### ASTR 110  INTRODUCTION TO ASTRONOMY

CRN 63095, Credits: 3  
MW 9:30 AM-10:45 AM, Imiloa 133

**INSTRUCTOR:**  Marvin Kessler  
**OFFICE:**  Hale Imiloa 136  
**OFFICE HOURS:**  MW, 9:00 AM-9:30 AM; 12:30 PM-1:30 PM  
**TELEPHONE:**  222-6573  
**EMAIL:** mkessler@hawaii.edu  
**EFFECTIVE DATE:**  Fall Semester, 2011

---

**WINDWARD COMMUNITY COLLEGE MISSION STATEMENT**

*Windward Community College offers innovative programs in the arts and sciences and opportunities to gain knowledge and understanding of Hawai‘i and its unique heritage. With a special commitment to support the access and educational needs of Native Hawaiians, we provide O‘ahu’s Ko‘olau region and beyond with liberal arts, career and lifelong learning in a supportive and challenging environment — inspiring students to excellence.*

---

**CATALOG DESCRIPTION**

Introduction to the astronomical universe for non-science students. (3 hrs. lect.)

**Activities Required at Scheduled Times Other Than Class Times**

One Star-Gazing show at the Imaginarium. These shows are held at 7:00 PM on the second Wednesday of each month. Substitution is permitted if student is unable to come at that time because of work commitment or similar serious impediment. Substitution must be approved by instructor.

---

**STUDENT LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

- Outline the development of astronomy from ancient times to present and explain the role of the scientific method in this historic context.
- Describe and explain the apparent motions of the celestial bodies, especially as related to naked-eye observations.
- Identify the appropriate instruments used by astronomers to understand the universe.
- Outline the origins of our solar system and appraise the leading cosmological theories of the origin of the universe.
- Describe the physical and chemical properties of the objects in our solar system and apply the concept of comparative planetology.
- Describe the physical and chemical nature of stars, and especially our sun, and apply the astronomical techniques used to measure stellar properties.
- Outline the evolutionary stages in a star's life and compare and contrast the structure of our Milky Way and other galaxies.
- Apply astronomical concepts to the search for extraterrestrial life.
COURSE TASKS

1. Division of time
Class on Monday will be devoted to lecture and assignments. Important sections of the textbook also will be highlighted. The focus of this first class of the week will be to listen, take direction, and read. Between Monday and Wednesday the student should read the assigned pages of the textbook, outline them, do the homework, and answer the pertinent quizzes at the end of the chapter.
Class on Wednesday will be devoted to reports by students on the assignments that were given on Monday. Extensive use will be made of the workbook, Lecture Tutorials for Introductory Astronomy. There will be use of dyads and small groups for discussion. This is a day that will focus on active learning. At the end of the class there will usually be time to write a “one minute paper” or take a short quiz, which will be handed in to the instructor. Some of these will be used for grading. Students will be informed in advance if the paper or quiz will be graded.

2. Audio-Visuals
Several videos will be shown to the class. These videos are chosen for their excellence of presentation and accuracy. The Imaginarium will be used to demonstrate the motion of the stars and the arrangement of constellations.

3. Participating
Students are expected to participate fully with the instructor and their classmates through lecture-tutorial exercises, asking questions in class, and contributing to discussion.

4. Reading
The basic information source is the textbook (listed below). The class calendar (also listed below) gives dates on which each chapter of the textbook will be covered.

5. Calculating
Calculators are not required, but a ruler with both metric and English measurements on it will be needed. Calculators will be helpful for extra credit homework.

ASSESSMENT TASKS AND GRADING

1. There will be four open-notes tests, which will be given on the dates indicated on the class calendar. Each test will be worth 25 points, for a total of 100 points for the semester. These tests will be closely coordinated with the classroom discussion and assignments.

2. One Minute Papers will be worth 5 points each. There will be about five such papers. The purpose of these short essays is to help students formulate in their own words what they are studying. The papers will be written responses to discussion or a video.

3. Homework. Homework will be assigned on Monday and handed in at the beginning of class on Wednesday. The purpose of homework is to highlight important topics in order to assist students in their study. Late homework will not be accepted. Students who do not hand in homework on time are still expected to complete the homework as a preparation for tests. In general, mathematical problems will not be assigned.

