

## Astronomy 212H

## The Solar System

Fall 2010

Instructor: Dr. Andy Layden  
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Class Schedule: **MWF 11:30am-12:20pm** in 184 Overman Hall  
Office Hours: **MWF 12:30-1:20 pm, TR 2-3 pm**, or by appointment.  
Text: *Pathways to Astronomy, Schneider & Arny, 2009 (2<sup>nd</sup> Edition)*.  
Course Website: <http://physics.bgsu.edu/~layden/a212h.htm>

**Overview:** This course focuses on the planets and other objects that orbit our Sun. Topics include: the appearance of the night sky and what it tells us about the structure of our Solar System; exploration by telescopes and spacecraft; the Sun; a planet-by-planet tour with emphasis on similarities and differences; the scientific understanding of how the solar system formed and developed, and the evidence that led to and supports that understanding; the planetary systems recently discovered around other stars; and the possibility that life exists elsewhere in the universe. Some class time will be spent doing activities that clarify how astronomers obtain and interpret information about distant worlds. We will connect astronomy with human history, culture, and technology, and apply critical thinking strategies to solve astronomy and other problems.

**Learning Outcomes:** Students completing this course successfully will be able to:

- (1) Describe the appearance of the night sky, its motions, and their physical causes;
- (2) Describe in detail, using proper terminology, the physical nature of the planets and other objects in the Solar System. This provides a knowledge base for a lifetime of enjoying astronomy in newspapers, websites, and amateur-level magazines;
- (3) Describe the scientific explanation for the formation and development of the Solar System, and support it using information from the physical nature of the planets and their motions;
- (4) Explain how scientists use observation and mathematics to learn more about the Solar System, and use basic forms of some of these methods.

### **Working Modes:**

**Reading** from the textbook will be assigned most nights along with several study questions. Some nights there will be supplemental reading in addition to or in place of the textbook. In class, we will discuss and expand on the previous night's reading. *Doing the reading ensures you will be prepared for discussions, in-class activities, and new material.*

**Activities** are in-class assignments designed to help you get a better hands-on and/or mathematical feel for the concepts about which you have read. If you don't complete them in class, complete them as homework and turn them in at the beginning of the next class.

**Homework:** We will do 3-6 online Simulation Labs during the semester in order to better understand the sometimes-complex 3-D motions found in Astronomy. You will follow

instructions and answer questions on a student guide, using the online discussion board to share strategies, tips and pitfalls. There will also be 3-6 short (<1 page) writing assignments during the semester. Some of these may be peer-reviewed before the final draft is submitted.

**Planet Mission Project:** You and 3-4 group-mates will research and design an original mission to a planet in the solar system. Your group will write a report describing the proposed mission in detail, and briefly present the mission to the class. Both should include the history of research on that planet, the motivation for your mission, and the methods of exploration you would use (it should not be technical) -- this will require research using outside sources that build on the topics discussed in class. Details to follow.

**“Hour” and Final Exams** will be a mixture of multiple choice, short-answer, and essay questions. They will focus on concepts emphasized in the study questions, activities, and homeworks. A **quiz** will be given early in the term to provide a model for the format as well as feedback on your current study habits.

**Bring to every class:** Calculator, pencil/pen, notebook/paper(binder?) and if possible, your textbook. Your calculator should do square roots and scientific (exponential) notation [for example, the *TI-30Xa* or *Sharp EL-506VB* are ~\$12].

### **Grading:**

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|--|-----------------------------|
| • Activities, group discussion and class participation                   | 15% of final grade          |
| • Homework including Simulation Labs, short papers, etc.                 | 21% of final grade          |
| • One “Planet Mission” group research paper & presentation               | 15% of final grade          |
| • One Quiz (25 min)  | 4% of final grade           |
| • Two “Hour” (50 min) Exams  | 20% of final grade (10% ea) |
| • One comprehensive Final Exam   | 20% of final grade          |
| • Attend one Stargaze at the BGSU Observatory ( <i>see page 4</i> )      | 5% of final grade           |
| • Optional extra credit ( <i>see list of projects on class website</i> ) | up to 4% of final grade.    |

Grading is the standard: 90-100% = A, 80-89% = B, 70-79% = C, 60-69% = D, <60%=F. I round up in cases where effort is evident.

Note: For the Activities and Simulation Labs, I expect to carefully grade and provide feedback on 1/3 of the works submitted (the “alphas”), while the other 2/3 (the “omegas”) will be graded as: 5 = careful job turned in on-time, 4 = careful job turned in one day late, 3 = later or careless job, 0 = not turned in by 3 classes after due (the point values may scale higher or lower for longer or shorter assignments). For each assignment, semi-random selection will determine which students will be alphas vs. omegas. Answer keys will be posted for all assignments 3 class meetings after the due date so you can self-correct and reflect on your answers promptly.

Excused absences: If you need to be out of town for a valid reason, arrange with me before hand how to handle missed assignments. If you are ill for a class or two, email me and I’ll accept it late with no penalty. If you are absent for more than 3 classes, I would appreciate a doctor’s note (some students inform their Dean’s office and they inform faculty).

