

ASTR 110 WI INTRODUCTION TO ASTRONOMY

CRN 64006, Credits: 3

MW 8:30-9:45 AM, Imiloa 133

INSTRUCTOR: Marvin Kessler
OFFICE: Hale Imiloa 136
OFFICE HOURS: MW, 11:15 AM-12:30 PM
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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 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 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. Writing

In a writing intensive course the student is expected to use writing as a way to stimulate critical thinking. This process is well explained by John Bean in his book, *Engaging Ideas*, where he focuses on writing as critical thinking. There he explains that writing can actually contribute to critical thinking. In academic writing, students often come away with the mistaken notion that there is a divorce between thinking and writing. First you think, and then you write down what you think. Bean’s article explains that in real life most writers come to their insights while writing.

That probably is not the case in much scientific reporting where data has been gathered, reduced, and the conclusion reached before writing. Then there is just the reporting of the outcome. However, even then there may be times when the conclusion becomes clearer during the writing.

In “WI-Introduction to Astronomy” students are encouraged to gain insight by writing. However, if they are not able to achieve that lofty goal, they at least are expected to learn from writing. The hallmarks of a writing intensive course are listed as follows on the WCC website:

- Writing promotes learning of course content.
- Writing is considered to be a process in which multiple drafts are encouraged.
- Writing contributes significantly to each student’s course grade.
- Students do a substantial amount of writing, a minimum of 4,000 words.
Depending on the types of writing appropriate to the discipline, students may write critical essays or reviews, journal entries, lab reports, research reports or reaction papers.
- To allow for meaningful teacher-student interaction on each student’s writing, the class is restricted to 20 students.
- Individual conferences on writing assignments are required in WI courses at Windward CC.

3. Conferences

At least one formal conference will be held with each student. Frequent brief conferences before and after class and via email are also encouraged. This is in addition to the exchange of written comments and suggestions by teacher and student.

4. Turnitin

This online site checks written material for plagiarism and English grammar. The four video papers must be submitted to this site to be checked for plagiarism and grammatical correctness.

5. 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.

6. 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.

7. 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. There will be five questions on a test. Each answer should comprise about 100 words, with a total of 500 words for the entire test. The 500 words count toward the four thousand word goal of a writing intensive course. The five questions will be based on the questions that were given for homework. “Blue Books” should be used for the tests. Study guides will be provided for each of the tests.
2. Video Papers. During the semester four videos on various topics will be shown. These have been chosen based on their astronomical content and excellence of presentation. The student will be expected to write a reaction paper on each of these videos. The paper will be worth 25 points toward the final grade. The paper should be a minimum of 1000 words in length. This will count toward the WI goal.
3. Quizzes. There will be approximately 5 of these. They will be given as “on the spot” checks of student comprehension of the lecture material during that particular class. They may or may not be graded. If graded, they will be worth 5 points, for a total possible points of 25.
4. Homework. Homework will be assigned on Monday and handed in at the beginning of class on Wednesday. Homework is not graded. The purpose of homework is to point out the most important topics for the student to study. **Late homework will not be accepted.** Students who do not hand in homework on time are still expected to complete the homework in preparation for tests.
5. 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, the student should 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.

6. The Final Exam will be worth 100 points. It will be a multiple-choice test, and it will cover all the major topics of introductory astronomy. A study guide will be provided.

This adds up to a total of 310 possible points, as follows:

Three Tests (25 points each)	75 points
Four Video Papers (25 points each)	100 points
Wednesday Star Show	10 points
Quizzes	25 points
Final Exam	<u>100 points</u>
TOTAL	310 points

The video papers must be handed in on time or there is a penalty deduction, depending on how many days late. The three 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). Quizzes may not be taken late. Points earned and letter grade will be recorded on Laulima.

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 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.** Grades also are reported 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.
- The bulletin board in Hale Imiloa 133 is used to post print-outs of current astronomical discoveries. Most of these are from <http://spaceflightnow.com/news> and <http://skyandtelescope.com/news>.

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 the Disability Specialist Counselor to discuss reasonable accommodations that will help you succeed in this class. Ann 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. Due at Turnitin by 11:59 PM on January 22.

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? Due to be turned in to Turnitin by Feb. 26, 11:59 PM.

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. Due March 19, 11:59 PM.

UNIT IV The Stars

Week 11 March 20 and 22

Monday: Chapter 7: *Surveying the Stars*

Luminosity/Distance Formula

Hertzprung-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. Due April 23, 11:59 PM.

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 _____