Course Description: Demonstration of astronomical principles through observations with astronomical instruments and analysis of astronomical data. A nighttime field trip to Mount Laguna Observatory is required.

What you need for this class:
- Pencil or pen
- Scientific calculator
- Astronomy 109 Lab Manual ($30 at the SDSU Bookstore)

Instructor: Eliot Vrijmoet
vrijmoet@rohan.sdsu.edu
Instructor's Office: PA-228
Course Websites:
http://blackboard.sdsu.edu
http://www-rohan.sdsu.edu/~pautzke/a109/index.shtml

Help Room Hours with me are held in PA-215A on:
- Tuesdays from 1 PM - 2 PM
- Thursdays from 11 AM - 12 PM

Questions?
Feel free to come to my help room hours, e-mail me, or drop by my office anytime. We can discuss a lab, astronomy, problems in physics—you name it!

What will happen in each class:

1. At each class meeting, you will complete an assigned lab from the Astro 109 Lab Manual. Read the assigned lab before class!

2. You may work on the lab either by yourself or with a partner or two, but everything your turn in must be written in your own words. If you have a partner or partners, put their name(s) on your lab paper.

3. Complete the lab on a separate piece of paper or in your lab notebook (rip the pages out to turn them in). Write legibly and show all steps in your calculations, or you won’t get full credit!

4. Write a one-paragraph conclusion briefly explaining/summarizing the background astronomy or science concepts this lab required, and how you used these concepts when doing the lab activities. (Hint: This means the stuff in the lab intro)

5. Labs are due 24 hours after the lab period begins (9 AM on Wednesday).

Late Work Policy: Late labs may be turned in up to 48 hours after the lab was officially due (this means by 9 AM Friday morning). I will not accept them after that time.

Late labs lose 20% (10 points) for being late!
Grading Breakdown:

→ Each lab is worth 50 points. Your score is based on:
  • Accuracy of your answers and responses.
  • Showing your work (no steps = no partial credit!)
  • Neatness and organization.
  • Final answers must include units.
    (e.g., write “10 years” instead of just “10”)
  • Detail and completeness of your one-paragraph lab conclusion.

→ At the end of the term, I will drop your lowest lab score so it no longer counts towards your final grade.

→ Punctual attendance is mandatory. If you are consistently late to class, I will deduct points from your final grade. If you are absent more than 3 times, you will automatically receive an F in the course. All missed labs are automatic zeroes. No make-up labs.

→ The “Astronomy Picture of the Day” Project will be worth 100 points total. Here is a brief overview of the project:

2. Research your picture (e.g. What does it show? How does that occur in nature? How was the image captured or created?).
3. Write a paper (about 1000 words) describing what you learned from your research. This paper is worth 70 points.
4. Give a 5-minute presentation to the class about your picture and what you learned. This presentation is worth 30 points.

Please see Lab 10 in the Astro 109 Lab Manual (pg 79) for a complete description.

→ Finally, there is one required field trip to Mount Laguna Observatory (a.k.a. “MLO”).

Schedule of Assigned Labs: (*subject to change at any time!*)

August 25 ........ Lab 1: The Size of the Earth
September 1 .... Lab 2: The Rotation of the Sun
September 8 .... Lab 15: The Moon
September 15 ..... Lab 3: The Celestial Sphere
September 22 .... Lab 4: Kepler's First Law and Elliptical Orbits
September 29 .... Lab 5: Kepler's Third Law and Jupiter's Moons
October 6 ....... Lab 6: Measuring Distance with Parallax
October 13 ............ MLO Field Trip! (weather permitting)
October 20 ....... Lab 7: An Exploration of Light and Atoms (MLO backup)
October 27 ....... Lab 8: A Universe of Galaxies and Dark Matter
November 3 ...... Lab 9: The Age of the Universe
November 10 .... Lab 11: Telescopes
November 17 .... Lab 12: The Hertzsprung-Russell Diagram
November 24 .... Lab 14: Distances to Cepheid Variable Stars
December 1 ...... TBD
December 8 ............ APOD Presentations!
The Role of Astronomy 109 in San Diego State University’s General Education Program:

This course is one of nine courses that you will take in General Education Foundations. Foundations courses cultivate skills in reading, writing, research, communication, computation, information literacy, and use of technology. They furthermore introduce you to basic concepts, theories and approaches in a variety of disciplines in order to provide the intellectual breadth necessary to help you integrate the more specialized knowledge gathered in your major area of study into a broader world picture.

This course is one of four Foundations courses that you will take in the area of Natural Sciences and Quantitative Reasoning. Upon completing Natural Science Foundations courses in physical sciences, life sciences, and a lab, you will be able to: 1) explain basic concepts and theories of the natural sciences; 2) use logic and scientific methods to analyze the natural world and solve problems; 3) argue from multiple perspectives about issues in natural science that have personal and global relevance; 4) use technology in laboratory and field situations to connect concepts and theories with real-world phenomena. Upon completing a Foundations course in Quantitative Reasoning you will be able to: 1) apply appropriate computational skills and use basic mathematical concepts to analyze problems in natural and social sciences; and 2) use methods of quantitative reasoning to solve and communicate answers to real-world problems.