Before each exam, I will summarize your current Activity and Homework points and post an interim estimate of your course grade on [my.BGSU.edu](http://my.BGSU.edu). You can check any time you like:

- 1) Enter your web browser and navigate to <http://my.bgsu.edu>, then login as usual.
- 2) Click on the “My Courses” tab near the top of the page.
- 3) Select “The Solar System” from the list of courses in which you are participating.
- 4) Click the “Tools” button on the frame at left, and select “My Grades”.
- 5) Your grades should appear.
  - If you have trouble with any of these steps, contact me or StudentTech (2-9277).
  - If you think a grade is incorrectly reported, please contact me as soon as possible.
  - It may take me 1-2 days after an assignment is due to post the grades, please be patient.

### **Important Dates:**

- **Mon Aug 23** -- First day of classes.
- **Mon Sep 6** -- Labor Day, no classes.
- **Fri Sep 10** -- **Quiz** (approximate date, stay tuned).
- **Wed Sep 29** -- **First Hour Exam** (approximate date, stay tuned).
- **Mon Oct 11** -- Fall Break, no classes.
- **Wed Nov 10** -- **Second Hour Exam** (approximate date, stay tuned).
- **Wed 24 and Fri 26 Nov** -- Thanksgiving Break, no classes.
- **Wed Dec 1** -- **Planet Mission Paper and Presentation** (approximate date, stay tuned).
- **Thurs Dec 9** -- Last Stargaze.
- **Fri Dec 10** -- Last day of class, **extra-credit projects due**.
- **Wed Dec 15** -- **Final Exam, 10:45am – 12:45pm in our classroom**.

### **Rough Calendar:**

Week 1	Topic:	Constellations, celestial sphere, angles.
2		Motions of Sun and stars in the sky; time and seasons.
3		Lunar phases, lunar motions, eclipses, planet motions on the sky.
4		Kepler’s laws, Newtonian gravity, orbital motion; the nature of science.
5-6		Light and matter, (telescopes?), the Sun and solar activity.
7		Origins in the Universe and of the solar system.
8		Earth: formation, interior, surface & atmosphere; climate change.
9		Moon and Mercury: cratering & evolution.
10		Venus & Mars: the other terrestrial worlds.
11		Jupiter & Saturn: gas worlds, rings, and moons.
12		The outer planets: Uranus & Neptune vs. Pluto and the Kuiper Belt.
13		Meteorites, asteroids & comets – origins revisited.
14		Planets orbiting other stars and extraterrestrial life.

## Astronomy Stargaze Schedule -- Fall 2010

The goal of the Stargaze is to give you the opportunity to view the heavens firsthand with the help of experienced instructors. You will learn some constellations, look at stars through a small telescope (8-inch, a typical telescope bought by amateurs), and look at fainter celestial objects through a larger research telescope (20-inch). BGSU is one of a few Universities to have a large telescope on campus, within easy reach of its students. Don't miss this unique opportunity!

A warning: the things you will see won't be as beautifully dramatic as the color pictures in your textbook. Those are long exposure photographs taken with large telescopes located at the best observing sites in the world. What you *will* see is light that has traveled huge distances across empty space, captured by your very own eyes. I find it awe-inspiring!

Stargazes begin at the following times:

August 29 -- December 9

**Sunday, Monday, Tuesday, Wednesday, and Thursday 10:00 p.m.**

EXCEPT no sessions on:

Sun Sep 5 and Mon Sep 6 (Labor Day)

Sun Oct 10, Mon Oct 11, & Tue Oct 12 (Fall Break),

Thu Nov 11 (Veterans' Day)

Tue Nov 23, Wed Nov 24, Thu Nov 25 & Sun Nov 28 (Thanksgiving).

1. We encourage you to **make your stargaze visit early in the semester**. Many sessions (two out of three) are lost to bad weather, especially late in the semester. Do not wait until the end, or you may get closed out by bad weather or large crowds. *Plan ahead! Go early!*
2. Stargaze sessions are held in the Observatory area on the roof of the Physical Sciences Laboratory Building (PSLB). Wait in the lobby on the ground floor. Do not use the stairs, as the rooftop doors are locked. You will be escorted to the Observatory in a group as near as possible to the scheduled time. Each session lasts 45 - 60 minutes.
3. The maximum size of a group is 20 people on a **first-come, first-served basis**. Everyone who shows up on time will be served, but you may have a long wait if the turnout is large and we have to run extra sessions to accommodate everyone. A **sign-up sheet** is put out in the planetarium lobby about one hour before the first scheduled stargaze. You may wait in the Planetarium lobby, or leave and return about 10 min before the next session is due to start.
4. There is no late admission. If you miss the departure of a group, you must wait until the next scheduled time. There are no exceptions and there is no other access to the Observatory.
5. **Look at the sky before you come**. Sessions are held only when the sky is clear and free of clouds. If it's cloudy, partly cloudy, too hazy, foggy, raining, or snowing, the sessions must be canceled. If you live out of town or sky conditions look ambiguous to you, you can call 419-372-8831 for a recorded message telling whether the sessions will be held or canceled. The tape is put in at 9pm, so please do not call earlier than that, or you may get a wrong message.
6. **Bring your student ID card**. This is how you get the points credited to your grade!
7. **Dress warmly**. The roof is usually colder and windier than the ground. Out of consideration for others, there is no smoking, food, or beverages on the roof; please turn off cell phones.
8. The student telescope operators have full disciplinary authority if necessary.