



UNIVERSITY of HAWAII®
WINDWARD
COMMUNITY COLLEGE

ASTR 110L – Survey of Astronomy – Lab - 63252

[3 Credits (CRN 63252)]

Asynchronous Online Course

INSTRUCTOR: [Sean Moroney]
OFFICE: Imiloa 112B
OFFICE HOURS: [Sundays, 8:00 – 9:00 PM]
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EFFECTIVE DATE: [Semester/Year]

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

Demonstration of astronomical principles through laboratory observations and analysis of astronomical data. Not required for ASTR 110.

Activities Required at Scheduled Times Other Than Class Times

No additional activities

Activities Required at Scheduled Times Other than Class Times

None

STUDENT LEARNING OUTCOMES

As a result of taking this course, students can expect to attain the following outcomes:

The student learning outcomes for the course are:

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.
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 TASKS

The Course Tasks (also called Assignments) described here rely considerably upon active involvement and participation by all course members.

The availability of each Course Task will be made known by an Announcement, which will also be emailed. Three days before a Course Task is Due, an Announcement to that effect will be posted and emailed.

Further details on all these course tasks will be by the Announced placement of labeled documents in the Course Docs section of the Left Menu.

In all Course Tasks, submissions will be inspected for errors or flaws in spelling, grammar, and sentence structure. If necessary, it will be useful to have someone with good language skills function as a proofreader for each Assignment.

- **First Week Introductions (FWI) 1% of the Course Grade (as Extra Credit):**
 - In the first nine days of the Course, each Student is to post, in the appropriate forum, complete answers to five introductory questions. Each Student should then review the postings of the other Students and should then reply, abiding by the Netiquette protocols posted on the Course website, to a minimum of two (2) of the fellow Students.
 - By the Due Date; the postings should be all complete. WCC has linked any absence of responses to the possibility of being disenrolled from the course.

- **Starry Night (SN) Exercises (25% of the Course Grade):**
 - The Starry Night College Textbook will be available through a weblink to an outside source. Students will have a login/passcode to have access. The subscription price will cover one year's access.
 - The SN website will host the Exercises to be done during the term. The Learning Management System Canvas will be operating in the background, keeping track of the grades and linking them into the Lulima GradeBook.
 - The number of SN Exercises varies from Chapter to Chapter in the Starry Night textbook. A Calendar will be made available for the opening and closing dates of each Chapter. When a Chapter closes, the accumulated scores from all the Chapters used will be tallied. This will be entered into the Lulima Gradebook.
 - The SLOs and MLOs for the Course apply to these Assignments.

- **Lab Exercises (25% of the Course Grade):**
 - In each Module, students will perform various experimental tasks using the Lab Exercises provided and will complete a Lab Report on each.
 - A document discussing the structure of a Lab Report may be found in the Left Menu / Resources / Course Docs folder.
 - Insights gained from the Starry Night Exercises should be included in the Lab Reports.
 - There will be 14 such Lab Exercises during the term. Announcements regarding the opening of Lab Exercises and their Due Dates will be released at regular intervals during the Course.
 - The **best 12 of the 14 Lab Exercise scores** will be counted toward the Final Grade.
 - The SLOs and MLOs for the Course apply to these Assignments.

- **Ask the Student (AskS) (10% of the Course Grade):**
 - Twice in each of the five (5) Modules, in forums set up for this purpose, the Instructor will pose two separate thought-provoking Questions on subject matter relevant to the current Module. Students are expected to explore these topics in some detail and to post considered and thoughtful responses.
 - Answers previously posted will not be visible to an answering student until that student submits his/her own answer.
 - Answers to the Questions must be given in short essays of about 75 words. The answers should go into some depth and may bring in related ideas and information from current astronomical news items or from other sources. Answers should include a Reference section if information was drawn from an outside source.
 - Grades given for the answers will depend on the answer quality, with minimalist answers getting lower grades and well-thought-out answers getting higher grades.
 - In addition, each student must offer a critique to two (2) answers from fellow students. All critiques must have an objective basis in the Science.
 - Critiques may be positive (adding in supporting information) or negative (pointing out or correcting errors).
 - Critiques must be substantive and must add to the knowledge base being built in the class. While compliments, and like comments, are acceptable, they will not count toward grading.
 - **The rules and behavior of Netiquette are to be observed at all times in all our online interactions.**
 - For additional detail on the full procedure, please review the document, The AskS and AskP Assignments, found in Laulima's Left Menu / Resources / Course Docs.
 - There will be ten (10) AskS assignments in total.
 - The **best 8 of the 10 AskS** scores will be counted toward the final grade.
 - The SLOs for each Module apply to these Assignments.

