SYLLABUS
ASTR 1013.001: The Solar System
2017 Fall Semester

1 OVERVIEW

Purpose
Welcome! This course focuses on our Solar System, its future, and our exploration of it—including the search for life. You will also be introduced to astronomical observing, and the practice of science.

Lectures
Physical Sciences Room PS 141
TR 10:30a–11:45a

Coursework Return
Graded projects and exams will be returned in class the first week after they were due or administered. After that week, contact the astronomy Teaching Assistants to obtain your papers. Keep your graded projects until final grades have been posted on SIS.

Astro Web Page
Announcements, TA information, test statistics, and sky viewing dates will be posted on the Astro Web Page at http://physics.okstate.edu/shull/courses. Check it often! Copies of the free version of the textbook, course handouts and study aids are also downloadable from there. Note: This course does not use Desire2Learn (D2L).

Professor
Dr. Peter Shull
pos@okstate.edu
405-744-5785
Office Hours: in PS 150, TR 1:30p–3:00p, or by appointment

Teaching Assistants
The astronomy TAs' names, e-mail addresses, and office hour information are posted on the Astro Web Page. They are also available by appointment. They can help you with your weekly projects.

Sky Viewings
Optional sky viewings will be scheduled during the semester. Details will be announced in class and on the Astro Web Page.

Required Texts
Astronomy (FREE OpenStax textbook downloadable from the Astro Web Page) by A. Fraknoi, D. Morrison and S. Wolff et al. Optional: full-color, hardcover copies can be purchased for $58.00 new /$43.50 used from the OSU bookstore, which uses "OpenStax" as the author.
Exploring the Universe with Voyager 4, 2nd edition, by Monson and Shull. ISBN 978-1-4652-5528-0. Buy only a new copy of this workbook (removable pages). However, former ASTR 1023 (or 1024) students may use the copy they purchased then.

Books and Magazines of Interest
Norton’s Star Atlas, any edition (great star charts)
Observer’s Handbook 2017, ed. James Edgar (the year’s events)
Astronomy and Sky & Telescope (popular monthly magazines)
2 GRADING

Point Values
Up to 1000 points can be earned as listed below. Unannounced, extra-credit quizzes may be given from time to time. Note that we drop the lowest two projects.

- Comprehensive final exam: 300 pts
- 3 one-hour exams @ 150 pts each: 450 pts
- Top 10 of 12 weekly projects @ 25 pts each: 250 pts

Grading Scale
Semester grades will be assigned according to a point scale similar to the preliminary one below. These grade "floors" may be shifted slightly downward for fairness.

A: 750 pts  
B: 650 pts  
C: 550 pts  
D: 450 pts

Project and test scores are reported as percentages. It is easy to convert percentages to points. For example, 60% on a project equals $0.60 \times 25 \text{ pts} = 15 \text{ pts}$.

To predict your semester grade at any time, use the equation below to estimate your semester point total, then refer to the grading scale above.

\[
\text{Point prediction} = (\text{average project } \% ) \times (250 \text{ pts}) + (\text{average exam } \% ) \times (750 \text{ pts})
\]

For example, if your project average is 80% and your exam average is 60%, your point estimate is 650 points, which is a B. **Warning:** not doing any projects will typically yield a semester grade of D or F because the average exam score is about 60%.

Policy for Missed Projects and Exams
NO MAKE-UP OR EXTRA-CREDIT WORK OF ANY KIND WILL BE GIVEN. If you anticipate any problems not covered by the following provisions, see Dr. Shull in advance.

1. Your two lowest project scores, including zeroes, are automatically dropped.
2. Projects may be submitted early.
3. If a sudden emergency makes you miss an exam, contact Dr. Shull immediately. If you present documentation acceptable to him (such as a physician's note), your score for that exam will be set equal to the average of your other three exam scores. This can be done only once. Any additional missed exams will be assigned zeroes that will be included in the semester grade calculation.

3 EXAMS

Exams consist of multiple-choice questions evenly covering the relevant lectures. Some lecture topics are not in the textbook. The readings reinforce the lectures. **Hour exams** have 25 questions each. The **final exam** has 25 questions over the topics of the previous exams (their questions are not re-used), plus 25 questions over the newest topics. Exam dates are in the Course Schedule on page 7. Bring erasers and pencils to every exam.

A few questions on each exam may involve simple arithmetic or algebra, but calculators are neither necessary nor permitted. The Mathematics Learning Success Center (744-5818) on the fifth floor of the Edmon Low Library can help you. Or, just google math topics of interest.

