

PHYS-101L: ASTRONOMY LABORATORY

Cuyahoga Community College

Viewing: PHYS-101L : Astronomy Laboratory

Board of Trustees:

MARCH 2024

Academic Term:

Fall 2024

Subject Code

PHYS - Physics

Course Number:

101L

Title:

Astronomy Laboratory

Catalog Description:

Intended for non-science majors. Exercises on measurements, optics, telescopes, the sun, constellations, and other related astronomy topics. Laboratory activities complement and enrich related lecture course.

Credit Hour(s):

1

Lecture Hour(s):

0

Lab Hour(s):

3

Other Hour(s):

0

Requisites

Prerequisite and Corequisite

PHYS-1010 Astronomy or concurrent enrollment.

Outcomes

Course Outcome(s):

Apply concepts and current models in astronomy to describe, explain, or predict observations of the modern world and universe.

Objective(s):

1. Name and locate common constellations and bright stars.
2. Observe and describe the sun, stars, and other celestial phenomena.
3. Describe the planets, galaxies, electromagnetic radiation, and types of spectra.
4. Discuss the evolution of stars and star systems observed.
5. Use astronomy concepts and knowledge to address issues and/or solve problems.
6. Discuss impacts of science on the contemporary world.

Course Outcome(s):

Apply laboratory skills, including safety practices, and data acquisition to the study of the modern world and universe.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Compare physical data on the solar system utilizing charts, graphs, and fundamental laws.
 2. Use lab equipment and instruments to collect unique or physically authentic data which include random or systemic variability.
 3. Graph or interpret scientific data.
 4. Demonstrate the formation of conclusions based on evidence.
 5. Explain aspects of data reproducibility, intrinsic variability, and/or limitations.
 6. Name and describe the optical systems of reflecting and refracting telescopes.
 7. Demonstrate proper lab safety practices.
 8. Demonstrate relevant safety techniques in individual lab exercises.
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Methods of Evaluation:

1. Examinations and/or quizzes
2. Written library research reports
3. Individual class presentations
4. Cooperative class projects
5. Homework assignments
6. Pre-laboratory assignments
7. Laboratory experiments
8. Post-laboratory assignments
9. Student/faculty contractual agreements
10. Computer assignments/games/simulations
11. Field trip activities/assignments
12. Other or some combination of the above

Course Content Outline:

1. The Scientific Method
 - a. Observation
 - b. Testable hypotheses
 - c. Data reproducibility
 - d. Evidence-based conclusions
2. Safety in the laboratory
 - a. Student responsibilities
 - i. no unauthorized experiments
 - ii. knowledge of safety policy and procedures
 - iii. laboratory techniques
 - b. Physical facilities
 - i. first-aid, eye washes, burns, etc.
 - ii. fire extinguishers and fire blanket
 - iii. electrical power and circuit breakers
 - iv. emergency exits
 - c. Types of avoidable accidents
 - i. injuries caused by misuse of equipment
 - ii. careless behavior in the laboratory
 - iii. eye injuries
 - iv. no food/drinks in laboratory
 - d. Importance of proper safety technique in individual lab exercises
3. Measurements in the laboratory
 - a. Scientific notation
 - b. Metric measurements
 - i. fundamental units
 - ii. metric conversions
 - iii. scientific notation
 - c. Graphs
 - i. plotting data
 - ii. interpretation
 - d. Intrinsic variability of measured data

4. Electromagnetic radiation and spectra
 - a. Types of radiation
 - b. Types of spectra
 - c. Wavelength vs. frequency
5. Laws of optics
 - a. Refraction
 - b. Reflection
6. Properties of telescopes
 - a. Refractors
 - b. Reflectors
 - c. Others
7. Planets, constellations, and stars
 - a. Planets
 - i. motions
 - ii. configurations
 - iii. properties
 - iv. moons
 - b. Constellations
 - i. zodiacal
 - ii. location on celestial sphere
 - iii. names and locations of prominent stars
8. Structure of the sun and its characteristics
 - a. Solar characteristics
 - b. Motions of the sun
 - c. Sunspot cycle
9. Evolution of stars
 - a. Hertzsprung-Russell (H-R) diagram
 - b. Evolutionary paths
10. Classification of galaxies
 - a. Elliptical
 - b. Spiral
 - c. Irregular
 - d. Dwarf
 - e. The local group

Resources

Reynolds, Mike D; and Bakich, Michael E. *Exploring the Universe: A Laboratory Guide for Astronomy*. 1st. Morton, 2015.

Fraknoi, Andrew; Morrison, David; Wolff, Sidney C; et al. *Astronomy*. 2nd. Houston, Texas: OpenStax, Rice University, 2022. 2023. <https://openstax.org/details/books/astronomy-2e>

Arny, Thomas T.; Schneider, Stephen E. *Explorations: An Introduction to Astronomy*. 10th. New York, NY: McGraw-Hill, 2023.

Bennett, Donahue, Schneider, and Voit. *The Cosmic Perspective*. 10th. Boston: Pearson, 2024.

Schneider, Stephen E.; Arny, Thomas T. *Pathways to Astronomy*. 6th. New York, New York: McGraw-Hill, 2020.

Geller, Robert; Freedman, Roger A.; Kaufmann, William J. *Universe*. 11th. William H. Freeman Publishing, 2019.

Project STAR.

Lomaga, G. *Astronomy through practical investigation*. 1 st. LSW Publishing, 1998.

Custom Astronomy Lab Equipment Kit. Home Science Tools,

Astronomy Kit Interactive Manual. eScienceLabs, 2017.

Resources Other

1. Audio-visual materials: slides, videos and dvds, audio tapes and computer programs, and laboratory equipment, i.e., optical bench, telescope, etc.
2. National Aeronautics and Space Administration website: www.nasa.gov
3. Topical material from space-related websites
4. Library reference materials
5. Astronomy, Kalmbach Publishing
6. Sky and Telescope. Sky Publishing
7. Faculty developed instructional materials

Instructional Services

OAN Number:

Ohio Transfer 36 TMNS

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