ASTR 110L: Introduction to Astronomy Laboratory
CRN 63108, 1 Credit
Monday, 1:30 PM-4:15 PM, Imiloa 137

INSTRUCTOR: Marvin Kessler
OFFICE: ‘Imiloa 136
OFFICE HOURS: MW, 9:00 AM-9:30 AM; 12:30 PM-1:30 PM
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EFFECTIVE DATE: Fall 2011

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
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 circumstances which make it impossible for them to attend. Instructor must approve this substitution.

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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<td>5. Asteroid detection</td>
<td>5. use Astrometrica to detect asteroids on digital images</td>
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<td>6. Internet Astronomical Program</td>
<td>6. access NASA website for information and graphics on a specific asteroid</td>
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<td>7. Spectroscopy of emission spectra</td>
<td>7. use a spectrometer to identify gases by their spectra</td>
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<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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<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. There will be 13 reports, of which 12 will be used to calculate a grade, for a total of 240 points. **The lowest lab score of the 13 reports 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.

- **Final Semester Grade** will be based on the following table:

<table>
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<tr>
<th>Letter Grade</th>
<th>Definition</th>
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<tr>
<td>A</td>
<td>90% - 100% of cumulative points possible</td>
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<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>
</tr>
<tr>
<td>D</td>
<td>60% - 69% of cumulative points possible</td>
</tr>
<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

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
   - 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.
## CALANDER FOR FALL 2011

| WEEK 1 | August 22 | Tour of facilities.  
Activity One on page 129 in *Astronomy Media Workbook*, “Introducing Sky-Gazer” |
| WEEK 2 | August 29 | 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 | September 5 | HOLIDAY |
| WEEK 4 | September 12 | *Astronomy Media Workbook*, pages 177-184, “Seasonal Constellations”.  
Prepare seasonal maps.  
Imaginarium: practice using maps; test on identifying stars and constellations |
| WEEK 5 | September 19 | Nature of Light:  
Experiment 2 in Basic Optics System: “Refraction”  
Experiment 3 in Basic Optics System: “Reflection” |
| WEEK 6 | September 26 | Nature of Light Continued:  
The Optics of a Simple Lens System |
| WEEK 7 | October 3 | Experiment 15 in BOS: “Telescope” |
| WEEK 8 | October 10 | Assembling and using the Orion Space Probe, 130mm Equatorial Telescope |
| WEEK 9 | October 17 | Finding faint objects with the telescope by star hopping or using Right Ascension and Declination. |
| WEEK 10 | October 24 | 400 Years of the Development of the Telescope |
| WEEK 11 | October 31 | The Spectrometer: wave nature of light  
Identifying gasses based on their spectrum |
| WEEK 12 | November 7 | *Astronomy Media Workbook*, pages 267-278, “Asteroids, Comets, and Meteors” |
| WEEK 13 | November 14 | Astrometry:  
Finding asteroids using Astrometrica |
| WEEK 14 | November 21 | Photometry:  
Finding variable stars |
| WEEK 15 | November 28 | Experiment 1 in BOS, “Color Addition”  
Combining RGB images into color pictures of astronomical object |
| WEEK 16 | December 5 | *Astronomy Media Workbook*, pp. 313-322, “The Universe-Hubble’s Law” |