**ASTR 110L: Introduction to Astronomy Laboratory**  
CRN 60120, 1 Credit  
Monday, 1:30PM-4:15PM, Imiloa 137

<table>
<thead>
<tr>
<th>INSTRUCTOR:</th>
<th>Marvin Kessler</th>
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<tbody>
<tr>
<td>OFFICE:</td>
<td>‘Imiloa 136</td>
</tr>
<tr>
<td>OFFICE HOURS:</td>
<td>MWF, 10:30AM-11:20AM</td>
</tr>
<tr>
<td>TELEPHONE:</td>
<td>222-6573 EMAIL: <a href="mailto:mkessler@hawaii.edu">mkessler@hawaii.edu</a></td>
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<td>EFFECTIVE DATE:</td>
<td>Fall 2010</td>
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**WINDWARD COMMUNITY COLLEGE MISSION STATEMENT**

*Windward Community College is committed to excellence in the liberal arts and career development; we support and challenge individuals to develop skills, fulfill their potential, enrich their lives, and become contributing, culturally aware members of our community.*

**CATALOG DESCRIPTION**

Demonstration of astronomical principles through laboratory observations and analysis of astronomical data. **Prerequisite:** ASTR 110; may be taking ASTR 110 concurrently.

**Activities Required at Scheduled Times Other Than Class Times:** there will be one evening observing session. Students may substitute for this session if they have serious and compelling circumstances which make it impossible for them to attend this evening session.

**STUDENT LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

1. Apply the scientific method to a selected group of topics in astronomy.
2. Collect, report and analyze data obtained in a laboratory and/or observatory setting in a manner exhibiting organization, proper documentation and critical thinking.
3. Demonstrate a basic understanding of the use of standard astronomical instruments, especially the telescope
4. Perform image analysis, especially as related to astronomical photographic data
5. Identify environmental factors which affect the outcome of an experiment or observation, and apply basic error analyses techniques.
6. Demonstrate a working knowledge of computer on-line and internet astronomical programs.
### COURSE CONTENT and SKILLS

<table>
<thead>
<tr>
<th>Concepts or Topics</th>
<th>Skills or Competencies: student will be able to:</th>
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<tbody>
<tr>
<td>1. Star Identification</td>
<td>1. identify four bright stars and four constellations for each season of the year</td>
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<tr>
<td>2. Deep Sky Objects</td>
<td>2. locate objects based on right ascension and declination</td>
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<tr>
<td>3. Telescope</td>
<td>3. calculate the resolution of a telescope based on aperture</td>
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<tr>
<td>4. Telescope</td>
<td>4. calculate magnification based on the focal lengths of the objective and eyepiece</td>
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<tr>
<td>5. Asteroid detection</td>
<td>5. use Astrometrica to detect asteroids on digital images</td>
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<tr>
<td>6. Internet Astronomical Program</td>
<td>6. access NASA website for information and graphics on a specific asteroid</td>
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<tr>
<td>7. Spectroscopy of emission spectra</td>
<td>7. use a spectrometer to identify gases by their spectra</td>
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<tr>
<td>8. Photometry of Variable Star</td>
<td>8. use Iris to create a light curve of a variable star based on digital images</td>
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<tr>
<td>9. Error Analysis</td>
<td>9. calculate percent difference and explain what might account for this</td>
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<tr>
<td>10. Image Processing</td>
<td>10. process RGB images of a galaxy and other astronomical objects using the DS-9 program</td>
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### ASSESSMENT TASKS AND GRADING

Evaluation of the successful completion of the objectives of this course will be determined by grades received on Laboratory Reports and tests of ability to identify stars and manipulate instruments.  
- **Laboratory Reports**: Lab reports are completed according to the instructions given in the lab manual and/or on the handouts distributed at each lab session. Ordinarily, the report consists of a completed data and analysis sheet provided in the handout plus any other appropriate sheet of observed data and graphical analysis. Lab Reports are worth **20 points** each. **The lowest lab score will be dropped from the student's record.** A protocol sheet explains the procedure to be followed in handing in the completed report to the instructor. There will be 11 reports, of which 10 will be used, for a total of 200 points.
**Final Semester Grade** will be based on the following table:

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Definition</th>
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<tr>
<td>A</td>
<td>90% - 100% of cumulative points possible</td>
</tr>
<tr>
<td>B</td>
<td>80% - 89% of cumulative points possible</td>
</tr>
<tr>
<td>C</td>
<td>70% - 79% of cumulative points possible</td>
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<tr>
<td>D</td>
<td>60% - 69% of cumulative points possible</td>
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<tr>
<td>F</td>
<td>below 60% of cumulative points possible</td>
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Other grades may be assigned as listed on page 25 of the 2009-2011 WCC Catalog.

**LEARNING RESOURCES**

**TEXTBOOKS AND OTHER ASSIGNED INSTRUCTIONAL MATERIALS:**
- Supplementary laboratory experiments will be described in handouts
- [www.masteringastronomy.com](http://www.masteringastronomy.com)

**REQUIRED MATERIALS:** calculator (non-scientific); metric ruler

**Additional Information**

1. **Expectations of Students:** Success in this course will be enhanced by:
   - having a positive, inquiring attitude toward science
   - making use of the full 2 1/2 hours of lab time
   - completing reports in a professional manner
   - carefully reading the workbook and handouts
   - seeking assistance from the instructor
   - attending all classes and responsibly obtaining all assignments and/or changes to the course syllabus

2. A student can determine his/her current grade during any time of the semester by dividing his/her cumulative score by the cumulative points possible and converting into a percentage and referring to the table of Letter Grades.

3. Students are encouraged to visit WCC's **Aerospace Exploration Lab** (located in Hale `Imiloa 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.

4. Any student wishing to be informed of his/her Final Exam grade and/or semester grade in advance of the official report of grades should email a request for the grades to the instructor immediately after the Final Exam. The student may also provide the instructor a stamped, self-addressed postcard or envelope on the day of the Final Exam with an enclosed note requesting the grades.
CALENDAR FOR FALL 2010

WEEK 1 Aug. 23/25
Tour of facilities.
Activity One on page 129 in Astronomy Media Workbook, “Introducing Sky-Gazer”

WEEK 2 Aug. 30/Sept. 3
Activities 2 and 3 in Astronomy Media Workbook, pages 139 to 156, “Motions of the Stars” and “Celestial Sphere”
Orientation to use of tutorials on masteringastronomy.com

WEEK 3 Sept. 6/8
Monday is holiday. No Class.
Wednesday class does meet. Introduction to use of telescope

WEEK 4 Sept. 13/15
Imaginarium: practice using maps; test on identifying stars and constellations

WEEK 5 Sept. 20/22
Experiment 2 in Basic Optics System: “Prism”
Experiment 3 in Basic Optics System: “Reflection”
Nature of Light Continued:
Exp. 12 in BOS: “Focal Length and Magnification of a Thin Lens”

WEEK 6 Sept. 27/29
Workbook, “Telescopes” on pages 57-62.
This is an activity that uses the masteringastronomy website.

WEEK 7 Oct. 4/6
Experiment 15 in BOS: “Telescope”

WEEK 8 Oct. 11/13
Assembling and using the Orion Space Probe, 130mm Equatorial Telescope

WEEK 9 Oct. 18/20
400 Years of the Development of the Telescope
Monday Class: meet in the lab
Wednesday Class: meet in Imiloa 133
Finding faint objects with the telescope by star hopping or using Right Ascension and Declination.

WEEK 10 Oct. 25/27
Finding gasses based on their spectrum

WEEK 11 Nov. 1/3
The Spectrometer: wave nature of light
The CCD camera: photon nature of light

WEEK 12 Nov. 8/10
Astrometry:
Finding asteroids using Astrometrica
Workbook, pages 267-278, “Asteroids, Comets, and Meteors”
Photometry:
Finding variable stars

WEEK 13 Nov. 15/17
Experiment 1 in BOS, “Color Addition”
Combining RGB images into color pictures of astronomical objects

WEEK 14 Nov. 22/24

WEEK 15 Nov. 29/Dec. 1

WEEK 16 Dec. 6/8