For best results, **follow these study tips:**

1. Attend every lecture and **ask questions**. Some lecture topics are not in the textbook. Listening and taking notes by hand makes you learn better.
2. Study every day! Lectures only highlight course topics. It may help to write down in your notes the corresponding textbook page numbers. According to OSU’s academic regulations, you should devote six hours per week to studying for this course.

3. During the first week, read the "Chapter Outline" and "Thinking Ahead" sections at the beginning of each chapter we will cover. Skim each week’s reading assignment before Tuesday’s lecture. Read each assignment at least twice, including the illustrations, diagrams, and their captions. It is normal to have to read scientific material several times to fully comprehend it.

4. Use Voyager 4 to visualize and understand the astronomical phenomena we study.

5. Start studying for exams a week in advance. Cramming will not work. Look at the "Chapter Review" section at the end of each chapter. Some exam questions will require the recollection of facts. Others will require the application of what you understand about natural phenomena (i.e., the answers are not explicitly in your notes or text).

6. Sample exam questions can be downloaded from the Astro Web Page, as well as a list of lecture topics that will help you organize your notes. It also pays to figure out the correct answers to any questions you missed on previous exams.

7. Form a study group (via social media?) with classmates for studying and comparing notes. Copies of notes for missed lectures will not be provided.

8. Find OSU’s rules about academic integrity, dropping courses, and withdrawing from the university at http://academicaffairs.okstate.edu/content/resources-students.

4 VOYAGER PROJECTS

Read this entire section (pages 3–6) before doing your first project! All projects utilize the Voyager 4 sky simulator program, which is accessible in these OSU computer labs:

(1) Classroom Building CLB 407–408
(2) Mathematical Sciences MS 108
(3) Kerr-Drummond mezzanine
(4) Physical Sciences PS 102

General Project Information
1. Each week you will complete one Project Report in Exploring the Universe with Voyager 4. They are not always due in numerical order! The pages are perforated for easy removal. Reports are due by the beginning of class on the dates listed in the schedule on page 7. You may submit Reports ahead of time. If Project 3 is due this semester, start early on it, because it requires observing the sky!

2. Do the projects on your own schedule. Labs are usually open every day, as posted weekly at each lab’s entrance. The MS 108 and K-D labs are always open.

3. Voyager 4 orientation will be held in class on the date listed in the Course Schedule.

4. For all Projects involving Stillwater locations: Stillwater is listed on the pull-down menu for the "Chart/Set Location..." command.

5. If you have already taken ASTR 1023 or 1024, we will re-use your Project 1 and 2 scores. When Project 1 is due, submit a sheet of paper with your name, e-mail address, and a phrase like "Please re-use my Project 1 and 2 scores from the Spring semester of 20__."

6. Ask the TAs or Dr. Shull whenever you have questions about the projects. Any signs of copying, etc., on a project will lead to severe penalties (see Tip #8 above).
Computer Lab Information
1. The PS 102 lab has Mac computers, the others have Windows computers.

2. You may need your student ID card to enter the labs.

3. Knowing about Voyager 4 is not part of the lab monitors' duties. Contact Dr. Shull or a TA whenever you have questions concerning the program.

Starting Up the Voyager 4 Program
In case of computer hardware malfunctions, please advise the lab monitor, then go to another computer or lab.

OSU’s site license allows only 60 copies of Voyager 4 to run simultaneously.

To ensure the correct program settings are loaded, always launch Voyager 4 yourself.

Instructions for Mac computer lab:
1. Find one of the six computers nearest the door, labeled CHEM01–CHEM06.

2. Log in with your password and "O-Key Account Username". To find it, go to http://okey.okstate.edu.

3. If you have recently changed your password, a message window may appear about being unable to unlock your keychain. Just click on "Continue Log In". When another message window appears about wanting to use your login keychain, click anywhere on the desktop image, and wait for the Apple menu bar that runs across the top of the screen to appear (meaning you're logged in). Then...

   • Hold down option key and click on "Go" in the menu bar.
   • Scroll down to the "Library" item and click on it.
   • Look for the "Keychains" folder and click on it.
   • Move the items within that folder to the Trash folder (icon at lower left of screen). Do not empty the Trash.
   • Restart the computer (use the menu bar's Apple icon at top left) and log back in.
   • Use the "Finder" menu in the menu bar to empty the Trash. Then you are good for 120 days at that one computer.

