**ASTR 110**  **INTRODUCTION TO ASTRONOMY**  
CRN 60423, Credits: 3  
MW 10:00-11:15AM, Imiloa 133

**INSTRUCTOR:**  Marvin Kessler  
**OFFICE:**  Hale Imiloa 136  
**OFFICE HOURS:**  MW, 11:30AM-12:30PM  
**TELEPHONE:**  222-6573  
**EMAIL:**  mkessler@hawaii.edu  
**EFFECTIVE DATE:**  Fall, 2015

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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.*

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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 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 questions 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 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 four 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. There will be four Video Essays. The essays will be written responses to an astronomy video that has been shown. There will be four such videos, worth 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. 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. 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.

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 255 possible points, as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
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<tbody>
<tr>
<td>Four Tests (25 points each)</td>
<td>100</td>
</tr>
<tr>
<td>Four Video Essays (5 points each)</td>
<td>20</td>
</tr>
<tr>
<td>Five Quizzes (5 points each)</td>
<td>25</td>
</tr>
<tr>
<td>Wednesday Star Show</td>
<td>10</td>
</tr>
<tr>
<td>Final Exam</td>
<td>100</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>255</strong></td>
</tr>
</tbody>
</table>

None of the quizzes or essays may be taken late. The four 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. This may be done by telephone (222-6573) or by email (mkessler@hawaii.edu). Points earned on tests, quizzes, and essays will be recorded on Laulima in the grade book for this course. Laulima will also report student course 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 2015-2017 Windward Community College Catalog, page 28, 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.

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. The textbook will qualify for “buy-back” at the end of the semester. The workbook will not.

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 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. 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 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 FALL 2015

UNIT I    The Celestial Sphere

Week 1   August 24 and 26
        Monday: Introduction to the course. Review syllabus.
        Chapter 1, Discovering the Universe for Yourself.
        Assigned homework for first half of chapter 1.
        What would you most like to learn from this course?
        Wednesday: hand in homework
        Video, Wonders of the Solar System: Aliens
        Post-Video reaction essay

Week 2   August 31 and September 2
        Monday: Go over homework from last week.
        Assignment of new homework for second half of chapter 2.
        Lecture on “The Reason for Seasons”
        Complete tutorials in Lecture-Tutorial workbook: “Position” on pp 1-3
        Wednesday: hand in homework
        Complete tutorials in Lecture-Tutorial workbook: “Motion” on pp 3-6,
        “Seasonal Stars” on pp 7-10, and “Ecliptic” on pp11-16

Week 3   September 7 and 9
        Monday: LABOR DAY-HOLIDAY
        Wednesday: Lecture on: Daily versus Annual Motion

Week 4   September 14 and 16
        Monday: Continue chapter 1.
        Why do eclipses occur? What causes retrograde motion?
        Wednesday: Test 1

UNIT II    The Solar System

Week 5   September 21 and 23
        Monday: Chapter 2, Formation of the Solar System
        Lecture on Formation of the Solar System
        Home work for this week will be assigned. 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.)
        Complete lecture on formation of Solar System
Week 6  September 28 and 30  
Monday: Chapter 3, *Earth and the Terrestrial Worlds*  
Focus is on the similarities and differences between Venus, Earth, and Mars  
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 7  October 5 and 7  
Monday: Chapter 4, *Asteroids, Comets, and Dwarf Planets*  
History of impacts between Earth and Asteroids  
Wednesday: Test 2  
Review of scientific notation called “Powers of 10”.

UNIT III  Life and Light

Week 8  October 12 and 14  
Monday: Chapter 5: *Life in the Universe*  
Wednesday: continue chapter 5

Week 9  October 19 and 21  
Monday: Chapter 6: *Light*  
Wavelength, frequency, and speed of light.  
Wednesday: Video, *Light Speed*  
Essay on the video

UNIT IV  The Stars

Week 10  October 26 and 28  
Monday: Chapter 7: *Surveying the Stars*  
Luminosity/Distance Formula  
Wednesday: LT, pp 33-36, on Blackbody Radiation, Parts I and II

Week 11  November 2 and 4  
Monday: The Hertzsprung-Russell Diagram  
LT, pp 47-48: “H-R Diagram”

Week 12  November 9 and 11  
Monday: Chapter 8, *Star Stuff,*  
Go over notes on the Lifeline of stars.  
Wednesday: VETERAN’S DAY-HOLIDAY
Week 13  November 16 and 18
   Monday: Black Holes.
      LT, pp 49-50, “Stellar Evolution”
   Wednesday: Test 4

UNIT V  The Galaxies

Week 14  November 23 and 25
   Monday: Chapter 9, Our Galaxy.
      LT, pp 51-54: “Milky Way Scales”
   Wednesday: Video, KnownUniverse: Biggest and Smallest
      Essay on the video

Week 15  November 30 and December 2
   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  December 7 and 9
   Monday: Review
   Wednesday: Review

Week 17  FINAL EXAM WEEK  December 14 to 19

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___________________________