- **Ask the Professor (AskP) (10% of the Course Grade):**
 - Twice in each of the five (5) Modules, in forums set up for this purpose, each student will be asked to pose two separate Questions on Module-related topics, which the Instructor will then explore in some detail.
 - The Questions asked must be thought-provoking Questions, exploring the information, and the implications thereof, presented in the Module.
 - Thought-provoking Questions do not include asking for the Instructor's opinion on any subject.
 - Unacceptable Questions are those which require simply looking up the answer in the text or online; there must be some depth to any Question asked. The Questions asked must make sense and must not contain errors in the science. Improper spelling, grammar, and/or sentence structure can disqualify a Question. If a Question is rejected, it may be reworked and resubmitted for credit without penalty, except for any relevant Lateness Deduction.
 - The grade given for an accepted Question will depend on the quality of the Question, with a trivial Question getting a lower grade and a profound thought-provoking Question getting a higher grade.

- Follow-up Questions from the same student and/or from different students are welcome.
 - After a Week closes out, the Questions asked, and their answers, will continue to be visible; no new Questions may be posted after that time.
 - There will be ten (10) AskP assignments in total.
 - The **best 8 of the 10 AskP** scores will be counted toward the final grade.
 - The SLOs for each Module apply to these Assignments.
- **Essays (25% of the Course Grade):**
 - There will be three (3) Essays during the term. The Essay will have Due Dates that conform, in general, to the Module Schedule.
 - Instructions will be available in the Info Text Headers in both the Essay Topics and the Essays, located in the Assignments section of the Left Menu. Instructions will also be available in the Left Menu / Resources / Course Docs.
 - The Topic specifically selected for each Essay must be submitted for approval by a particular Due Date. Instructions for this are posted in the Assignment site; a reminder will be posted as an Announcement.
 - The Essay Topic selection is valued as 10 points of the 100 points for the Project. The Essay Topic may be resubmitted continuously during a Grace Period until it is approved. If no Essay Topic is selected, any subsequent Report will not be approved.
 - The Essay is valued as 90 points of the 100 points for the Project. Details of the formatting, etc., of the Essay will be posted in the Course Docs section of the Left Menu.
 - The SLOs and MLOs for the Course apply to these Assignments.
- **Weekly Reflections (WRs) (3% of the Course Grade):**
 - There is a lot of interesting information in the news from space in this era.
 - In the WR assignments, we'll be sharing the things we thought were most stunning about what the class has covered and what the world's news has brought in.
 - In a short paragraph, let us all know what new facts and insights you thought most remarkable. Then comment on the thoughts of two of your fellows.
- **Participation (P) (2% of the Course Grade):**
 - Being active in this online course each Week is important for your academic progress.
 - The Participation score, which notes the submission of assignments and the reading of the postings of other students attests to your presence.

ASSESSMENT TASKS AND GRADING

GRADING OF COURSE TASKS

The course grade will be computed as follows:

	Number	Max. Score

<i>First Week Introductions</i>	<i>1 (Extra Credit)</i>	<i>1%</i>
Starry Night Exercises *	Best [#N - #(N-3)]	25%
Lab Experiments *	Best 12 of 14	25%
Essays *	3	25%
Ask the Student *	Best 8 of 10	10%
Ask the Professor *	Best 8 of 10	10%
Weekly Reflections *	15	3%
Attendance	15	2%
	Total =	100%

Course work submitted after specified Due Dates (marked with *) will be subject to a Lateness Deduction, which will generally be 5% per calendar day late, or fraction thereof, after the Due Date. Lateness Deductions may be excused for valid documented reasons.