3. Quizzes. There will be about five short quizzes, worth 5 points each, for a total of 25 points.
4. Attendance at one Wednesday evening Star Show in the Imaginarium will be obligatory. It will be worth 10 points. A brief report must be submitted within one week. In writing this report, use the form that is attached at the end of this syllabus. If the student cannot attend the Star Show because of work or other serious commitment, a substitute is available.

5. The Final Exam will be worth 75 points. It will cover select sections of the entire course. It will not be open-book. Study guide will be provided.

This adds up to a total of 235 possible points, as follows:

- Four Tests (25 points each) 100 points
- Five One Minute Papers (5 points each) 25 points
- Five Quizzes (5 points each) 25 points
- Wednesday Star Show 10 points
- Final Exam 75 points
- TOTAL 235 points

None of the quizzes or one minute papers may be taken late. The four 25 point tests may be taken late, only if Mr. Kessler is contacted the day of the test, and he agrees to this. This may be done by telephone (222-6573) or by email (mkessler@hawaii.edu). On tests, quizzes, and one minute papers the points earned will be reported to the student. At mid-term a letter grade will be given, and the final grade for the course will be a letter grade.

Correspondence between points and letter grade will be as follows:

- A- 90% to 100% of points,
- B- 80% to 89% of the points,
- C- 70% to 79%,
- D- 60% to 69%,
- F- 0 to 59%.

The grading standards given in the 2009-2011 Windward Community College Catalog, page 25, will be followed. The Catalog allows for other assigned grades. Students are encouraged to consult the instructor at any time about their grade. If a student wishes to be informed of his/her final grade in advance of the official posting of grades at the end of the semester, he/she should request this via email or should provide the instructor with a stamped, self-addressed postcard or envelope on the day of the Final Exam.

**LEARNING RESOURCES**

REQUIRED TEXT: *The Essential Cosmic Perspective, Custom Edition*, by Bennett, Donahue, Schneider, and Voit. This is a loose leaf printing of the book. It is identical in content to the bound fifth edition of the book.


WEBSITE: [www.masteringastronomy.com](http://www.masteringastronomy.com)
**Additional Information**

Students are strongly encouraged to spend time outside under the stars, identifying constellations, planets, the moon and their motions across the sky. There are some excellent applications that can be downloaded to smartphones and used for this.

Students also are encouraged to visit WCC’s AEROSPACE LAB, located in Hale Imiloa, Room 135. Besides a large collection of astronomy related resource materials which the student may borrow, there is a hands-on physical science museum. Phone 235-7321 for availability.

Students are directed to the IMAGINARIUM (planetarium) to avail themselves of the programs presented there on the second Wednesday of the month at 7:00 PM and the second Friday of the month at 7:00 PM. Reservations are recommended. Call 235-7433 for the Friday program and 235-7321 for the Wednesday program. Scheduled events are also listed on the college website.

Bundled with the textbook is Sky-Gazer, a CD-ROM that can be used as a planetarium in the student’s computer at home or at one of the campus computer labs. This CD has some animated graphics that help to understand seasons, eclipses, and retrograde motion.

Also bundled with the textbook is a folder that contains an access code to the textbook website, www.masteringastronomy.com.

- There is a table in the main hallway of Hale Imiloa that contains handouts (monthly star charts and astronomical events) and a list of internet sites for learning about constellations.
CLASS CALENDAR FOR FALL 2011

Week 1 August 22 and 24
   Chapter 2, Discovering the Universe for Yourself. Note: we are beginning with chapter 2, not with chapter one.
   Monday: Introduction to the course
   Review syllabus
   What would you most like to learn from this course?
   Assigned homework from chapter 2
   Wednesday: go over homework
   Video: “Wonders of the Solar System: Aliens”

Week 2 August 29 and 31
   Continue chapter 2.
   Monday: Assignment of new homework.
   Lecture on: (1) Daily versus Annual Motion, (2) Seasons
   Wednesday: Go over homework.

