AST R101L: ASTRONOMY LABORATORY

Originator
jwmiller

College
Oxnard College

Discipline (CB01A)
AST - Astronomy

Course Number (CB01B)
R101L

Course Title (CB02)
Astronomy Laboratory

Banner/Short Title
Astronomy Laboratory

Credit Type
Credit

Start Term
Fall 2021

Catalog Course Description
This laboratory reinforces principles learned in AST R101. Students obtain hands-on experience with telescopes, star charts, and other devices used in astronomy. Observations are made of the Moon, the planets, and the stars. Field trips to observatories, planetariums, and/or dark-sky sites may be required.

Taxonomy of Programs (TOP) Code (CB03)
1911.00 - Astronomy

Course Credit Status (CB04)
D (Credit - Degree Applicable)

Course Transfer Status (CB05) (select one only)
A (Transferable to both UC and CSU)

Course Basic Skills Status (CB08)
N - The Course is Not a Basic Skills Course

SAM Priority Code (CB09)
E - Non-Occupational

Course Cooperative Work Experience Education Status (CB10)
N - Is Not Part of a Cooperative Work Experience Education Program

Course Classification Status (CB11)
Y - Credit Course

Educational Assistance Class Instruction (Approved Special Class) (CB13)
N - The Course is Not an Approved Special Class

Course Prior to Transfer Level (CB21)
Y - Not Applicable

Course Noncredit Category (CB22)
Y - Credit Course

Funding Agency Category (CB23)
Y - Not Applicable (Funding Not Used)

Course Program Status (CB24)
1 - Program Applicable

General Education Status (CB25)
Y - Not Applicable

Support Course Status (CB26)
N - Course is not a support course

Field trips
May be required

Faculty notes on field trips; include possible destinations or other pertinent information
Deep sky viewing field trips and a trip to the Griffith Observatory.

Grading method
Letter Graded

Does this course require an instructional materials fee?
No

Repeatable for Credit
No

Is this course part of a family?
No

Units and Hours

Carnegie Unit Override
No

In-Class

Lecture

Activity

Laboratory
Minimum Contact/In-Class Laboratory Hours
52.5
Maximum Contact/In-Class Laboratory Hours
52.5

Total in-Class

Total in-Class
Total Minimum Contact/In-Class Hours
52.5
Total Maximum Contact/In-Class Hours
52.5

Outside-of-Class

Internship/Cooperative Work Experience

Paid

Unpaid

Total Outside-of-Class

Total Outside-of-Class

Total Student Learning

Total Student Learning
Total Minimum Student Learning Hours
52.5
Total Maximum Student Learning Hours
52.5

Minimum Units (CB07)
1
Maximum Units (CB06)
1

Prerequisites
AST R101 or concurrent enrollment

Advisories on Recommended Preparation
MATH R005 or MATH R015 or High School Algebra

Entrance Skills

Entrance Skills
The students are expected to have prior knowledge of the theory regarding the material for a given laboratory experiment.

Prerequisite Course Objectives
AST R101-Describe the history of astronomy, the practical applications of astronomy, and the more important tools of astronomy; for example, the use of a telescope.
AST R101-Define the terms and theories of modern astronomy; for example, the Equatorial Coordinate System.
AST R101-Describe what astronomy is and is not, what it encompasses, and the benefits of studying it.
AST R101-Explain the nature of our solar system, our galaxy, and the universe as a whole, e.g., stars, including binaries, variables, and main sequence stars; stellar evolution; interstellar objects; and galaxies.
AST R101-Describe the basic concepts of matter and energy, such as atoms, mass, inertia, gravity, photons, kinetic and potential energy.

Entrance Skills
Prior knowledge of algebra is recommended due to various calculations and mathematically based concepts.

Prerequisite Course Objectives
MATH R005-Simplify algebraic expressions.
MATH R005-Graph linear equations by plotting points and using intercepts.
MATH R015-Evaluate and simplify algebraic expressions.
MATH R015-Convert decimals to scientific notation and vice versa.

Requisite Justification

Requisite Type
Prerequisite

Requisite
AST R101

Requisite Description
Course not in a sequence

Level of Scrutiny/Justification
Closely related lecture/laboratory course

Requisite Type
Advisory

Requisite
MATH R005

Requisite Description
Course not in a sequence

Level of Scrutiny/Justification
Content review

Requisite Type
Concurrent

Requisite
AST R101

Requisite Description
Course not in a sequence

Level of Scrutiny/Justification
Closely related lecture/laboratory course

Requisite Type
Advisory

Requisite
MATH R015

Requisite Description
Course not in a sequence

Level of Scrutiny/Justification
Content review

Student Learning Outcomes (CSLOs)

	Upon satisfactory completion of the course, students will be able to:
1	Students will be able to name and describe the functionality of all pieces of a Newtonian reflector telescope.
2	Students will be able to locate a given constellation in the night sky.