Assignment Grading will be completed within one week after the Due Date for each Assignment.

If a Grade is disputed, that dispute must be originated within three (3) weeks after the Due Date.

GRADING SCALE

The final letter grade will be based on the total percentage that the student has earned from all the course tasks. Each letter grade and its respective level of achievement is provided in the following table:

Letter Grade	Definition
A	90.0% - 100% of cumulative points possible
B	80.0% - 89.9% of cumulative points possible
C	65.0% - 79.9% of cumulative points possible
D	50.0% - 64.9% of cumulative points possible
F	below 50.0% of cumulative points possible

Computed grades will not be rounded up.

Other grades may be assigned as listed in the WCC Catalog.

COURSE CONTENT. (This section is optional)

This course is structurally divided into 5 Modules, each of which is composed of 3 Weeks, within which various Course Tasks are to be carried out and completed. The Modules overlap by one Week, allowing for 28 Weeks of Lab Experiments to fit into a 15-Week Semester. For example, the second Week of Module 1 overlaps with the first Week of Module 2; the pattern then continues, like stair-stepping, through to the end. The Course Calendar below identifies those time segments.

The theme developed in this course is how the science of Astronomy has developed, with particular attention given to the our planetary Solar System. Our companion course, ASTR 110 - Survey of Astronomy, develops the coverage of the discoveries with reference to the universe as a whole. Here we consider some early models people used to make sense of the near Cosmos. We study how the heliocentric model provides simple explanations for how basic astronomical phenomena work and we look at how the guidance from Kepler's Laws permits us to understand the motions of the planetary bodies. We make use of computer technology to study the motions of Solar System bodies as seen from Earth. We continue with some actual exploration of our real Solar System by studying the findings of some recent spacecraft data. We finally continue with some exploration of the space beyond the small confines of the Solar System.

Module 1: In this Module, we focus on the Basics of Astronomical investigation, such as the movements of celestial bodies in the sky, the fundamentals of mathematical descriptions for celestial analysis, and the concept of models that can represent reality and that can guide the advancement of Astronomical knowledge. Two models in particular, the Astrological model and the Flat Earth model, will be explored in some detail. We also learn of a method used in Mathematics for representing very large or very small numbers in a manner that permits simpler calculations. (SLOs 1, 2, 3, 5, & 6)

MODULE LEARNING OBJECTIVES (MLOs):

Upon completion of this Module, the student will be able to:

- 1.1 - Use a computer program to locate the main bodies of the Solar System in the sky, as seen from any point on the Earth and at any time within a century of the present time.
- 1.2 - Set up and understand the use of a natal horoscope in Astrology.
- 1.3 - Convert numbers in standard decimal notation into scientific notation, and vice versa.

- 1.4 - Explain the concept of a Flat Earth and how that might be a model with the power to explain the Solar System phenomena around us.
- 1.5 - Explain where the Flat Earth model has shortcomings in its explanations.

Module 2: The focus turns to the interrelationship of the Sun, the Moon, and the Earth, as shown by the phenomena of seasons, eclipses, and lunar phases. The usefulness of the heliocentric model in correctly describing these celestial events and predictions made from them is explored in some detail. (SLOs 1 & 3)

MODULE LEARNING OBJECTIVES (MLOs):

Upon completion of this Module, the student will be able to:

- 2.1 - Discuss how the combination of the elliptical orbit and the tilt of the Earth give rise to the meteorological and climatic phenomena we call the seasons.
- 2.2 - Recognize that other worlds can have periodically changing environmental conditions that, although nothing like those on Earth, can be called seasons.
- 2.3 - Summarize the types of models that explain the motions within the solar system.
- 2.4 - Explain how the coordinate systems used in astronomy locate celestial objects in the sky.
- 2.5 - Describe the motion of the sky as a whole about the Earth.

