ASTR 110, Introduction to Astronomy
3 Credits, CRN 60323
10:00-11:15am, Imiloa 133

INSTRUCTOR: Marvin Kessler
OFFICE: Imiloa 136
OFFICE HOURS: Wednesday, 11:30am to 01:30pm
TELEPHONE: please call instructor cell, 808 222-6573  EMAIL: mkessler@hawaii.edu
EFFECTIVE DATE: Spring 2019

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 the Ko‘olau region of O‘ahu 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
As a result of taking this course, students can expect to attain the following outcomes:
1. Outline the development of astronomy from ancient times to present and explain the role of the scientific method in this historic context.
2. Describe and explain the apparent motions of the celestial bodies, especially as related to naked-eye observations.
3. Identify the appropriate instruments used by astronomers to understand the universe.
4. Outline the origins of our solar system and appraise the leading cosmological theories of the origin of the universe.
5. Describe the physical and chemical properties of the objects in our solar system and apply the concept of comparative planetology.
6. Describe the physical and chemical nature of stars, and especially our sun, and apply the astronomical techniques used to measure stellar properties.
7. Outline the evolutionary stages in a star's life and compare and contrast the structure of our Milky Way and other galaxies.
8. 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. 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. A study guide will be provided.

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 four short quizzes, worth 5 points each, for a total of 20 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. 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 225 possible points, as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three Tests (25 points each)</td>
<td>75</td>
</tr>
<tr>
<td>Four Video Essays (5 points each)</td>
<td>20</td>
</tr>
<tr>
<td>Four Quizzes (5 points each)</td>
<td>20</td>
</tr>
<tr>
<td>Wednesday Star Show (10 points)</td>
<td>10</td>
</tr>
<tr>
<td>Final Exam</td>
<td>100</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>225</strong></td>
</tr>
</tbody>
</table>

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 2018-2019 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:

These books are available at the Windward Community College Bookstore.

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. There is also a full-sized replica of the Mercury Friendship capsule used by John Glenn in the first American orbital flight. 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, the first Friday of the month at 7:00 PM, and the fourth Saturday of the month at 1:00PM. 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 ACCOMMODATIONS**

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 ‘Ākoakoa 213 for more information.

**TITLE IX**

Title IX prohibits discrimination on the basis of sex in education programs and activities that receive federal financial assistance. Specifically, Title IX prohibits sex discrimination; sexual harassment and gender-based harassment, including harassment based on actual or perceived sex, gender, sexual orientation, gender identity, or gender expression; sexual assault; sexual exploitation; domestic violence; dating violence; and stalking. For more information regarding your rights under Title IX, please visit: https://windward.hawaii.edu/Title_IX/.

Windward Community College is committed to the pursuit of equal education. If you or someone you know has experienced sex discrimination or gender-based violence, Windward CC has resources to support you. To speak with someone confidentially, contact the Mental Health & Wellness Office at 808-235-7393 or Kaahu Alo, Designated Confidential Advocate for Students, at 808-235-7354 or kaahualo@hawaii.edu. To make a formal report, contact the Title IX Coordinator, Karla K. Silva-Park, at 808-235-7468 or karlas@hawaii.edu.

**ALTERNATE CONTACT INFORMATION**

If you are unable to contact the instructor, have questions that your instructor cannot answer, or for any other issues, please contact the Academic Affairs Office:

Location: Alakai 121
Phone: 808 235-7422
Email: wccaa@hawaii.edu
CLASS CALENDAR FOR SPRING 2019

UNIT I  The Celestial Sphere

Week 1   January 7 and 9
Monday: Review syllabus.
Chapter 2, *Understanding the Sky*. Assign homework for
first half of chapter 2.
What would you most like to learn from this course?
Wednesday: hand in homework
Lecture on the celestial sphere and reason for seasons
Lecture-Tutorial workbook: “Position”, pp. 1-3
Quiz: what is the celestial sphere?

Week 2    January 14 and 16
Monday: Assign homework for second half of chapter 2
Lecture on: daily and annual motion
Lecture-Tutorial workbook: “Motion” on pp 3-6,
“Seasonal Stars” on pp 7-10, and “Ecliptic” on pp 11-16
Post-Video essay. Written in class.

Week 3     January 21 and 23
Monday: MARTIN LUTHER KING DAY---no class
Wednesday: hand in homework
Lecture: phases of the Moon
Complete tutorials: “The Cause of Moon Phases”, pp. 25-28

Week 4    January 28 and 30
Monday: Continue chapter 2.
Why do eclipses occur? What causes retrograde motion?
Wednesday: Test One

UNIT II  TRANSITION

Week 5    February 4 and 6
Monday: Chapter 3, *Changes in Our Perspective*.
The Copernican Revolution. Quiz on Copernican Revolution
Wednesday: Lecture on Gravity
How much does the Earth “weigh”?

Week 6    February 11 and 13
Monday: Lecture on Light, page 80 in textbook
Energy levels in the atom
Wednesday: **Video:** “Light Speed”
Post-Video essay.

**UNIT III The Solar System**

**Week 7 February 18 and 20**
- **Monday:** PRESIDENTS DAY—no class
- **Wednesday:** Chapter 4, *Origin of the Solar System*

**Week 8 February 25 and 27**
- **Monday:** Chapter 5, *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.

**Week 9 March 4 and 6**
- **Monday:** Chapter 6, *The Outer Solar System*, section 6.2 on Asteroids, Comets, and the Impact Threat
- **Wednesday:** Test Two
  Review of scientific notation called “Powers of 10”.

**UNIT IV The Stars**

**Week 10 March 11 and 13**
- **Monday:** Chapter 8: *The Sun and Other Stars*
  Luminosity/Distance Formula
- **Wednesday:** continue chapter 8
  LT, pp 33-36, on Blackbody Radiation, Parts I and II

**SPRING RECESS March 18-22**

**Week 11 March 25 and 27**
- **Monday:** Spectral classification of stars
- **Wednesday:** The Hertzsprung-Russell Diagram
  LT, pp 47-48: “H-R Diagram”
  Quiz on Luminosity, Temperature, Distance, and Size

**Week 12 April 1 and 3**
- **Monday:** Chapter 9, *Stellar Lives*
  Go over notes on the Lifeline of stars.
- **Wednesday:** continue Chapter 9.
  Quiz on Lifeline of Stars

**Week 13 April 8 and 10**
- **Monday:** White Dwarfs, Neutron Stars, and Black Holes.
  LT, pp 49-50, “Stellar Evolution”
Wednesday: Test Three

UNIT V The Galaxies

Week 14  April 15 and 17
  Monday: Chapter 11, Galaxies.
  LT, pp 51-54: “Milky Way Scales”
  Wednesday: Video: “Known Universe: Biggest and Smallest”
                  Post-Video Essay.

Week 15  April 22 and 24
  Monday: Chapter 12, Galaxy Distances and Hubble’s Law
          The distance chain
  Wednesday:
          LT, pp 55-56: “Looking at Distant Objects”
          LT, pp 57-58, “Expansion of the Universe”

Week 16  April 29 and May 1
  Monday: Review
  Wednesday: Review

Week 17  FINAL EXAM WEEK  May 6 to 10

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 __________________________________________