

Montgomery County Community College  
 AST 120/PHY 120/GLG 121  
 Introduction to Astronomy  
 4-3-3

**COURSE DESCRIPTION:**

Introduction to Astronomy is a one-semester college-level course in basic astronomy. The course may be used as a laboratory science elective with basic algebraic applications. The course explores a broad range astronomical concepts and principles in ten major areas: understanding the sky, apparent motions of the planets and the sun, telescopes and accompanying technology, basic structure and behavior of atoms, origin and analysis of light, origin of the solar system, internal structure and behavior of the sun, lifecycle of all stellar classes, origin and structure of galaxies, and cosmology. Throughout the course, emphasis is placed on the implementation of the scientific method, the evidence that astronomers use to support their conclusions, and the importance of astronomy. (Night-time observing is required). This course is subject to a course fee. Refer to <http://mc3.edu/adm-fin-aid/paying/tuition/course-fees> for current rates.

**REQUISITES:**

*Previous Course Requirements*

- ENG 010A Basic Writing, ENG 011 Basic Writing II, or ESL 011 Basic Writing within 5 years with a minimum grade of "C"

*Concurrent Course Requirements*

- MAT 090 - Fundamentals of Algebra, or MAT 011 - Beginning Algebra, or MAT 011B - Beginning Algebra with Review of Arithmetic with a minimum grade of C within 5 years, or High School Algebra II with a minimum grade of B within 5 years.. May be taken prior or during course.

LEARNING OUTCOMES Upon successful completion of this course, the student will be able to:	LEARNING ACTIVITIES	EVALUATION METHODS
1. Identify the major structures of the universe.	Lecture/Discussion Laboratory Exercises Telescope, Binocular and Other Night Sky Observations Field Trip to Local Planetarium Observational Journal Sketching	Laboratory Exercises Homework Assignments Group Research Paper and Presentation Observational Journal Sketching Examinations

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
2. Explain the role of constellations and the concepts and terminology associated with the celestial sphere.	Lecture/Discussion Laboratory Exercises Telescope, Binocular and Other Night Sky Observations Field Trip to Local Planetarium Observational Journal Sketching	Laboratory Exercises Homework Assignments Observational Journal Sketching Examinations
3. Compare and contrast pre-modern to modern scientific models of the universe.	Lecture/Discussion Laboratory Exercises Telescope, Binocular and Other Night Sky Observations	Laboratory Exercises Homework Assignments Examinations
4. Analyze and compute Kepler's laws of planetary motion and Newton's Laws of Motion.	Lecture/Discussion Laboratory Exercises	Laboratory Exercises Homework Assignments Examinations
5. Describe the operation of optical telescopes and the factors that determine the light-gathering, magnifying, and resolving powers of the telescope.	Lecture/Discussion Laboratory Exercises Telescope, Binocular and Other Night Sky Observations	Laboratory Exercises Homework Assignments Examinations
6. Explain the characteristics and properties of the electromagnetic spectrum and their effects on astronomical equipment and observations.	Lecture/Discussion Laboratory Exercises	Laboratory Exercises Homework Assignments Examinations
7. Describe a simplified model of a typical atom and its fundamental behavior.	Lecture/Discussion Laboratory Exercises	Laboratory Exercises Homework Assignments Examinations
8. Evaluate the interaction of light and matter to determine stellar chemical composition and motion as revealed by the Doppler Effect.	Lecture/Discussion Laboratory Exercises	Laboratory Exercises Homework Assignments Examinations