Module 3: The ruling force of gravity and its manifestations in Kepler's Laws of Planetary Orbits guides the work in this Module. The common behavior of all the bodies in Kepler's 3 Laws is seen as a unifying factor. The student gets to design interesting varieties of Solar Systems. (SLOs 1, 2, 3, 5, & 6)

MODULE LEARNING OBJECTIVES (MLOs):

Upon completion of this Module, the student will be able to:

- 3.1 - Quantitatively categorize the types of planetary orbits that are possible.
- 3.2 - Explain the role of changing velocities in the determination of the types of orbits that can be possible.
- 3.3 - Compare the effects on planetary orbits of changes in the mass of the Sun and/or the masses of the planets.
- 3.4 - Explain the effects of Kepler's 2nd Law.

3.5 - Generalize the findings of Kepler's 3rd Law to the planets of our Solar System.

3.6 - Describe the characteristics of what makes a Solar System stable and unstable.

Module 4: From the Earth, the “fixed stars” provide a seemingly unchanging background for the motions of the Solar System bodies. But these motions, as analyzed by a computer program can provide clues to some irregularities that can be detected. (SLOs 1, 2, 3, & 6)

MODULE LEARNING OBJECTIVES (MLOs):

Upon completion of this Module, the student will be able to:

- 4.1 - Identify and explain the rising of the Sun, as seen from various points on the Earth's surface.
- 4.2 - Illustrate and interpret the retrograde motion of a superior planet, explaining its mechanics and why this motion is not so obvious to the casual observer.
- 4.3 - Analyze the Sun's motion in the sky and look for irregularities in its motion throughout the year in the zodiac.

Module 5: Lastly, using datasets collected by NASA in its exploration of nearby worlds, we'll do a simulated exploration of the surfaces of the Moon, Mars, and other bodies and will conclude with a tour of the Solar System. (SLOs 1, 2, 3, 4, & 6)

MODULE LEARNING OBJECTIVES (MLOs):

Upon completion of this Module, the student will be able to:

- 5.1 - Identify and explain the nature of selected surface features of the Moon.
- 5.2 - Examine, in a simulation, and comment upon selected surface features of Mars.
- 5.3 - Interpret the differences between the worlds visited in a tour of the Solar System.

LEARNING RESOURCES

Software:

[Starry Night College Textbook](#)

To access the Starry Night College Textbook, please follow these directions:

Windward Community College is an equal opportunity, affirmative action institution.

Step 1. Obtain a Product Code

Purchase directly from the publisher:

Go to the online store - <https://bit.ly/astrotextbook> - and follow the instructions.

You can purchase a Product Code with a credit card or PayPal; the one-time cost is \$29.99.

Your 7-digit Product Code will be immediately emailed to you following purchase. Check your Spam/Junk folder. The email will come from store@simulationcurriculum.com.

Step 2. Sign In to the Starry Night Learning Platform

Go to <https://learn.simcur.com>

Click the Sign In button. Sign in using the login information and 8-digit password provided by your instructor. Press Continue.

A new window will load requesting access to your account. Press Authorize Access.

You will then be automatically signed into the Starry Night learning platform.

Step 3. Using Your Product Code

After you sign into the Starry Night Learning Platform, you will need to redeem the Product Code to use the Starry Night College Textbook.

Click the Redeem a Product Code button and enter your redeem code.

The Starry Night College Textbook will then be unlocked.

Click on the Assignments Tab to view all exercises assigned by your instructor.

ADDITIONAL INFORMATION (This may be included here or in an appendix.)