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1	Make measurements using optical instruments and analyze data.
2	Use and maintain telescopes, binoculars, and spectrometers.
3	Locate and describe several constellations and deep-sky objects in the night sky.
4	Apply the basic steps of the scientific method including collecting data, analyzing it, drawing conclusions, and evaluating results.

Course Content

Lecture/Course Content

None

Laboratory or Activity Content

1. Introductory observations appropriate to the season and phase of the moon
2. Review of math skills, scientific notation, use of calculator, metric units, and problem solving
3. Sky Motions
   a. Celestial coordinates, using a star atlas, star atlas exercise, stellar magnitude scale
   b. The cause of the seasons and modeling the variation of solar heating in summer and winter
   c. Using a planisphere to learn constellations and their seasons
4. Optics and Telescopes
   a. Properties of lenses, measuring focal lengths of lenses, constructing a simple refracting telescope
   b. Telescope mountings and accessories
   c. Telescope parameters, using telescopes
   d. Observing with a telescope, field of view activity or double star activity, keeping an observing log
   e. Local field trip to a dark sky site, deep-sky observing, keeping an observing log
5. Solar System
   a. Angle, size, and distance The small angle formula
   b. Parallax and introduction to statistics Measure parallax of moon using a model earth and moon Combine students' results using statistics and determine estimated errors
   c. Using Kepler's third law to make a scale model of the orbits of the planets
   d. Determining the distance to a planet using the planet's observed position along with the scale model of the solar system
   e. Measuring the apparent diameter of a planet through a telescope and using that information, along with the calculated distance to the planet to determine the planet's diameter
   f. Determining the rotation rate of the Sun by measuring the movement of sunspots, taking into account Earth's revolution
   g. The Moon: Identifying features on the Moon using a lunar atlas Measuring the size of craters on a photograph and converting them to actual sizes on the Moon Telescope observations
   h. Determining the Moon's size and distance by measuring and analyzing the curve of the Earth's shadow on photographs taken during the partial phase of a lunar eclipse
6. Radiation and Stellar Classification
   a. Spectroscopy: Kirchhoff's laws of spectral analysis Using a simple spectroscope to measure emission lines on gas discharge tubes and then identifying the gases from the spectrum lines
   b. Thermal radiation and the classification of stars: Plotting visually bright stars and nearby stars on an H-R diagram Identifying the regions making up the different luminosity classes Calculating the diameters of selected stars from their luminosity and surface temperature.
   c. Stellar distances: Using the H-R diagram to determine the absolute magnitude of stars in the Pleiades star cluster and then using the method of spectroscopic parallax to determine the distance to the cluster.

Methods of Evaluation

Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):

Problem solving exercises
Written expression

Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):

Essays
Laboratory activities
Laboratory reports
Problem-Solving Assignments

Instructional Methodology

Specify the methods of instruction that may be employed in this course

Distance Education
Demonstrations
Field trips
Laboratory activities
Small group activities

Describe specific examples of the methods the instructor will use:

1. Demonstrations: Proper techniques and procedures regarding the utilization of lab equipment will be demonstrated by the instructor. For instance; how to properly use a reflecting telescope to view the moon.
2. Distance education: Laboratory activities, as noted below, will take place in a virtual setting. The experiments will be tailored to utilize computer simulations, prerecorded data acquisition, live online meetings, and message boards where questions can be asked and answered.
3. Field Trips: Deep Sky "Star Parties" may be employed to allow students the chance to see stars, galaxies, and nebulae that are far beyond observations that can be within the city limits. A trip to the Griffith Observatory may also be used to allow students the opportunity to see all that it has to offer to the public.
4. Laboratory activities: Each week the students will preform an laboratory experiment or activity investigating certain aspects of a system that have been discussed in lecture. These experiments will direct the students such that the intricacies of a given system are explored and/or identified. For instance; viewing the moon through a telescope and producing a sketch of the major craters that are visible.
5. Small group activities: The students will work in small groups while preforming the experiments where applicable.

Representative Course Assignments

Writing Assignments

1. Students write answers to the Advance Study Questions. The questions vary in difficulty, most requiring the student to synthesize a written answer from the information provided in the introductory material.

Critical Thinking Assignments

1. Students will be tasked to analyze data that they have taken in a given experiment and draw conclusions from said results. For instance; The students may take data regarding the intensity of a light source from various distances away and be asked to determine how intensity varies with position relative to the source.

