

# ASTR 110: SURVEY OF ASTRONOMY

## COURSE SYLLABUS

**Instructor:** Geoff Mathews  
**Email:** mathewsg+ASTR110@hawaii.edu  
**Office:** Watanabe hall, room 402  
**Hours:** Mon. 12:00 PM – 1:00 PM;  
Wed. 1:00 PM – 2:00 PM

**Assistant:** Jia Qi  
**Email:** jqi@hawaii.edu  
**Office:** Watanabe hall, room 403  
**Hours:** TBD

Please start email subject line with [ASTR 110 - 9:30]

The general Astronomy TA pool staffs Watanabe room 403. A link to their hours will be posted on the Laulima site for this course ([laulima.hawaii.edu](http://laulima.hawaii.edu)).

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### Class Details

**Semester:** Fall, 2015  
**Meeting Time:** MWF, 9:30-10:20  
**CRN:** 77661

**Room:** Watanabe hall, room 112  
**Dates:** August 24 – Dec 10, 2014  
**Final:** Dec. 18, 9:45 – 11:45

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### Course goals

The primary goals of this course are for you to be able to:

- (1) describe the basic structure and behavior of the universe across all scales
- (2) explain how we know what we know about the universe
- (3) assess new information about astronomy from the media

### Materials

- *Class website at <http://laulima.hawaii.edu>* (class notes, announcements, grades)
- *Mastering Astronomy* online homework service. When registering, you must give the correct course code: MATHEWS2015F. Access to *Mastering* is available:
  - (1) as part of bundle at UHM bookstore, or
  - (2) online at <http://masteringastronomy.com> (you must select the correct textbook: *The Cosmic Perspective Fundamentals 2<sup>nd</sup>* ed. by Bennett et al.)
- *Textbook: The Cosmic Perspective Fundamentals 2<sup>nd</sup>* ed. by Bennett et al. Available:
  - (1) as part of bundle at UHM bookstore, or
  - (2) online at <http://masteringastronomy.com> when purchasing access to *Mastering*.
- *In-class workbook: Lecture Tutorials for Introductory Astronomy*, 3rd edition by Prather et al. Available:
  - (1) as part of bundle at UHM bookstore, or
  - (2) from various retailers

### Important dates

- August 24 - first day of instruction
- August 31 - last day to drop course without a "W"
- September 1 - last day to add a course or change a grading option
- September 7 - holiday, Labor Day
- October 24 - last day to drop a course with a "W"
- November 11 - holiday, Veterans' Day
- November 25 - last day for exams before finals
- November 26, 27 - holiday, Thanksgiving
- December 10 - last day of instruction
- December 18, 9:45 a.m. - final exam

### Approximate Course Calendar

This **approximate** course calendar is subject to change, based on class pacing.

- Week 1, Aug. 24, 26, 28:** The scale of the universe; astronomy as a time machine (Ch. 1)
- Week 2, Aug. 31, Sept. 2, 4:** Patterns in the night sky, and the seasons (Ch. 2)
- Week 3, Sept. 9, 11:** From an Earth-centered to a sun-centered model (Ch. 3)
- Week 4, Sept. 14, 16, 18:** Measuring the universe I (p. 97, 80, 184, 132)
- Week 5, Sept. 21, 23, 25:** Measuring the universe II (p. 132, 116, 199-201)
- Week 6, Sept. 28, 40, Oct. 2:** Telescopes; Solar system formation (p. 43, Ch. 4)
- Week 7, Oct. 5, 7, 9:** Learning about Earth by studying Rocky Worlds (Ch. 5)
- Week 8, Oct. 12, 14, 16:** Gas giants and solar system leftovers (Ch. 6)
- Week 9, Oct. 19, 21, 23:** Midterm 1; Planets planets everywhere! (Ch. 7)
- Week 10, Oct. 26, 28, 30:** Properties of stars (Ch. 8)
- Week 11, Nov. 2, 4, 6:** Stellar life and death (Ch. 9 & 10)
- Week 12, Nov. 9, 13:** Determining the properties of Galaxies (Ch. 11.1)
- Week 13, Nov. 16, 18, 19:** Dark matter (Ch. 11.3, 14.1, 11.2)
- Week 14, Nov. 23, 25:** Expansion of the Universe (Ch. 12)
- Week 15, Nov. 30, Dec. 2, 4:** Formation of the Universe; Astrobiology (Ch. 13, 15)
- Week 16, Dec. 7, 9:** Where are the aliens? (Ch. 15)

### Course Description

**Overview.** The aim of this course is to give you an understanding of the process of science and an appreciation of the science of astronomy. Instead of focusing on learning a long list of facts (that is what Google is good for), in this course we will focus on developing a conceptual understanding of how astronomers deduce the properties of objects throughout the universe. This will allow you — and hopefully inspire you — to view the sky and read about new astronomical discoveries with a new depth of understanding, appreciation and insight.