Week 3 September 5 and 7
   Monday is Labor Day, a HOLIDAY.
   Wednesday: Continue chapter 2.
   From masteringastronomy website, Tutorial on moon phases.
   LT, p.79: “The Cause of Moon Phases”

Week 4 September 12 and 14
   Monday: Continue chapter 2.
   Go over homework from last Wednesday.
   Why do eclipses occur? What causes retrograde motion?
   Wednesday: Open Notes Test 1

Week 5 September 19 and 21
   Monday: Chapter 3, The Science of Astronomy
   New homework assignment. (Homework is assigned each Monday; no further mention will be made of this in this calendar.)
   Go over Test One.
   Preview blue handout on Copernican Revolution
   Chapter 6, Our Solar System and Its Origin
   Wednesday: continue chapter 6
   Go over homework(This is done each Wednesday; no further mention will be made of it in this calendar.)
   Quick Quiz on Copernican Revolution
   Lecture on Formation of the Solar System
Week 6  September 26 and 28
Monday: Chapter 7, *The Terrestrial Planets*, and Chapter 8, *Jovian Planet Systems*
Focus is on the similarities and differences between Venus, Earth, and Mars
Wednesday: Video: “Wonders of the Solar System: Dead or Alive?”
Post-Video Quiz: “Why are Earth, Venus, and Mars so different from each other?”

Week 7  October 3 and 5
Monday: Lecture on Chapter 9, *Remnants of Rock and Ice: Asteroids, Comets, and Pluto*
History of impacts between Earth and Asteroids
Wednesday: *Open Notes Test 2*
Review of scientific notation called “Powers of 10”.

Week 8  October 10 and 12
Monday: Lecture on Chapter 4, *Making Sense of the Universe.*
Atomic nature of matter
Energy
Law of gravity
Wednesday: continuation of chapter 4
Newton’s version of Kepler’s third law

Week 9  October 17 and 19
Monday: Lecture on Chapter 5: *Light: the Cosmic Messenger.*
LT, p. 57, on Blackbody Radiation, Parts I and II
Wednesday: Video on “The Universe: Light Speed”
One Minute Paper on the video

Week 10  October 24 and 27
Monday: Chapter 5 continued.
Wednesday: *Open Notes Test 3*
Nuclear fusion in the Sun

Week 11  October 31 and November 2
Monday: Lecture on Chapter 11: *Surveying the Stars*
Magnitude and Spectral Classes of stars
Wednesday: Video on Albert Einstein
One Minute Paper on the video

Week 12  November 7 and 9
Monday: Continue chapter 11
The Hertzsprung-Russell Diagram
Wednesday:
LT, p. 53: “Luminosity, Temperature, and Size: Part I and II”
LT, p. 109: “H-R Diagram”
Week 13  November 14 and 16  
Monday: Lecture on Chapter 12, *Star Stuff*,  
Go over notes on the Lifeline of stars.  
Black Holes.  
LT, p. 121, “Stellar Evolution”  
Wednesday: Open Notes Test 4

Week 14  November 21 and 23  
Monday: lecture on Chapter 14, *Our Galaxy*.  
LT, p. 123: “Milky Way Scales”  
Wednesday: Video, “The Universe: Largest and Smallest”  
One Minute Paper on the video

Week 15  November 28 and 30  
The Distance Chain-measuring distances in the universe  
LT, p. 131: “Looking at Distant Objects”  
LT, p. 133, “Expansion of the Universe”  
Wednesday: Video, “The Universe: Another Earth”  
One Minute Paper on the video

Week 16  December 5 and 7  
Monday: Review  
Wednesday: Review

Week 17  December 12 and 16,  FINAL EXAM WEEK  
Final Exam: Monday, December 12 at usual class time in Imiloa 133

The above schedule has been carefully thought out and will be followed as much as possible, but there may have to be adjustments as the semester progresses. The Instructor will inform students of any changes at least one class day in advance. If a student is absent from class when changes are announced, it is the student’s responsibility to find out about the changes.
REPORT

This can be used to report on attendance at Star Shows in the Imaginarium and at Observing Sessions with the telescope. Obtain signature of the attending staff. You may use the reverse side of this page.

Attending Staff: ________________________ Date:______

Description of the show or observing session:

Sketches of Constellations, Planets, other objects seen in the session:

What I found most interesting:

Student Signature___________________________