PHYS 1002 – Introduction to Astrophysics and Astronomy

School:	**School of Science**
Subject Area:	**Physics**
Course Credit:	**3**
Instructor:	**CHEN Tian Wen**
Pre-requisite/co-requisite:	**Nil**

Notes:

- The syllabi provided here is for reference only and may be subject to changes and adjustments as determined by the course instructors.

PHYS1002 Introduction to Astrophysics and Astronomy
Course Outline- Summer 2025

Instructor(s)

Prof. CHEN, Tian Wen, twchen@ust.hk

Course Description

Credit Points: 3
Pre-requisite: A passing letter grade in CORE1401 OR CORE1402 OR CORE1403 OR CORE1404 OR LANG1002 (prior to 2022-23)
Exclusion: PHYS1006, PHYS3071
Brief Information/synopsis:
Introduction to our Universe; observation in astronomy; origin of modern astronomy. Newton's law of motions; gravity; light, atoms and telescope. The Sun; stellar formation and evolution; white dwarfs, neutron stars and black holes. The Milky way Galaxy; Normal galaxies, active galaxies and supermassive black holes. Foundation of modern cosmology; dark matter, dark energy and the fate of the Universe; the beginning of time.

Intended Learning Outcomes

Upon successful completion of this course, students should be able to:

No.	ILOs	Weighting (%)
1	Summarize the scale and history of the universe, basic sky phenomena, reason for the seasons, phases of the Moon and cause of eclipses	20
2	Apply basic physical laws to calculate motions of planets	10
3	Describe the basic properties of light & matter, telescopes and their working principles	10
4	Describe and explain the general properties of stars, how we measure these properties	10
5	Summarize stellar evolution and the birth-to-death lives of low, medium and high-mass stars	10
6	Summarize the end points of stellar evolution: white dwarfs, neutron stars, and black holes	10
7	Describe galactic cycling, Milky Way's mysterious center and how we determine the key parameters such as galactic distances and age, and galaxy evolution	20
8	Summarize the evidences for dark matter and dark energy and describe the concordance cosmic model	10

Sub-competencies

Sub-competencies	Possible Breakdowns of Competencies / Descriptions of Competencies
CM02 Language Meaning	• Develop ideas clearly and fully • Organize ideas coherently from sentence to text level (in speaking and writing)
PS02 Application of Critical Thinking	• Apply evidence-based solution • Provide unbiased judgment to analyze problem
PS03 Evaluation of Information and Sources	• Identify relevant sources/information • Analyze and synthesize information from sources • Evaluate the quality of information and sources • Provide evidence-based argument

	• Draw conclusions by synthesizing different skills such as analytical, quantitative reasoning, and critical thinking

Assessment and Grading
This course will be assessed using criterion-referencing and grades will not be assigned using a curve. Detailed rubrics for each assignment are provided below, outlining the criteria used for evaluation.

Assessment Scheme

Assessment	Weighting (%)	Format	Assessing Course ILOs	Assessing Sub-competencies
Final Exam	50	MC + Short Questions, 3 hours	1, 2, 3, 4, 5, 6, 7, 8	PS02, PS03
PRS Quizzes	9	Answering MC questions by iPRS in lectures	1, 2, 3, 4, 5, 6, 7, 8	PS02, PS03
Quizzes during Tutorial Sessions (Tutorial MCQ)	9	Answering MC questions by iPRS in tutorials	1, 2, 3, 4, 5, 6, 7, 8	PS02, PS03
Strip Sequence Test (SST)	4	4 Strip-Sequence MC questions	1, 2, 3, 4, 5, 6, 7, 8	PS02, PS03
Student-generated Question (SGQ)	3	Students each setting one MC question of their own	1, 2, 3, 4, 5, 6, 7, 8	CM02, PS02, PS03
Written Report of an Open-ended Question (OEQ)	25	Students each choosing one open-ended question to write a 500-word report	1, 2, 3, 4, 5, 6, 7, 8	CM02, PS02, PS03

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Course overall score higher than or equal to $\sim 80/100$: Demonstrates a comprehensive grasp of subject matter, expertise in problem-solving, and significant creativity in thinking. Exhibits a high capacity going beyond core requirements to achieve learning goals.
B	Good Performance	Course overall score lower than $\sim 80/100$ and higher than or equal to $\sim 65/100$: Shows good knowledge and understanding of the main subject matter, competence in problem-solving, and the ability to analyze and evaluate issues. Displays high motivation to learn.
C	Satisfactory Performance	Course overall score lower than $\sim 65/100$ and higher than or equal to $\sim 50/100$: Possesses adequate knowledge of core subject matter, competence in dealing with familiar problems, and some capacity for analysis and critical thinking. Shows

		persistence and effort to achieve broadly defined learning goals.
D	Marginal Pass	Course overall score lower than $\sim 50/100$ and higher than or equal to $\sim 30/100$: Has threshold knowledge of core subject matter, potential to achieve keyskills, and the ability to make basic judgments.
F	Fail	Course overall score lower than $\sim 30/100$: Demonstrates insufficient understanding of the subject matter and lacks the necessary problem-solving skills. Shows limited ability to think critically or analytically and exhibits minimal effort towards achieving learning goals.

Teaching and Learning Activities
Lectures: 16 2-hour lectures
Tutorials: 20-minute tutorial session after each lecture

Student Learning Resources
Text Book:
"Cosmic Perspective": Pearson New International Edition, 7th Edition
Author: Jeffrey O. Bennett; Megan Donahue; Nick Schneider; Mark Voit

Reference Books:
"The essential cosmic perspective " Bennett, Donahue, Schneider, Voit, Sixth Edition, Pearson
"Universe", Freedman and Kaufmann, 8th edition, Macmillan
"Astronomy Today", Eric Chaisson and Steve McMillan, 8th edition, Pearson

Course Schedule
- PART I: Developing Perspective
  Chapter 1: A Modern View of the Universe
  Chapter 2: Discovering the Universe for Yourself
  Chapter 3: The Science of Astronomy
- PART II: Key Concepts for Astronomy
  Chapter 4: Making Sense of the Universe: Understanding Motion, Energy, and Gravity
  Chapter 5-6: Light and Matter: Reading messages from the Cosmos; Telescopes: Portals of Discovery
- PART III: Stars
  Chapter 14: Our Star
  Chapter 15: Surveying the Stars
  Chapter 16-17: Star Birth and Star Stuff
  Chapter 18: The Bizarre Stellar Graveyard
- PART IV: Galaxies and Beyond
  Chapter 19: Our Galaxy
  Chapter 20-21: Galaxies and the Foundation of Modern Cosmology; Galaxy Evolution
  Chapter 22-23: The Birth of the Universe; Dark Matter, Dark Energy, and the Fate of the Universe

Communication and Feedback

Scores of each PRS/Tutorial Quizzes and Strip Sequence Test will be posted within two days. Scores of SGQs, OEQ reports and Final Exam will be posted on Canvas within two weeks after the due dates/exam. Students who have further questions about the feedback including marks should consult the instructor within five working days after the feedback is received.

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to Academic Integrity | HKUST – Academic Registry for the University's definition of plagiarism and ways to avoid cheating and plagiarism.