Student Learning Objectives:

Upon completing this course, students should be able to:

1. Explain the process by which humans first correctly deduced the size and shape of the Earth.
2. Perform research into an astronomical topic and relate information concerning it in both an oral presentation and a written paper.
3. Persuasively argue for or against a scientific theory after testing its foundations through experimentation.
4. Describe the phases of the moon, and explain why the moon can not always be seen at night.
5. Apply scientific problem solving abilities to other academic areas.
6. Determine their rough latitude on Earth’s surface at any time through careful observation of the nighttime sky.
7. Convince a fellow student who has never taken an astronomy class that it is possible to determine the precise distance to a nearby star through the careful analysis of its location in the sky over the course of a year.
8. Present the currently favored scientific theory for what the ultimate fate of our universe will be, and outline the astronomical observations upon which the theory is based.
9. Read and comprehend articles concerning astronomy that appear in the popular press, and participate in discussions about them.
10. Describe at least three major areas in which our astronomical knowledge is known to be incomplete.
Cheating and Plagiarism Policy:
Consistent with University policy, cheating and plagiarism are not tolerated in Astronomy 109. As defined by SDSU’s General Catalog, “Plagiarism is formal work publicly misrepresented as original”. Plagiarism and cheating are theft. Remember: While you are encouraged to work together on laboratory assignments, *the words that you write in your lab reports must be your own*. If you copy more than 4 words in a row from any source (including any source on the World Wide Web, or your lab partner!) and do not properly reference that source (i.e., put the words in quotes, with proper citation), then you are committing plagiarism.

If plagiarism or cheating are deemed to have occurred on a lab report or project, the following steps will be taken:

1. A “0” will be recorded for the assignment grade.
2. An “Academic Dishonesty Incident Report” will be submitted to the Center for Student Rights and Responsibilities. This action is *required* by Executive Order 1006, which “mandates faculty to report all incidents to the Center for Student Rights and Responsibilities”.
3. The incident will then be investigated by the Student Conduct Administrator, who “determines whether it is appropriate to charge a student with violation of the Student Conduct Code” (from Executive Order No. 1043, of August 3, 2009). Details on the judicial process (and the potential results, including “severance from the University”) can be found at the Center for Student Rights and Responsibilities web page: [http://csrr.sdsu.edu/index.html](http://csrr.sdsu.edu/index.html).

Students with Disabilities:
If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at (619) 594-6473. To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that accommodations based upon disability cannot be provided until you have presented your instructor with an accommodation letter from Student Disability Services. Your cooperation is appreciated.

Classroom Safety:
For all information concerning safety in the classroom, please read the information contained at San Diego State University’s “Emergency Preparedness” website: [http://bfa.sdsu.edu/emergency/](http://bfa.sdsu.edu/emergency/).
Field Trip to Mount Laguna Observatory:

- **Trip Information:** As part of Astronomy 109, students are required to attend a field trip to San Diego State University’s Mount Laguna Observatory (MLO), a professional astronomical observatory at which SDSU’s faculty and students conduct astronomical research. MLO is located in the Cleveland National Forest, about 1 hour east of SDSU’s campus. Attending the field trip is a requirement for the course, and students are responsible for their own transportation. Participants are required to be registered SDSU students or appointed faculty or staff. Prior to attending the field trip, all attendees must fill out and sign the “Warning, Waiver, and Release of Liability” form contained in the back jacket of the Lab Manual, and turn it in to the lab instructor. Additional information about the trip is contained in the Lab Manual, on the form “Mount Laguna Observatory Field Trip Potential Risks and Dangers” that is tucked into the back jacket of the manual.

- **Purpose of trip:** While at MLO, students will have the unique opportunity to see deep space objects through a large telescope, and observe the night sky from a very dark location.

- **Instructional outline of trip:** Students assemble in the parking lot of MLO at the time and date indicated by the lab instructor. A Teaching Associate will walk students up to the Visitor’s Telescope, where they will be able to view deep-sky objects. There will be at least two Teaching Associates available to assist students. While waiting to look through the telescope, additional activities may be provided to students by the Teaching Associates (e.g., finding constellations, identifying the Milky Way, observing planets, spotting satellites, etc.). At the conclusion of the telescope viewing, all students will be escorted down to the parking lot by a Teaching Associate, where they are to leave the Observatory. No students may remain at MLO after the Teaching Associates have departed.

- **Health and safety instructions:** MLO is considered an extension of the main SDSU campus; hence, the SDSU Student Code of Conduct applies at MLO, and MLO is a drug and alcohol-free workplace. Students are to bring a small flashlight, and are to remain on designated paths and roads at all times. Personal injury from falls, or scrapes and cuts from tree limbs and brush, can easily result from taking cross-country shortcuts. It can get quite chilly up at the Observatory in the evenings, and so all students are advised to dress very warmly—e.g., heavy jacket, long pants, socks and shoes (open-toed shoes are strongly discouraged); gloves and a hat are also recommended. Smoking and campfires are prohibited. Additional safety instructions are found in the “Mount Laguna Observatory Field Trip Potential Risks and Dangers” form that is tucked into the back jacket of the lab manual.

- **Emergency contact information:** SDSU public safety — (619) 594-1991.