4. Click on the "Go" menu in the menu bar running across the top of the screen, then click on "Applications" menu item to open the Applications window.

5. Find and click on the "Voyager 4.5" folder. Then find and click on the "Voyager 4.5" icon (looks like Saturn) to start the program.

6. If a Voyager message window appears about updating things, click on "Cancel".

Instructions for Windows computer labs:
1. Find a Windows PC and log on to the IT computer network (a lab monitor can help).

2. Click on the Voyager 4 program icon on the desktop of the screen (looks like Saturn).

Printing Sky Charts
1. Exactly follow all the instructions in the section titled "Printing Sky Charts" on page 5 of Exploring the Universe with Voyager 4. You must use the "landscape" page layout to make the printout match the screen. Exceptions: For Projects 1, 7, 17, 18, 23 and 24, maps of the entire sky (round outline) may come out better with the "portrait" layout.
Mac users: In the Print Manager window that appears, ignore the message about page charges; just click the Print button in that window. There will be no charges.

2. If your output doesn’t seem to appear at the printer, make sure you are checking the correct printer, and that it is working. Again, the lab monitor can help.

3. You may occasionally find it convenient to save your sky charts as PDF files that you can copy to a jump drive and print out later. This can also be useful for printout that does not come out looking exactly the way you want it to.

Mac users: click the PDF button in the window that opens when you issue the "Print Sky Chart..." command.

Windows users: issue the "Print Sky Chart..." command, then select "PDF Creator" from the printer list near the top of the window that opens.

4. Windows users only:

TIP #1: Before printing a Sky Chart, click the "Reduce Down" button at the top right of the window (immediately to the left of the red and white close button) to make it smaller. This seems to help keep the program from crashing (due to network overload) when you make a printout. Click the button again to restore the window’s original size.

TIP #2: To print the charts generated by the "Print Satellite Map...", "Print Solar Neighborhood...", and "Print Binary Orbit..." commands in Projects 13, 19, and 21, respectively, do the following:

• Press the "Screen Print" button (often ScrPnt) near the keyboard’s top right corner to copy the screen.
• Create and open a blank Word document file.
• Right-click on the open Word document to see a list of options that includes a Paste option. Click that to paste the screen copy into the document.
• Print the Word file.

Shutting Down the Program

Mac users: Log out via the Apple icon menu at the left end of the top menu bar.

Windows users: Log out via the "Start" button at the lower left of the screen. Use the "Switch user" choice. The lab monitor can show you how.

Rules for Doing the Projects

1. Always work independently. Never copy someone else’s work, data, cursor readings, etc. Do all your work yourself. When in doubt, consult an astronomy TA or Dr. Shull.

Exception: it is all right to show a classmate how to do a general task, or to explain a scientific principle. For example, it’s okay to help someone learn to print a star chart or understand equatorial coordinates. However, do not use a Project’s actual situations or numbers when doing so. List on your Reports the names of any people who helped you.

2. Submit only the perforated Project Report pages from your project book and any required printouts. Submissions not using the Report pages from your project book will not be graded (photocopying them is illegal). Do not e-mail scans/photos of your report pages!

3. On the front of every Report, below your name, copy or paraphrase the "Goal" from the first page of the Project.
4. Staple Report pages in order, printouts last. Points may be deducted otherwise.

5. Show all calculations, even simple ones. Write in the margins if you need extra space. Answers not showing the supporting math, even if correct, will receive zeroes.

6. In the "Conclusions" section, use a few complete sentences to briefly describe what you learned. Grading criteria are primarily spelling and grammar.

7. Write legibly, especially your name. The easier your Report is to read, the more generously the TAs will grade! It is good practice to initially write your answers on scratch paper, and later transfer them to the Report.

8. Express yourself clearly. Answers that cannot be easily understood will receive zero credit. You may use clearly labeled graphs and drawings.

9. Don't procrastinate! Take time to enjoy your work, and protect yourself from unexpected problems. Check lab hours in advance of holidays to avoid surprises.

10. Please advise Dr. Shull if you have a medical condition, e.g., color blindness, that may adversely affect your ability to do certain Projects.

5 ASTRONOMY WEBSITES OF INTEREST

Visit the sites below for the latest images of astronomical objects. You can also google the names of specific objects, observatories, and space missions.

- Hubble Space Telescope: http://heritage.stsci.edu
- National Optical Astronomy Observatory: http://www.noao.edu/image_gallery
- European Southern Observatory: http://www.eso.org/public/images


Find information on careers or summer jobs in astronomy at the American Astronomical Society’s website: http://aas.org.