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
9. Compare and contrast the major types of planets in order to develop a theory governing the creation and formation of the solar system.	Lecture/Discussion Laboratory Exercises Telescope, Binocular and Other Night Sky Observations	Laboratory Exercises Homework Assignments Examinations
10. Describe the internal structure and behavior of the sun as determined by the solar magnetic cycle and nuclear fusion.	Lecture/Discussion Laboratory Exercises Movie/Discussion	Laboratory Exercises Homework Assignments Examinations
11. Analyze and interpret the Hertzsprung-Russell (H-R) diagram to determine stellar properties such as radius, mass, luminosity, and stage of evolution.	Lecture/Discussion Laboratory Exercises	Laboratory Exercises Homework Assignments Examinations
12. Define terms such as parallax, parsec, supernova, and white dwarf.	Lecture/Discussion Laboratory Exercises	Laboratory Exercises Homework Assignments Examinations
13. Outline and explain the theorized process by which stars evolve, from molecular cloud to main sequence to death based upon their mass.	Lecture/Discussion Laboratory Exercises Movie/Discussion	Laboratory Exercises Homework Assignments Examinations
14. Identify the major morphological classes of galaxies, demonstrate how the distance, diameter, luminosity, and mass of a galaxy are measured, and explain their creation and evolution.	Lecture/Discussion Laboratory Exercises Telescope, Binocular and Other Night Sky Observations	Laboratory Exercises Homework Assignments Examinations
15. Evaluate and explain current theories regarding the evolution of the universe by understanding current observing methods and analyzing recent and recurrent data.	Lecture/Discussion Laboratory Exercises Movie/Discussion Group Research Paper and Presentation	Laboratory Exercises Homework Assignments Group Research Paper and Presentation Examinations

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
16. Compare and contrast current theories regarding dark matter, dark energy, multiple universes and other topics to evaluate their validity.	Lecture/Discussion Laboratory Exercises Movie/Discussion Group Research Paper and Presentation	Laboratory Exercises Homework Assignments Group Research Paper and Presentation
17. Manipulate algebraic expressions, including the square root and logarithm functions, to solve for and calculate the values of specific variables and express these answers in scientific notation with appropriate units.	Lecture/Discussion Laboratory Exercises Movie/Discussion	Laboratory Exercises Homework Assignments Examinations

At the conclusion of each semester/session, assessment of the learning outcomes will be completed by course faculty using the listed evaluation method(s). Aggregated results will be submitted to the Associate Vice President of Academic Affairs. The benchmark for each learning outcome is that *70% of students will meet or exceed outcome criteria*.

#### SEQUENCE OF TOPICS:

- A. Introduction
- B. Understanding the Night Sky
- C. Origins of Modern Astronomy
- D. Astronomical Tools and Technology
- E. Origin and Properties of Light
- F. Structure and Basic Behavior of Atoms
- F. Structure and Behavior of the Sun
- G. Origin and Properties of the Solar System
- H. Properties of Stars
- I. Evolution of Stars
- J. Neutron Stars, Black Holes and Our Galaxy
- K. Origin and Properties of Galaxies
- L. Cosmology

#### LEARNING MATERIALS:

##### Course Textbook:

Seeds, Michael A. (2010). *Horizons, Exploring the Universe* (12<sup>th</sup> edition). Belmont, CA: Wadsworth Publishing Company.

##### Laboratory Exercises Textbook:

Ferguson, Dale C. (2001). *Introductory Astronomy Exercises* (2<sup>nd</sup> edition). Belmont, CA: Wadsworth Publishing Company.

Spangler, Kelli. AST 120 Lab Manual 2011.

Other learning materials may be required and made available directly to the student and/or via the College's Libraries and/or course management system.

#### COURSE APPROVAL:

Prepared by: Dr. Peter J. Bachmann	Date: 4/1997
Revised by: Dr. Peter J. Bachmann	Date: Summer 2004
Revised by: Kelli Spangler, Lecturer of Astronomy	Date: 2/10/2009
Revised by: Kelli Spangler	Date: Spring 2011
Interim VPAA/Provost Compliance Verification: Victoria L. Bastecki-Perez, Ed.D.	Date: 5/17/2011
Revised by: Kelli Spangler	Date: 6/2012
VPAA/Provost or designee Compliance Verification: Victoria L. Bastecki-Perez, Ed.D.	Date: 6/19/2012
Revised by: Kelli Spangler	Date: 8/2013
VPAA/Provost or designee Compliance Verification: Victoria L. Bastecki-Perez, Ed.D.	Date: 8/7/2013
Revised by: Debbie Dalrymple	Date: 11/13/2017
VPAA/Provost or designee Compliance Verification: Victoria L. Bastecki-Perez, Ed.D.	Date: 12/18/2017
Revised by: Kelli Spangler	Date: 6/7/2023
VPAA or designee Compliance Verification:	Date: 6/7/2023



*This course is consistent with Montgomery County Community College's mission. It was developed, approved and will be delivered in full compliance with the policies and procedures established by the College.*