

ASTR 110 INTRODUCTION TO ASTRONOMY

CRN 64007, Credits: 3

MW 10:00-11:15AM, Imiloa 133

INSTRUCTOR: Marvin Kessler
OFFICE: Hale Imiloa 136
OFFICE HOURS: MW, 11:15AM-12:30PM
TELEPHONE: 222-6573 **EMAIL:** mkessler@hawaii.edu
EFFECTIVE DATE: SPRING 2017

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 attend 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 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 pertinent pages of the textbook, outline them, and answer the assigned questions at the end of the chapter.

Class on Wednesday will be devoted to reports by students on the questions that were assigned on Monday. Extensive use will be made of the workbook, *Lecture Tutorials for ASTR 110 and ASTR 110WI*. 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 three unit Tests, which will be given on the dates indicated on the class calendar. Each test will be worth 25 points, for a total of 75 points for the semester.

These tests will be closely coordinated with the classroom discussion and assignments.

2. There will be four Video Essays. The essays will be written responses to an astronomy video that has been shown. The essays will be worth 5 points each, for a total of 20 points.

3. Quizzes. There will be about five short quizzes, worth 5 points each, for a total of 25 points.

4. Homework. As indicated above homework will be assigned on Monday and handed in at the beginning of class on Wednesday. **Late homework will not be accepted.** Mr. Kessler will review the homework and return it on the following Monday. Homework does not contribute points to a student's grade, but it is extremely important to do as part of the learning process.

5. Attendance at one Wednesday evening Star Show in the Imaginarium is obligatory. It will be worth 10 points. A brief report must be submitted within one week. A report

form is provided at the end of this syllabus. If the student cannot attend the Star Show because of work or other serious commitment, a substitute assignment is available. 6. The Final Exam will be worth 100 points. It will cover select sections of the entire course. A study guide will be provided.

This adds up to a total of 240 possible points, as follows:

Three Tests (25 points each)	75 points
Four Video Essays (5 points each)	20 points
Five Quizzes (5 points each)	25 points
Wednesday Star Show (10 points)	10 points
Final Exam	<u>100 points</u>
TOTAL	230 points

None of the quizzes or essays may be taken late. The three 25 point tests may be taken late, only if Mr. Kessler is contacted the day of the test or before, and he agrees to this. Mr. Kessler may be contacted by telephone (222-6573) or by email at (mkessler@hawaii.edu). Points earned and course letter grade will be recorded on Laulima.

Correspondence between points and letter grade will be as follows:

- A- 90% to 100% of the 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 2015-2017 Windward Community College Catalog, page 30, will be followed. The Catalog allows for other assigned grades. **Students are encouraged to consult the instructor at any time about their grade.** As indicated above, grades are available to students on Laulima.

LEARNING RESOURCES

Two books are required:

1. TEXTBOOK: The Essential Cosmic Perspective for ASTR 110 and ASTR 110WI, by Bennett, Donahue, Schneider, and Voit.
2. WORKBOOK: Lecture-Tutorials for ASTR 110 and ASTR 110WI, by Adams, Prather, and Slater.

These books are custom editions which can be obtained at the Windward Community College Bookstore. They are abbreviated in order to contain only material that is used in class. This also reduces the cost of the books.

Copies of the Videos that are shown in class are on reserve in the library, and some of them may be found on YouTube.

Additional Information

Students are strongly encouraged to spend time outside under the night sky, 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. Tickets may be purchased at the Imaginarium box office 30 minutes before the show, or call 235-7433 to reserve tickets in advance. Reserved tickets must be picked up at the box office at least 15 minutes before showtime, otherwise they may be sold to waiting customers. Scheduled events are listed on the college website.

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.

DISABILITIES ACCOMMODATION STATEMENT

If you have a physical, sensory, health, cognitive, or mental health disability that could limit your ability to fully participate in this class, you are encouraged to contact Ann Lemke, the Disability Specialist Counselor, to discuss reasonable accommodations that will help you succeed in this class. Ms. Lemke can be reached at 235-7448, lemke@hawaii.edu, or you may stop by Hale 'Akoakoa 213 for more information.

CLASS CALENDAR FOR SPRING 2017

UNIT I The Celestial Sphere

Week 1 January 9 and 11

Monday: Introduction to the course. Review syllabus.