- **Instructor Bio - Sean Moroney, PhD**
 - I've had a life-long interest in the sciences, with physics as a particular favorite. I've taken a BS in Physics, a MS in Physics, and a PhD in Engineering Mechanics, with a specialty in Biomechanics. Astronomy, as exemplified in all of our space-age discoveries, has been a source of continued wonderment as everyone learns more and more about the cosmos we are in.
- **Work Submitted Late**
 - Work submitted after the Due Date will receive a Lateness Deduction of 5% per calendar day (or fraction thereof) for each day late. This will happen during the Grace Period which begins directly after the Due Date is past. Grace Periods tend to be no more than three (3) days in duration. If there are extenuating

circumstances that can be documented, the Lateness Deductions may be waived, in whole or in part; however, the Instructor must be notified about the circumstances in the shortest possible time.

- **Missed Work**

- Generally, work not submitted will receive the grade of zero. It is the student's responsibility to stay current with the Assignments and to keep track of upcoming Due Dates. If there are extenuating circumstances that interfere with this orderly progression, the Instructor must be notified at the earliest date, so that accommodations can be made. If an overly long time period has passed in which a sizable amount of coursework is not submitted, It may not be possible to request that more than a small fraction of that work may be eligible for completion.

- **Extra Credit**

- Extra Credit is not generally offered in this course. However, a small number of the lowest-graded assignments in most of the categories will be removed from the pool of scores contributing to the Final Grade. This will happen at the end of the term.

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 Accessibility Counselor to discuss reasonable accommodations that will help you succeed in this class. Roy Inouye can be reached at (808) 235-7448, royinouy@hawaii.edu, or you may stop by Hale Kāko‘o 106 for more information.

SEX DISCRIMINATION AND GENDER-BASED VIOLENCE RESOURCES (TITLE IX)

Windward Community College is committed to providing a learning, working, and living environment that promotes personal integrity, civility, and mutual respect and is free of all forms of sex discrimination and gender-based violence, including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence, and stalking.

If you or someone you know is experiencing any of these, WCC has staff and resources to support and assist you. To report an incident of sex discrimination or gender-based violence, as well as receive information and support, please contact one of the following:

Jojo Miller, Confidential Advocate
 Phone: (808) 348-0663
 Email: advocate@hawaii.edu
 Office: Hale Kāko‘o 110

Desrae Kahale, Mental Health Counselor & Confidential Resource
 Phone: (808) 235-7393
 Email: dkahale3@hawaii.edu
 Office: Hale Kāko‘o 101

Karen Cho, Deputy Title IX Coordinator
Phone: (808) 235-7404
Email: kcho@hawaii.edu
Office: Hale 'Alaka'i 120

As a member of the University faculty, I am required to immediately report any incident of sex discrimination or gender-based violence to the campus Title IX Coordinator. Although the Title IX Coordinator and I cannot guarantee confidentiality, you will still have options about how your case will be handled. My goal is to make sure you are aware of the range of options available to you and have access to the resources and support you need.

For more information regarding sex discrimination and gender-based violence, the University's Title IX resources and the University's Policy, Interim EP 1.204, go to manoa.hawaii.edu/titleix/

ACADEMIC INTEGRITY (This section is optional)

Work submitted by a student must be the student's own work. The work of others should be explicitly marked, such as through quotes or summarizing with reference to the original author.

In this class, students who commit academic dishonesty, cheating, or plagiarism will have the following consequence(s):

- Students will receive failing grades for plagiarized assignments.
- All cases of academic dishonesty are referred to the Vice Chancellor for Student Affairs.

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: Alaka'i 121
- Phone: (808) 235-7422

COURSE DOCS IN LAULIMA

The Course Docs section in the Resources section of the Left Menu in Laulima is another critically important section that contains some necessary information about the Assignments and other aspects of the Course.

The Course Docs section should be reviewed carefully in the early Weeks of the Course.

FIRST WEEK INTRODUCTIONS (FWI)

The FWI Assignment is DUE by the EOD
on 28 August 2002.

This is a WCC requirement. If not done,
there is a possibility of being dropped from the course.

STARRY NIGHT EXERCISES (SN)

Because the SN Exercises are not equal in size,
there will be a separate schedule for those.
Grading for completed SN Assignments will be done
on an approximately weekly basis.
Information on this will be posted as it is developed.

