If you cannot make it to an exam, see the professor well in advance. If you miss an exam, see the professor immediately about scheduling a makeup exam. Makeup exams can be scheduled for anytime, and could be in the form of an ESSAY. Your midterm exams will be returned to you in your lab. If you feel there is a mistake on the multiple-choice portion of your exam, please see Terry Thibeault in Physics 356.
## Tentative Course Schedule

<table>
<thead>
<tr>
<th>Dates</th>
<th>Topic</th>
<th>Chapter Reading (7th edition)</th>
<th>Labs and Due Dates</th>
<th>Homework</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 21</td>
<td>The sky, phases of the moon</td>
<td>2</td>
<td>No Labs</td>
<td>No HW</td>
</tr>
<tr>
<td>Jan 26, 28</td>
<td>Astronomical distances, History of Astronomy</td>
<td>1.1, 3</td>
<td>D</td>
<td>HW1</td>
</tr>
<tr>
<td>Feb 2, 4</td>
<td>Motion, Energy and Gravity</td>
<td>4</td>
<td>A</td>
<td>HW2</td>
</tr>
<tr>
<td>Feb 9, 11</td>
<td>Light and telescopes</td>
<td>5</td>
<td>B</td>
<td>HW3</td>
</tr>
<tr>
<td>Feb 16, 18</td>
<td>Solar system overview; Terrestrial Planets</td>
<td>6, 7 (not 7.1, 7.5)</td>
<td>E</td>
<td>HW4, MP1</td>
</tr>
<tr>
<td>Feb 23, 25</td>
<td>Jovian Planets, <strong>MID-TERM EXAM 1</strong></td>
<td>8</td>
<td>L</td>
<td>HW5</td>
</tr>
<tr>
<td>Mar 2, 4</td>
<td>Asteroids, Comets, Earth’s Environment</td>
<td>9</td>
<td>M</td>
<td>HW6</td>
</tr>
<tr>
<td>Mar 9, 11</td>
<td>The Sun: Our nearest star</td>
<td>11</td>
<td>I</td>
<td>No HW</td>
</tr>
<tr>
<td>Mar 16, 18</td>
<td>SPRING BREAK!!!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mar 23, 25</td>
<td>The Stars and their properties</td>
<td>12</td>
<td>F</td>
<td>HW 7, MP2</td>
</tr>
<tr>
<td>Mar 30, Apr 1st</td>
<td>Star Formation, <strong>MID-TERM EXAM 2</strong></td>
<td>13.1</td>
<td>H</td>
<td>HW8</td>
</tr>
<tr>
<td>Apr 6, 8</td>
<td>Stellar evolution, Exotic stars</td>
<td>13.2 – 13.4, 14</td>
<td>K</td>
<td>HW9</td>
</tr>
<tr>
<td>Apr 13, 15</td>
<td>The Milky Way</td>
<td>15</td>
<td>J</td>
<td>HW9</td>
</tr>
<tr>
<td>April 20, 22</td>
<td>Galaxies and the expansion of the universe</td>
<td>16</td>
<td>No lab</td>
<td>No HW</td>
</tr>
<tr>
<td>April 27, 29</td>
<td>Cosmology and The Big Bang</td>
<td>17, 18</td>
<td>G</td>
<td>MP3</td>
</tr>
<tr>
<td>May 4, 6</td>
<td>Exoplanets and life in the universe</td>
<td>10</td>
<td>No lab</td>
<td>HW11</td>
</tr>
<tr>
<td>May 11</td>
<td><strong>FINAL EXAM, 6:30 – 8:30pm</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

You will not be required to read all of every chapter! More detailed reading assignments will be posted on Moodle by Friday afternoon each week.