ASTR 110  INTRODUCTION TO ASTRONOMY  
CRN 62050, 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 Semester, 2014

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 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.
4. 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 100 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 260 possible points, as follows:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Points</th>
</tr>
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<tbody>
<tr>
<td>Four Tests (25 points each)</td>
<td>100</td>
</tr>
<tr>
<td>Five One Minute Papers (5 points each)</td>
<td>25</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>260</strong></td>
</tr>
</tbody>
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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 2013-2015 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.** 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.

**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 sixth edition of the book.

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.

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.
- 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.
CLASS CALENDAR FOR FALL 2014

UNIT I  The Celestial Sphere

Week 1  August 25 and 27
  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 for first half of chapter 2.
  Wednesday: hand in homework
    Video: “Wonders of the Solar System: Aliens”
    Post-Video reaction essay

Week 2  September 1 and 3
  Monday is Labor Day, a HOLIDAY.
  Wednesday: Go over homework from last week.
    Assignment of new homework for second half of chapter 2.
    Lecture on: (1) Daily versus Annual Motion, (2) Seasons

Week 3  September 8 and 9
  Monday: Complete tutorials in Lecture-Tutorial workbook:
    page 1: “Position”, page 3: “Motion”, and page 7: “Seasonal Stars”
  Wednesday: Continue chapter 2.
    LT, p.81: “The Cause of Moon Phases”

Week 4  September 15 and 17
  Monday: Continue chapter 2.
    Why do eclipses occur? What causes retrograde motion?
  Wednesday: Open Notes Test 1

UNIT II  The Solar System

Week 5  September 22 and 24
  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.)
    Preview blue handout on Copernican Revolution (Quiz on Wednesday).
    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.
    Lecture on Formation of the Solar System
Week 6  September 29 and October 1
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 6 and 8
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”.

UNIT III  Physics

Week 8  October 13 and 15
Monday: Lecture on Chapter 4: *Making Sense of the Universe.*
Newton’s Laws: mass, velocity, acceleration, gravity
Wednesday: Lecture on Chapter 5: *Light: the Cosmic Messenger.*

Week 9  October 20 and 22
Monday: Chapter 5 continued.
LT, p. 59, on Blackbody Radiation, Parts I and II
Wednesday: Open Notes Test 3

UNIT IV  The Stars

Week 10  October 27 and 29
Monday: Lecture on Chapter 11: *Surveying the Stars*
Magnitude and Spectral Classes of stars
Nuclear fusion in stars
Wednesday: Video: “The Universe: Another Earth”
One Minute Paper on the video

Week 11  November 3 and 5
Monday: Continue chapter 11
The Hertzsprung-Russell Diagram
LT, p. 117: “H-R Diagram”
Week 12 November 10 and 12
Monday is Veterans’ Day, a HOLIDAY.
Wednesday: Lecture on Chapter 12, Star Stuff,
          Go over notes on the Lifeline of stars.

Week 13 November 17 and 29
Monday: Black Holes.
       LT, p. 133, “Stellar Evolution”
Wednesday: Open Notes Test 4

UNIT V The Galaxies

Week 14 November 24 and 26
Monday: lecture on Chapter 14, Our Galaxy.
       LT, p. 135: “Milky Way Scales”
Wednesday: Video, “KnownUniverse: Biggest and Smallest”
           Essay on the video

Week 15 December 1 and 3
Monday: lecture on Chapter 15, A Universe of Galaxies.
       The Distance Chain: measuring distances in the universe
Wednesday:
       LT, p. 149: “Looking at Distant Objects”
       LT, p. 161, “Expansion of the Universe”

Week 16 December 8 and 10
Monday: Review
       Wednesday: Review

Week 17 December 15 to 17,
       FINAL EXAM WEEK

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. You may use the reverse side of this page.

Obtain signature of the attending staff.
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 __________________________