Reading Assignments

1. Each topic has an introduction in the workbook, providing background information. Students are instructed to be prepared by reading the introductory material and to familiarize themselves with the goal and procedure for the activity.

Skills Demonstrations

None

Other assignments (if applicable)

None

Outside Assignments

Representative Outside Assignments

None

District General Education

A. Natural Sciences

B. Social and Behavioral Sciences

C. Humanities

D. Language and Rationality

E. Health and Physical Education/Kinesiology

F. Ethnic Studies/Gender Studies

CSU GE-Breadth

Area A: English Language Communication and Critical Thinking

Area B: Scientific Inquiry and Quantitative Reasoning

Area C: Arts and Humanities

Area D: Social Sciences

Area E: Lifelong Learning and Self-Development

CSU Graduation Requirement in U.S. History, Constitution and American Ideals:

IGETC

Area 1: English Communication

Area 2A: Mathematical Concepts & Quantitative Reasoning

Area 3: Arts and Humanities

Area 4: Social and Behavioral Sciences

Area 5: Physical and Biological Sciences

Area 6: Languages Other than English (LOTE)

Textbooks and Lab Manuals

Resource Type
Manual

Description
Goodman, G. (2020). *Astronomy Laboratory Workbook*. Oxnard College.

Resource Type
Other Instructional Materials

Description
Edmund Scientific (1977). *Mag 5 Star Atlas*.

Resource Type
Other Instructional Materials

Description
Chandlers, David (1992). *The Night sky* . Planisphere.

Resource Type
Other Instructional Materials

Description
Handouts provided by the instructor.

Distance Education Addendum

Definitions

Distance Education Modalities
Hybrid (51%–99% online)
Hybrid (1%–50% online)
100% online

Faculty Certifications

Faculty assigned to teach Hybrid or Fully Online sections of this course will receive training in how to satisfy the Federal and state regulations governing regular effective/substantive contact for distance education. The training will include common elements in the district-supported learning management system (LMS), online teaching methods, regular effective/substantive contact, and best practices.
Yes

Faculty assigned to teach Hybrid or Fully Online sections of this course will meet with the EAC Alternate Media Specialist to ensure that the course content meets the required Federal and state accessibility standards for access by students with disabilities. Common areas for discussion include accessibility of PDF files, images, captioning of videos, Power Point presentations, math and scientific notation, and ensuring the use of style mark-up in Word documents.
Yes

Regular Effective/Substantive Contact

Hybrid (1%–50% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Other DE (e.g., recorded lectures)	The students will watch recorded lab videos that go over the pertinent subject matter of the lab exercise.
Synchronous Dialog (e.g., online chat)	Online meetings will be held to go over the experiment at hand and discuss how to proceed with the given experiment. Recordings will be made of all class meetings. Students may also be put into groups to work on a given experiment/activity.
Asynchronous Dialog (e.g., discussion board)	Students will have access to a discussion board in which they can ask questions regarding the course material.
Face to Face (by student request; cannot be required)	Face to face meetings can be arranged when needed.

Hybrid (51%–99% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Other DE (e.g., recorded lectures)	The students will watch recorded lab videos that go over the pertinent subject matter of the lab exercise.
Synchronous Dialog (e.g., online chat)	Online meetings will be held to go over the experiment at hand and discuss how to proceed with the given experiment. Recordings will be made of all class meetings. Students may also be put into groups to work on a given experiment/activity.

Asynchronous Dialog (e.g., discussion board)	Students will have access to a discussion board in which they can ask questions regarding the course material.
Face to Face (by student request; cannot be required)	Face to face meetings can be arranged when needed.

100% online Modality:

Method of Instruction	**Document typical activities or assignments for each method of instruction**
Other DE (e.g., recorded lectures)	The students will watch recorded lab videos that go over the pertinent subject matter of the lab exercise.
Synchronous Dialog (e.g., online chat)	Online meetings will be held to go over the experiment at hand and discuss how to proceed with the given experiment. Recordings will be made of all class meetings. Students may also be put into groups to work on a given experiment/activity.
Asynchronous Dialog (e.g., discussion board)	Students will have access to a discussion board in which they can ask questions regarding the course material.

Examinations

Hybrid (1%–50% online) Modality
Online
On campus

Hybrid (51%–99% online) Modality
Online
On campus

Primary Minimum Qualification
PHYSICS/ASTRONOMY

Review and Approval Dates

Department Chair
09/02/2020

Dean
09/03/2020

Technical Review
10/14/2020

Curriculum Committee
10/14/2020

Curriculum Committee
12/09/2020

CCCCO
MM/DD/YYYY

Control Number
CCC000181703

DOE/accreditation approval date
MM/DD/YYYY