Chapter 1, *Discovering the Universe for Yourself*.

Assign homework for first half of chapter 1.

What would you most like to learn from this course?

Wednesday: hand in homework

Lecture: go over homework assignment and daily vs annual motion

Complete tutorial in Lecture-Tutorial workbook: "Position" on pp 1-3

Week 2 January 16 and 18

Monday: MARTIN LUTHER KING DAY---no class

Wednesday: **Video**, *Wonders of the Solar System: Aliens*

Post-Video essay.

Week 3 January 23 and 25

Monday: Assign homework for second half of chapter 1

Lecture on: reason for seasons and phases of the Moon

Complete tutorial in Lecture-Tutorial workbook: "Motion" on pp 3-6,

"Seasonal Stars" on pp 7-10, and "Ecliptic" on pp 11-16

Wednesday: hand in homework

Lecture: go over homework

Complete tutorials: "The Cause of Moon Phases", pp. 25-28

Week 4 January 30 and February 1

Monday: chapter 1: Why do eclipses occur? What is apparent retrograde motion?

Wednesday: Test 1

UNIT II The Solar System

Week 5 February 6 and 8

Monday: Chapter 2, *Formation of the Solar System*

Lecture on the planets of the Solar System

Homework for chapter 2. (After this notation, mention will not be made of homework assignments.)

Wednesday: continue chapter 2

Go over homework. (This is done each Wednesday; no further mention will be made of it in this calendar.)

Lecture on formation of Solar System with emphasis on the role played by the frost line

Week 6 February 13 and 15

Monday: Chapter 3, *Earth and the Terrestrial Worlds*

Focus is on the similarities and differences between Venus, Earth, and Mars

Wednesday: complete lecture on comparison of Earth, Venus, and Mars

Week 7 February 20 and 22

Monday: PRESIDENTS DAY—no class

Wednesday: **Video**, *Wonders of the Solar System: Dead or Alive?*

Post-Video Essay: “Why are Earth, Venus, and Mars so different from each other?”

Week 8 February 27 and March 1

Monday: Chapter 4, *Asteroids, Comets, and Dwarf Planets*

History of impacts on Earth by Asteroids

Wednesday: Test 2

Review of scientific notation called “Powers of 10”.

UNIT III GRAVITY AND LIGHT

Week 9 March 6 and 8

Monday: handout on Gravity

Lecture on inverse square law of gravity, weightlessness, acceleration due to gravity

Wednesday: hand in homework.

Begin lecture on energy: nature of atom; energy levels

Week 10 March 13 and 15

Monday: Chapter 6: *Light*

Wavelength, frequency, and speed of light.

Wednesday: : **Video**, *Light Speed*

Post-Video reaction essay.

UNIT IV The Stars

Week 11 March 20 and 22

Monday: Chapter 7: *Surveying the Stars*

Luminosity/Distance Formula

Hertzsprung-Russell Diagram

Wednesday: LT, pp 29-32: “Luminosity, Temperature, and Size: Part I and II”

LT, pp 47-48: “H-R Diagram”

SPRING RECESS March 27-31**Week 12 April 3 and 5**

Monday: Chapter 8, *Star Stuff*,

Go over notes on the Lifeline of stars.
Wednesday: continue Chapter 8.

Week 13 April 10 and 12

Monday: Black Holes.
LT, pp 49-50, “Stellar Evolution”
Wednesday: Test 3

UNIT V The Galaxies

Week 14 April 17 and 19

Monday: Chapter 9, *Our Galaxy*.
LT, pp 51-54: “Milky Way Scales”
Wednesday: **Video**, *Known Universe: Biggest and Smallest*
Post-Video reaction essay.

Week 15 April 24 and 26

Monday: Chapter 10, *A Universe of Galaxies*.
The Distance Chain: measuring distances in the universe
Wednesday:
LT, pp 55-56: “Looking at Distant Objects”
LT, pp 57-58, “Expansion of the Universe”

Week 16 May 1 and 3

Monday: Review
Wednesday: Review

Week 17 FINAL EXAM WEEK May 6 to 12

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 one 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 interesting (at least 100 words; may use reverse side of page):

Student Signature _____