# Astronomy

## Course Description

This course provides students with a comprehensive, practical introduction to astronomy with an emphasis on critical thinking about humanity’s place in the universe. The course covers modern theories and observations as well as ideas regarding nature, the evolution of galaxies, quasars, stars, black holes, planets and the solar system.

## Required Text

The text that accompanies this course is *The Essential Cosmic Perspective*. (Bennet, 2018)

## Prerequisites

There are no prerequisites for this course.

## Learning Outcomes

* Develop a "big picture" perspective on the scale, history, and motion of the universe.
* Understand how Earth moves through space and how this relates to the patterns in the night sky, the phases of the Moon, and the seasons.
* Describe the origins of astronomy, the Copernican revolution, and the principles that make astronomy today a modern science.
* Explain the basic laws of physics pertaining to motion, energy, and gravity.
* Discuss the basic properties of light and matter and how telescopes work.
* Provide an overview of the planets, moons, and other objects in our solar system, and explain the nebular theory of solar system formation.
* Describe the basic properties of stars and the different methods that are used to determine those properties.
* Describe the birth, life, and death of stars.
* Describe the Milky Way and discuss theories on the evolution of galaxies.
* Discuss the Big Bang Theory and the evidence that supports it.

## Course Topics

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| Category/Topics | Learning Content |
| A Modern View of the Universe | Provides a broad overview of the scale, history and motion of the universe. |
| Discovering the Universe for Yourself | Describes the concept of the celestial sphere and constellations, and how the Earth’s tilt, rotation, and orbit relate to the movement of stars through the sky, seasons on Earth, and phases of the Moon. Explains apparent retrograde motion and how it complicated early attempts to explain planetary motion. |
| The Science of Astronomy | Summarizes how modern astronomy grew from ancient observations of the sky. Describes early Greek models of the solar system and explain how Copernicus, Tycho, Kepler, and Galileo contributed to the acceptance of a Sun-centered model of the solar system.  |
| Making Sense of the Universe | Introduces the different terminology used to describe motion. Reviews Newton’s Laws of Motion, the laws of conservation of angular momentum and energy, and the universal law of gravitation, and provide examples of how these principles can be used to explain astronomical phenomena.  |
| Light: The Cosmic Messenger | Describes the basic properties of light and matter, and how they interact. Discusses how spectra are used to study light from distant objects. Compares the two main types of telescopes and technologies that used by astronomers to collect and study light on earth and in space. |
| Formation of the Solar System | Lists the main objects that make up our solar system. Summarizes the nebular theory of solar system formation and how it explains the major features of our solar system. Discusses radiometric dating and what it tells us about the age of the solar system. |
| Earth and the Terrestrial Worlds | Explores the history of the terrestrial planets. Describe Earth’s geological activity and its atmosphere. Discusses the histories of the Moon, Mercury, Mars, and Venus. Explains what makes Earth uniquely suited for life and which qualities would be necessary for life on other worlds. |
| Jovian Planet Systems | Describes the characteristics of the Jovian planets and their moons. Discusses evidence of past or present geological activity on many of the medium-size and large moons. |
| Asteroids, Comets, and Dwarf Planets | Classifies small objects as asteroids, comets, and dwarf planets. Describes the composition of asteroids and comets and where they can be found in the solar system. Overviews Pluto and the discoveries made by the New Horizons mission. Details the damage asteroids and comets can do on Earth. |
| Other Planetary Systems | Compare the three methods used to detect planets around other stars. Describe how extrasolar planets compare with planets in our solar system. Discuss whether observations of extrasolar planets and planetary systems support the nebular theory of solar system formation. |
| Our Star | Documents what causes the sun to shine and the importance of gravitational equilibrium and energy balance. Describes the structure of the sun and the fusion of hydrogen to helium in its core. Discusses the different phenomena that occur in the sun’s atmosphere and the significance of the sunspot cycle. |
| Surveying the Stars | Describes the different properties of stars including luminosity, temperature, mass and how they are measured. Explains how stars are plotted on a Hertzsprung-Russell diagram and the significance of the main sequence stars. Distinguishes between open and globular clusters. |
| Star Stuff | Traces the formation of stars and summarizes the life stages of low-mass stars and high-mass stars. Explains the differences in their life cycles and their deaths. Discusses close binary systems. |
| The Bizarre Stellar Graveyard | Follows the process by which a low-mass star becomes a white dwarf. Traces the formation of neutron stars and black holes and describes the evidence that supports their existence. Discusses extreme events such as gamma ray bursts and the mergers of neutron stars and black holes in close binary systems. |
| Our Galaxy | Describes the structure of the Milky Way Galaxy. Differentiates the orbit of disk and halo stars. Summarizes the star-gas-star cycle. Explains how the Milky Way may have formed from a giant protogalactic cloud. Discusses the evidence pointing to a black hole at the center of the galaxy. |
| A Universe of Galaxies | Classify galaxies into their three major types. Lists the methods used to measure the distances to galaxies. Defines Hubble’s law and its use to estimate the age of the universe. Discusses the evidence for supermassive black holes at the centers of galaxies. |
| The Birth of the Universe | Describes the conditions in the early universe according to the Big Bang Theory, and the eras that the early universe passed through. Summarizes the evidence in support of the Big Bang and the significance of the cosmic microwave background. Defines inflation and Olbers’ paradox. |
| Dark Matter, Dark Energy, and the Fate of the Universe | Explores dark matter and dark energy. Summarizes the evidence for dark matter and the latest hypotheses of what dark matter might be made. Discusses evidence for the existence of dark energy. |
| Life in the Universe | Describes when and how life arose on Earth. Discusses the possibility of life on Mars, other worlds in our solar system and life on extrasolar planets. Lists the essentials needed on the surface of a planet. Defines the Drake equation. Discusses some ideas for interstellar travel. List the three categories of Fermi’s paradox. |

