

GE2305: ASTRONOMY - THE UNIVERSE AND US

Effective Term

Semester A 2024/25

Part I Course Overview

Course Title

Astronomy - The Universe and Us

Subject Code

GE - Gateway Education

Course Number

2305

Academic Unit

Physics (PHY)

College/School

College of Science (SI)

Course Duration

One Semester

Credit Units

3

Level

A1, A2 - Associate Degree

B1, B2, B3, B4 - Bachelor's Degree

GE Area (Primary)

Area 3 - Science and Technology

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

Nil

Precursors

Nil

Equivalent Courses

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

The course helps students to engage in the following learning activities: discuss the origin and structure of the universe, galaxies and stars; discover the principles that govern spacetime and structure formation; appreciate scientific advances in understanding the universe; discover the link between the Universe and humans; review the histories and features of Chinese and Western astronomies; explore the similarities and differences; explore modern theories such as the big bang, dark energy, dark matter and black holes; discuss the origin and evolution of star and the search for exo-planets and extraterrestrial life; and appreciate modern astronomical observations.

Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the origin and structure of the universe, galaxies and stars.	x	x	
2	Appreciate the characteristics of the Universe & its connection to humans		x	
3	Explain the principle spacetime and fundamental forces that govern the universe	x	x	
4	Explain the histories and features of Chinese and Western astronomies and explore the similarities and differences of the developments of astronomy in China and the West.	x		
5	Explore modern theories such as the big bang, dark energy, dark matter and black holes; discuss the origin and evolution of star and the search for exo-planets and extraterrestrial life; and appreciate modern astronomical observations.		x	x

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures	Nil	3
2	Tutorials	Students discuss concepts and models covered in lectures	1

3	Field Trip	Students practice and enjoy observations of astronomical objects in rural areas where better telescopes and atmospheric conditions are available.	1, 2, 4	0.5 hour/week on average, depending on the weather conditions and availability of venue.
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Assessment Tasks / Activities (ATs)

ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Project (presentation & report)	1, 2, 3, 4, 5	40
2	Assignment	1, 2, 3, 4, 5	30

Continuous Assessment (%)

70

Examination (%)

30

Examination Duration (Hours)

2

Assessment Rubrics (AR)**Assessment Task**

1. Project (presentation & report)

Criterion

Ability to explain, in detail and with accuracy, the information collected and the methods of inquiry. Demonstrate capacity for self-directed learning.

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not reaching marginal level

Assessment Task

2. Assignment

Criterion

Demonstrates understanding of the scientific principles and the working mechanisms. Able to discuss current affairs relating to astronomy or related technologies using the pertinent language and scientific reasoning.

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not reaching marginal level

Assessment Task

3. Examination

Criterion

Demonstrates understanding of the scientific principles and the working mechanisms.

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not reaching marginal level

Part III Other Information

Keyword Syllabus

Scale of cosmos;

The celestial sphere, the electromagnetic spectrum, Doppler effect & red shift;

The universal law of gravity and spacetime, Kepler's laws;

Galaxy types, galaxy formation and evolution;

Types of stars, H-R diagram & stellar evolution;

Black holes and gravitational waves;

Inflation, Big Bang, Nuclear synthesis, Cosmic Microwave Background and Large Scale Structure;

Dark energy and dark matter;

Multi-messenger astronomy including gravitational waves, cosmic rays and neutrino;
Exo-planets and extraterrestrial life;

Reading List

Compulsory Readings

Title	
1	Nil

Additional Readings

Title	
1	An Introduction to Modern Astrophysics, by Bradly W. Carroll, Dale A. Ostlie, 2nd Edition.
2	Foundations of Astronomy, by Michael A. Seeds, Thomson Learning (the newest edition).
3	To Explain the World: The Discovery of Modern Science, by Steven Weinberg.
4	The Last Stargazers: The Enduring Story of Astronomy's Vanishing Explorers, by Emily Levesque.
5	The First Three Minutes: A Modern View of the Origin of the Universe, by Steven Weinberg.
6	The Edge of Physics: A Journey to Earth's Extremes to Unlock the Secrets of the Universe, by Anil Ananthaswamy.
7	Black Holes, The Key to Understanding the Universe, by Brian Cox, Jeff Forshaw.

Annex (for GE courses only)

A. Please specify the Gateway Education Programme Intended Learning Outcomes (PILOs) that the course is aligned to and relate them to the CILOs stated in Part II, Section 2 of this form:

Please indicate which CILO(s) is/are related to this PILO, if any (can be more than one CILOs in each PILO)

PILO 1: Demonstrate the capacity for self-directed learning

4, 5

PILO 2: Explain the basic methodologies and techniques of inquiry of the arts and humanities, social sciences, business, and science and technology

1, 2, 3

PILO 3: Demonstrate critical thinking skills

4, 5

PILO 4: Interpret information and numerical data

1, 2, 3

PILO 5: Produce structured, well-organised and fluent text

2, 3, 5

PILO 6: Demonstrate effective oral communication skills

4, 5

PILO 7: Demonstrate an ability to work effectively in a team

4, 5

PILO 8: Recognise important characteristics of their own culture(s) and at least one other culture, and their impact on global issues

4

PILO 9: Value ethical and socially responsible actions

5

PILO 10: Demonstrate the attitude and/or ability to accomplish discovery and/or innovation

5

B. Please select an assessment task for collecting evidence of student achievement for quality assurance purposes. Please retain at least one sample of student achievement across a period of three years.

Selected Assessment Task

Project report and presentation materials