6 TAKE ASTR 1023 IN A FUTURE SPRING SEMESTER!


ASTR 1013 and ASTR 1023 both...

- meet TR in PS 141 (but ASTR 1023 meets at 2:00p–3:15p)
- use the same two books
- carry 3 hours of general education "N" credit
LECTURE TOPICS, READING, AND IMPORTANT DATES

Abbreviations: Ch 2.4 means Chapter 2, Section 4

The projects are not always due in numerical order, and sometimes there are gaps!

Reading for this week: Ch 1.1–1.3, 1.5–1.9, 2.3
Aug 22  #1  Cosmic Overview; the Nature of Science
Aug 24  #2  What Science Isn’t; How to Use the Voyager 4 program

Reading for this week: Ch 1.4, 2.1, 4.1–4.4
Aug 29  #3  The Terrestrial Globe; Days & Years; Handling Big Numbers
Aug 31  #4  Neat Math; Celestial Coordinates; Seasons & Precession

Reading for this week: Ch 2.2, 4.5–4.7
Sep 05  #5  Astronomical Influences on Climate; Planetary & Lunar Motions; Tides
Project 1 due: Introduction to Voyager 4
Sep 07  #6  Lunar & Solar Eclipses; Early Models of the Solar System

Reading for this week: Ch 2.4, 3.1–3.5, 5.1–5.2, 6.1–6.2, 6.6
Sep 12  #7  Modern Models of the Solar System; Newton’s Laws
Project 2 due: Celestial Coordinates
Sep 14  #8  Newton & Orbits; Light & Telescopes

Reading for this week: Ch 6.3–6.4
Sep 19  #9  Observing with the Eye, Binoculars & Telescope; Telescope Instruments
Project 4 due: Motions of the Sun
Sep 21  #10  Radio Telescopes & Interferometers
Exam on Lectures 1 – 8

Reading for this week: Ch 5.2–5.6, 6.5, 11.1
Sep 26  #11  Flying Telescopes; Space Probes; Atoms & Light; Continuous Spectra
Project 5 due: Phases of the Moon and Planets
Sep 28  #12  Line Spectra; Uses of Spectra in Solar-System Astronomy

Reading for this week: Ch 7.3–7.4, 14.3–14.5, 15.1–15.4, 21.3–21.6
Oct 03  #13  The Quiet & Active Sun
Project 6 due: Retrograde Motion
Oct 05  #14  The Sun’s Effects on Earth; Clues About the Solar System’s Formation

Reading for this week: Ch 8.1–8.4; review Ch 7.4, 14.3–14.5, 21.3–21.6
Oct 10  #15  Formation of the Solar System; Earth’s Early History
Project 7 due: Maybe Ptolemy Wasn’t So Wrong!
Oct 12  #16  Earth as a Planet; Human Effects on Earth’s Atmosphere
Oct 17  #17  Some Planetary Physics  
Oct 19  Exam on Lectures 9 – 15  
Oct 24  #18  The Moon and its Strange Origin; Overview of the Terrestrial Planets  
Project 8 due: Seasons  
Oct 26  #19  Mercury, Venus & Mars  
Oct 31  #20  Jupiter and its Moon Systems  
Project 9 due: Planetary Alignments  
Nov 02  #21  Jupiter’s Large Moons; Overview of the Jovian Planets; Saturn  
Nov 07  #22  Uranus & Neptune; Kuiper Belt Objects  
Project 10 due: Lunar Eclipses  
Nov 09  #23  Asteroids & Comets  
Nov 14  #24  Meteoroids; Past Collisions of Asteroids with Earth  
Project 11 due: Solar Eclipses  
Nov 16  #25  Effects of Asteroid Impacts on Earth  
Exam on Lectures 16 – 23  
Nov 21  #26  The Origin and History of Life on Earth  
Project 12 due: The Galilean Moons of Jupiter  
Nov 23  Thanksgiving Holiday  
Nov 28  #27  Life Elsewhere in the Solar System; Asteroid Detection and Defense  
Project 14 due: Rendezvous with Comet Halley  
Nov 30  #28  Solar and Human Influences on Earth’s Fate  
Dec 05  #29  Interplanetary Travel  
Dec 07  #30  The Colonization and Terraforming of Mars  
Dec 08  Last day to resolve grading-related issues  
Dec 12 (Tue)  Comprehensive Final Exam  (PS 141, 10:00a–11:50a)  
See the "Exams" section on page 2 for more information.