Participation (P)

Participation will be measured on a weekly basis.
On Monday mornings, the activities of and
the work done by each student will be assessed;
a grade will then be posted.

LAB EXERCISES

MODULE	WEEK	LAB	OPEN	DUE	CLOSE
1	1	LAB 01	22-Aug	4-Sep	7-Sep
	2	LAB 02	29-Aug	11-Sep	14-Sep
	3	LAB 03	5-Sep	18-Sep	21-Sep
2	4	LAB 04	12-Sep	25-Sep	28-Sep
	5	LAB 05	19-Sep	2-Oct	5-Oct
	6	LAB 06	26-Sep	9-Oct	12-Oct
3	7	LAB 07	3-Oct	16-Oct	19-Oct
	8	LAB 08	10-Oct	23-Oct	26-Oct
	9	LAB 09	17-Oct	30-Oct	2-Nov
4	10	LAB 10	24-Oct	6-Nov	9-Nov
	11	LAB 11	31-Oct	13-Nov	16-Nov
	12	LAB 12	7-Nov	20-Nov	23-Nov
5	13	LAB 13	14-Nov	27-Nov	30-Nov
	14	LAB 14	21-Nov	4-Dec	8-Dec

CALENDARS OF DUE DATES

ESSAYS

TOPIC	Available	Due	Available
	From	Date	Until
1	22-Aug	4-Sep	7-Sep
2	26-Sep	9-Oct	12-Oct
3	31-Oct	13-Nov	16-Nov

PROJECT	Available	Due	Available
	From	Date	Until
1	22-Aug	25-Sep	28-Sep
2	26-Sep	30-Oct	2-Nov
3	31-Oct	4-Dec	8-Dec

ASK THE STUDENT/PROFESSOR (Ask-S/Ask-P)

MODULE	ASK#	OPEN	DUE	CLOSE
1	1	22-Aug	11-Sep	14-Sep
2	2	12-Sep	2-Oct	5-Oct
3	3	3-Oct	23-Oct	26-Oct
4	4	24-Oct	13-Nov	16-Nov
5	5	14-Nov	4-Dec	8-Dec

WEEKLY REFLECTIONS (WRs)

WEEK	FROM	DUE	CLOSE
01	26 Aug	28 Aug	29 Aug
02	2 Sep	4 Sep	5 Sep
03	9 Sep	11 Sep	12 Sep
04	16 Sep	18 Sep	19 Sep
05	23 Sep	25 Sep	26 Sep
06	30 Sep	2 Oct	3 Oct
07	7 Oct	9 Oct	10 Oct
08	14 Oct	16 Oct	17 Oct
09	21 Oct	23 Oct	24 Oct
10	28 Oct	30 Oct	31 Oct
11	4 Nov	6 Nov	7 Nov
12	11 Nov	13 Nov	14 Nov
13	18 Nov	20 Nov	21 Nov
14	25 Nov	26 Nov	27 Nov
15	2 Dec	4 Dec	5 Dec

ASTR 110L OL – Fall 2022**Schedule of Modules**

<u>Modules</u>	<u>Topics</u>	<u>Week</u>	<u>Date</u>
Module 1	Some Basics	1	22 -28 Aug
		2	29 Aug - 4 Sep
		3	5 -11 Sep
Module 2	Motion Measurements	4	12 - 18 Sep
		5	19 - 25 Sep
		6	26 Sep - 2 Oct
Module 3	Solar System Motions	7	3 - 9 Oct
		8	10 - 16 Oct
		9	17 - 23 Oct
Module 4	Gravity & Kepler's Laws	10	24 - 30 Oct
		11	31 Oct - 6 Nov
		12	7 - 13 Nov
Module 5	Current Explorations	13	14 - 20 Nov
		14	21 - 27 Nov
		15	28 Nov - 4 Dec
CONCLUSION and SUMMATION		5 - 8 Dec	
Aloha!		16 Dec 2022	