**Active Learning.** This course is taught in an active learning style that is based on short lectures infused with collaborative tutorials, questions and discussions that are carried out within small groups or with the class as a whole. This active learning environment (also known as inquiry-based learning or peer-centered learning) has been proven in numerous studies in both physics and astronomy to lead to a much greater understanding of the concepts than even the most engaging traditional lecture. The four-word summary of this approach is this: **you learn by doing.**

**"Flipped" Classroom.** In order to spend class time engaged in active learning, information must be acquired before scheduled classes. Therefore, there will be required reading each week, and you will be tested on the basic facts from that reading *before* class.

**Time Commitment.** The university expects students to spend 2–3 hours outside of class for each hour in class carrying out coursework, including reading, assignments, and studying. This is based on the important principle that **you learn by doing**. The more time you spend working with and thinking about the course, the more you will learn.

**Physical Sciences Diversification credit.** ASTR 110 satisfies the requirements of the Physical Sciences Diversification, provided you earn a D or higher (may vary with some departments). This requirement serves to ensure that all students gain some understanding of the basic physical principles by which the universe operates, as well as gaining some practice with scientific reasoning.

### Learning Goals

The following outlines the "big picture" concepts that you should understand by the end of this course. Some of these are specific to astronomy, some are broader understandings of the nature of science and how we discover how the universe works, and others are reasoning skills that are broadly applicable.

- Astronomy specific understandings
  - Space is big. Very, very big.
  - The objects of study in astronomy have properties far outside the range of our day-to-day experiences.
  - Our knowledge about the universe outside of Earth comes from collecting light (i.e. making observations with instruments attached to telescopes).
  - A handful of basic concepts govern the behavior of the universe (e.g., gravity explains the motion of planets and the motion of galaxies).
  - We see objects as they were in the past - the further away we look, the further back in time we look, as well.
- The process of science
  - We interpret our observations using the same physics and chemistry we use to understand phenomena here on Earth (i.e., the laws of physics are the same everywhere)
  - We constantly strive to develop conceptual and mathematical models that explain past observations and correctly predict future ones.
- Critical thinking tools
  - Perspective matters (both figuratively and geometrically).
  - Scale models help us comprehend quantities outside our day-to-day experience.
  - Understanding cause-and-effect can help you predict outcomes of actions, and leads to better decision making.
  - Mathematical models allow one to succinctly state and make use of the relations between concepts.

**Institutional Learning Objectives.** The course outcomes are aligned with the University of Hawaii's Institutional Learning Objectives for Undergraduate Students (<http://manoa.hawaii.edu/ovcaa/ilo/>). This course:

- gives a general understanding of how the universe works and our place in it (objective 1a),
- provides continuous practice with critical and creative thinking: solving challenging and complex problems, applying questioning and reasoning, generating and exploring new questions, information literacy, and mathematical reasoning (objective 2a),
- integrates in-class collaborative work to practice and extend the concepts covered in class (objective 2c), and
- provides a sufficient basic understanding of astronomy to allow you to understand and place in context new discoveries presented in the popular literature, and cultivates the supremely important habit of asking, "What is the evidence for that claim?" (objective 3a).

## Grading

### Traditional ABCDF scale (90%, 80%, 70%, 60%, less than 60%)

Pre-reading — 20% (once started, must be completed in 30 minutes; 1 attempt per question)

Homeworks — 20% (-10% per day late, maximum penalty of -50%; 3 attempts per question)

In-class activities — 20% (no make-ups; 3 missing = -1 subgrade e.g., A to A-)

Midterm Exam — 20%

Final Exam — 20%

**Pre-reading.** Each week, I will post 5–15 multiple choice questions on **Mastering Astronomy** to evaluate your understanding of the key points of the reading. Once begun, you have 30 minutes to complete the questions, and each question may be attempted only once. This is designed to encourage careful reading of the chapters, while giving enough time to double check material before answering.

At the start of the semester, all questions will be based entirely on the reading. Over the course of the semester, I will gradually add questions that require you to apply key astronomical concepts to extend what you have read.

**Pre-reading will be due midnight each Sunday, with no late work being accepted.**

**Homework.** Each week, there will be a homework assignment. Assignments will become available on Wednesday evenings, and will be due in TWO Sundays at midnight (for example, Assignment 1 will become available on August 26 and will be due at midnight on September 8). You lose partial credit for each wrong answer submitted (3 attempts allowed). **Late assignments lose 10 percentage points for each day after the due date, to a maximum reduction of 50%.**

**In-class activities.** The active learning environment requires class participation in group or pair discussions and tutorials. During most classes we will complete and discuss a lecture tutorial. I will collect your tutorial each class, and will spot grade one item. Each activity will have a grade of 0 (no assignment), 1 (graded item not reached), 2 (graded item attempted, but wrong), or 3 (basically correct). Furthermore, at least one item from each in-class activity will be used as the basis of an exam question.