## Study Questions

Study questions are similar to homework assignments for reviewing and supplementing what you have learned in a lesson. You can repeat the questions as preferred, but will need to achieve a score of 80% or higher on the study questions associated with a lesson before that lesson is marked as complete. You will then receive the appropriate proportion of the total number of points available for the study questions based on their overall average score for all study questions in the course.

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## Course Time Limit

This course is self-paced, which means you can complete the course requirements at a pace that is comfortable for you. However, there is an overall time limit of 180 days to complete each course, starting from the date on which you registered. This time limit is indicated on your Courses screen as “Course Period.”

Once the time limit has passed, you will no longer be able to attempt any further activities or assessments. Assuming you have not yet attempted the Final Exam, you can immediately unregister and reregister for the course to start over. Otherwise, you will be required to wait to reregister per our Course Retake Policy.

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## Course Retake Policy

There is a one-week waiting period before this course can be re-taken, starting from the date of the last Final Exam attempt.

To retake the course, first unregister from the course on your Courses screen. If it has been over a week since your last attempt, you will then be able to register for this course again.

Your highest final score for the course will be used for the transcript.

## Exams

There are a total of four exams for this course as described below.

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| --- | --- | --- | --- |
| **Exam** | **Coverage** | **Number of Multiple-Choice Questions** | **Time Limit, Minutes** |
| **First** | Lessons 1-18 | 25 | 60 |
| **Midterm** | Lessons 19-37 with some review of topics from Lessons 1-18 | 50 | 90 |
| **Third** | Lessons 38-49 | 25 | 60 |
| **Final** | Cumulative; everything taught in the course with an emphasis on content from the last half (and particularly the last quarter) of the course | 50 | 90 |

## Grading

To determine your level of mastery for this course, you will earn points by successfully completing the learning and evaluation activities below in sequence.

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| --- | --- |
| Source | Points Available |
| Study Questions | 300 |
| Graded Exam #1 | 100 |
| Midterm Exam | 200 |
| Graded Exam #2 | 100 |
| Final Exam | 300 |

Upon completion of the course and the grading source activities, InstantCert will provide you with a percentage score. The minimum passing score is 700 points, or an overall course grade of 70%.

**Important! Only a passing score on a course marked 100% complete (including the proctored final exam) is eligible for college credit.**

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## Proctoring of the Final Exam

A proctor is a person who monitors the work of another person who is taking an examination. Online proctoring services allow you to take the working remotely and in the same way as if you were sitting in an exam room. Proctoring ensures that the test you take complies with current college level examination policies.

Proctoring is used only for the final exam. It is offered through the online proctoring service RPNow at the Software Secure web site. You will pay a separate fee to RPNow for each final exam attempt.

RPNow requires that students download and install proprietary software. They will need to use a PC or a Mac with a webcam. Students can review the full system requirements for RPNow at:

<http://clientportal.softwaresecure.com/support/index.php?/Knowledgebase/Article/View/252/0/system-requirements-remote-proctor-now>

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## Exam Retake Policy

Both graded exams, the midterm and the final exam can be retaken ONCE. There is a 3-day waiting period before you will be allowed to retake an exam. If you retake an exam, the higher result of your two attempts will be used to calculate your final score.

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## Academic Integrity

You are required to comply with the InstantCert full Student Code of Conduct, which specifically prohibits cheating or any other academically dishonest behavior. Violation of any part of the Student Code of Conduct can result in a grade reduction or even suspension from the course.

## Software Requirements

The operating system, browser, internet access and speed are provided below for use with courses from the InstantCert web site.

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| --- | --- |
| **Operating Systems** | * Windows XP and above
* Mac OS X
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| **Browsers** | * The latest version of Chrome, Firefox of Safari
* IE9 or higher
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| **Internet and Speed** | Broadband Internet; 1Mbps or higher |

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## Accessibility and Disability Accommodations

InstantCert strives to make online education accessible to people everywhere in the following ways:

* All course content is available online, accessible from anywhere through an Internet connection.
* All video lessons include a transcript for use by those who are hearing impaired and/or by students that wish to have written copies of the lessons.
* All video lessons have close captioning.
* Lesson pages can be navigated by screen readers.
* Videos may be replayed an unlimited amount of times. Video speed can be increased or slowed.
* Lesson transcripts and quizzes can be printed for offline use.
* The proctoring software RPNow works with screen readers.