

Montgomery County Community College
 AST 121
 Astrobiology
 4-3-3

COURSE DESCRIPTION:

Astrobiology uses a multidisciplinary and scientific approach to analyze and assess the theories regarding the evolution of life elsewhere in the universe. While strong emphasis is placed on the astronomical/astrophysical aspects of astrobiology, the course introduces, discusses, and integrates aspects from multiple disciplines (chemistry, biology, geology, and earth sciences) to achieve an overall understanding of the definition of life and evolution. A secondary focus of the course is to develop a firm understanding of the scientific method such that students who complete the course can appreciate the scientific process, build scientific reasoning skills that are applicable beyond this course, and develop basic laboratory skills. This course is subject to a course fee. Refer to <http://mc3.edu/adm-fin-aid/paying/tuition/course-fees> for current rates.

REQUISITES:

Course Requirements

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

High School Algebra II or MAT 090 Fundamentals of Algebra with a minimum grade of C within 5 years

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
Upon successful completion of this course, the student will be able to:		
1. Apply scientific reasoning and the scientific method to evaluate the implications of experiments and observations that have led to the current state of scientific understanding.	Lecture Discussion Assigned readings Research Project Laboratory Exercises	Written Assignments Exams Quizzes Laboratory Exercises Research Project

2. Use vocabulary, scientific theories, and observational data in scientific discussions of the potential for life beyond Earth.	Discussion Assigned readings Research Project	Written Assignments Exams Quizzes Research Project
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LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
3. Evaluate the possibility of interstellar travel and how it impacts the origin of life on Earth (panspermia) and our ability to reach other extrasolar systems.	Discussion Assigned readings Lecture	Written Assignments Exams Quizzes Research Project
4. Compare and contrast the major types of planets to develop a theory governing the creation and evolution of the solar system and how it applies to extra-solar systems.	Lecture Assigned readings Discussion	Written Assignments Exams Quizzes Research Project
5. Evaluate the interaction of light and matter to determine chemical composition and motion as revealed by the Doppler Effect.	Discussion Demonstrations Laboratory Exercises Assigned Readings	Written Assignments Exams Quizzes Laboratory Exercises
6. Describe the internal structure and behavior of the Earth and the impact on the origin and evolution of life.	Lecture Assigned readings Discussion	Written Assignments Exams Quizzes
7. Compare and contrast the conditions under which extremophiles of domains of life exist on Earth with conditions found on other planetary bodies.	Lecture Assigned readings Discussion	Written Assignments Exams Quizzes Research Project

8. Evaluate the possibility of the existence of life on planetary bodies based on physical and chemical characteristics.	Lecture Assigned readings Discussion	Written Assignments Exams Quizzes
9. Explain the transition from chemical reactions to biological evolution and how environment affects the results.	Lecture Assigned readings Discussion Laboratory Exercises	Written Assignments Exams Quizzes Laboratory Exercises Research Project

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:

1. History of Astrobiology
2. Origin Definition, and Properties of Our Solar System and Extrasolar systems
3. Habitable Zones and Planetary Atmospheres
4. Origin of Life: Chemistry to Biology
5. Origin of Cellular Life: prokaryotic and eukaryotic organisms
6. Fundamentals of light, matter, and energy
7. Types of rocks and Earth behavior/properties
8. Fundamentals of basic biology: cells, molecules, DNA, and extremophiles
9. Environments of other solar system objects: Venus, Mars, and Jovian Moons and their impact on the evolution of life-forms
10. SETI: Search for ExtraTerrestrial Intelligence
11. Realities of interstellar travel

LEARNING MATERIALS:

Course Textbook:

Life in the Universe 5th Edition, Bennett and Shostak, Princeton University Press, 2022

Course Lab Manual:

AST 121 Lab Manual by Kelli Spangler, 2024

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: Kelli Spangler Date: 4/2014
 VPAA/Provost or designee Compliance Verification:
 Victoria L. Bastecki-Perez, Ed.D. Date: 5/19/2014

Revised by: Debbie Dalrymple Date: 6/27/2016
 VPAA/Provost or designee Compliance Verification:
 Victoria L. Bastecki-Perez, Ed.D. Date: 6/27/2016

Revised by: Debbie Dalrymple Date: 2/2/2018
 VPAA/Provost or designee Compliance Verification:
 Victoria L. Bastecki-Perez, Ed.D. Date: 2/2/2018

Revised by: Kelli Spangler Date: 3/1/2018
 VPAA/Provost or designee Compliance Verification:
 Victoria L. Bastecki-Perez, Ed.D. Date: 4/9/2018

Revised by: Kelli Spangler Date: 6/7/2023
 VPAA or designee Compliance Verification:
 Chae Sweet, E.d.D. Date: 6/7/2023

Revised by: Kelli Corrado Date: 11/5/2024

VPAA or designee Compliance Verification: Date: 11/13/2024



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.