**Exams.** There will be a midterm and a final exam. The midterm exam will be given approximately 1/2 way through the course. The final will be cumulative but about 2/3 of questions will focus on material covered in the second half of the course.

### Course Policies

- **Academic Honesty:** Putting ideas or descriptions in your own words helps you to identify which areas you don't understand and helps you learn how to communicate astronomy with your peers. Furthermore, the University of Hawaii has very strict plagiarism rules and I am required to check all assessment items for plagiarism. Plagiarism can result in you being removed from this course, suspension or expulsion from UH Mānoa.
- **Common courtesy guidelines:** These guidelines are self-explanatory and are for the benefit of the entire class:
  - Be on time
  - Turn off **ALL** cell phones, laptops, ipods, etc.
  - Laptops are detrimental to active learning and are not allowed in this active learning class.
  - Be kind and respectful of your classmates and instructors.
- **Class pair and group activity guidelines:** During pair-based or group activities in class, you are expected to follow six guidelines. These guidelines are similar to expectations of behavior in meetings and team projects in the workplace.
  - **Read:** Come to class prepared to discuss the reading and homework material
  - **Risk:** Be open with your opinions and your questions. Listen to and encourage everyone's ideas so that they can take risks, too.
  - **Relax:** Don't take criticism of your own ideas personally. Change your mind when evidence shows that you should.
  - **Respect:** Act toward your peers as you would have them act towards you. Be civil, be charitable.
  - **Reason:** Play the skeptic, but be critical of reasoning, ideas, and data, not of people. Consider the extreme cases to try to understand the underlying principles.
  - **Restate:** Try to paraphrase another's explanation if it is unclear to you. Try to put them together in a way that makes sense. Focus on coming to the best possible answer as a group.
- **Mastering Astronomy:** You will have received the Mastering Astronomy access kit with your textbook package. You will need to go to the Mastering Astronomy website and sign up so that you can access the post-class and pre-reading questions, the homework assignments (see the Mastering Astronomy access handout attached or the class website), and use the tutorial resources. Technical problems with Mastering will not excuse assignments – you have access to computers in the libraries and computer labs.

### Tips for doing well in class

- **Attend the lectures.** Lectures have many in-class questions, collaborative discussions and tutorials. Answers are not necessarily given in the lecture notes. Exams and homeworks are based on the lecture material. Your success in this class depends on and is enhanced by your active participation in class.
- **Come prepared.** Bring a writing implement and paper or a notebook for taking notes.
- **Get help early.** If you are confused by aspects of the coursework or you feel that you are falling behind, come and see us immediately. No matter what is causing the difficulty, we are willing to work with you to help you succeed
- **Don't Procrastinate.** Start the homework assignments early. If you leave them to the last minute, you won't be able to take the time needed to deeply understand the material, nor get help should you need it. To avoid losing points, turn in work when it is due.

# Get Started with Pearson's MasteringAstronomy

## First, make sure you have these 3 things...

**Email:** Please use your UH Manoa @hawaii.edu address.

**Course ID:** MATHEWS2015F

**Access code or credit card:** The required access code comes either with your book or by itself at your bookstore. Alternatively, you can buy instant access with a credit card or PayPal account during registration.



## Next, get registered!

1. Go to [www.masteringastronomy.com](http://www.masteringastronomy.com). Under the large **Register Now** section on the right side of the page, click the **Student** button.
2. Read the onscreen instructions and select your location. Next, check off whether or not you have a **Course ID**. If you have a **Course ID** code provided by your instructor, type it in and Click **Go**. If your course does not require an ID, Click on that radio button next to it and Click **Next**. Check with your professor to be sure.
3. You will now need to enter your **Access Code** that may have been included with your textbook or student access card available from your campus bookstore.
4. If you don't have an access code, select your textbook (**Cosmic Perspective Fundamentals, 2<sup>nd</sup> edition**, by Bennett et al.) and whether you want an eText.
5. You'll then be asked to **Accept** the License Agreement before moving on. After this, either **Create** a new Pearson username/password, or, if you've already registered for another Pearson product (e.g. MyMathLab), enter that username/password. If you have an **Access Code**, enter it on the bottom of the page.
6. On the next page, fill out the appropriate information fields then click **Next**. If you entered an **Access Code**, you will be brought to a page from which you can access your product. If not, enter your payment information so that you can **Purchase Access**, after which you'll be granted access.
7. You are now registered! Now, it's time to enroll in your course. Click **Log In Now**. Once signed in you can: enter your **Course ID** (same as Step #2) and your **Student ID** (if prompted to do so). That's it!

## Need help?

Visit [www.masteringastronomy.com](http://www.masteringastronomy.com) for:

- Helpful videos
- Frequently Asked Questions
- Set Up Your Computer

Or visit our 24/7 Technical Support site at <http://247pearsoned.custhelp.com>