

PHYS1002 Summer 2026

Course Outline

Course Description

Credit Points: 3

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; main sequence stars; white dwarfs, neutron stars and black holes. The Milky way Galaxy; galaxy types and evolution; supermassive black holes at galactic centers. Foundation of modern cosmology; dark matter, dark energy and the fate of the Universe; the beginning of time.

Instructor

L1: Prof. CHEN, Tian Wen,

Email: twchen@ust.hk

Office Hours: Friday 4:30pm - 5:30pm

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

Teaching and Learning Activities

1 lecture per day, 2 hours 20 minutes each

Course Description

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; main sequence stars; white dwarfs, neutron stars and black holes. The Milky way Galaxy; galaxy types and evolution; supermassive black holes at galactic centers. Foundation of modern cosmology; dark matter, dark energy and the fate of the Universe; the beginning of time.

Key Topics

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

Intended Learning Outcomes

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

No.	ILOs
1	Summarize the scale and history of the universe, basic sky phenomena, reason for the seasons, phases of the Moon and cause of eclipses
2	Apply basic physical laws to calculate motions of planets
3	Describe the basic properties of light & matter, telescopes and their working principles
4	Describe and explain the general properties of stars, how we measure these properties
5	Summarize stellar evolution and the birth-to-death lives of low, medium and high-mass stars
6	Summarize the end points of stellar evolution: white dwarfs, neutron stars, and black holes
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
8	Summarize the evidences for dark matter and dark energy and describe the concordance cosmic model

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.

Assessment Task	Contribution to Overall Course grade (%)	Format	Date	Assessing Course ILOs	Assessing Sub-competencies
Homework	0	Self-practice	N/A	1, 2, 3, 4, 5, 6, 7, 8	PS02, PS03
PRS Quizzes	5	Answering multiple choice (MC) questions by iPRS in lectures	In-class	1, 2, 3, 4, 5, 6, 7, 8	PS02, PS03
Tutorial MC Quizzes	5	Answering MC questions by iPRS at the end of lectures	In-class	1, 2, 3, 4, 5, 6, 7, 8	PS02, PS03
Multiple Choice and Strip sequence Test	10	MC questions + Strip-Sequence	29 Jun (3:30 PM – 4:15 PM)	1, 2, 3, 4, 5, 6, 7, 8	PS02, PS03

		question, 45 minutes			
Student-generated Question (SGQ)	10	Students each writes one MC question	8 Jul (9:00 AM)	1, 2, 3, 4, 5, 6, 7, 8	CM02, PS02, PS03
Written Report of an Open-ended Question (OEQ)	20	Students each chooses one open-ended question and writes a report	13 Jul (9:00 AM)	1, 2, 3, 4, 5, 6, 7, 8	CM02, PS02, PS03
Final Exam	50	41 MC questions + 4 Short Questions, 3 hours	10 Jul (2:00PM – 5:00PM)	1, 2, 3, 4, 5, 6, 7, 8	PS02, PS03

Final Grade Descriptors

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Course overall score higher than or equal to ~ 80/100: Demonstrates a comprehensive grasp of subject matter, expertise in problem-solving, and significant creativity in thinking. Exhibits a high capacity for scholarship and collaboration, going beyond core requirements to achieve learning goals.
B	Good Performance	Course overall score lower than ~ 80/100 and higher than or equal to ~ 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 and the ability to work effectively with others.
C	Satisfactory Performance	Course overall score lower than ~ 65/100 and higher than or equal to ~ 45/100: 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 ~ 45/100 and higher than or equal to ~ 35/100: Has threshold knowledge of core subject matter, potential to achieve key professional skills, and the ability to make basic judgments. Benefits from the course and has the potential to develop in the discipline.
F	Fail	Course overall score lower than ~ 35/100: 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. Does not meet the threshold requirements for professional practice or development in the discipline.

Format and Grading Rules

Homework

Homework questions will be posted at the beginning of each chapter as self-learning materials. Students are not required to hand in homework solutions. Homework solutions will be provided by the instructors about one week after each chapter concludes.

Quizzes (iPRS)

1 mark for each correct answer, 0.5 mark for each incorrect answer, 0 mark for no answers.

The best 80% of a student's quiz answers will be counted for the total marks of PRS and tutorial quizzes.

Marks of the PRS and MCQ quizzes conducted during the add-drop period will not be counted toward the final grade.

To answer the quizzes, students will use the APP HKUST iLearn, which can be downloaded from

Google Play: <https://play.google.com/store/apps/details?id=hk.ust.itsc.tt.iLearn&hl=en&pli=1>

APP Store: <https://apps.apple.com/hk/app/hkust-ilearn/id954203479?l=en-GB>

MC and Strip-Sequence Test

Closed-book test covering Chapter 1 to Chapter 6. There will be MC questions and strip sequence questions.

A strip-sequence question requires students to arrange a provided list of items in the correct order (not necessarily chronological). Points are awarded based on the number of inversions in the sequence on a linear scale, where full marks are given if all pairs are in the correct order, and zero marks are awarded if only half or fewer than half of the pairs are in the correct order.

For example, if a question presents 5 items, resulting in a total of 10 pairs, the marks will be allocated as follows:

Number of pairs in correct order	Marks
5 or fewer	0%
6	20%
7	40%
8	60%
9	80%
10	100%

Students can bring one A4-size cheat sheet (2 sides together, either hand-written notes or electronic typing notes). The cheat sheet is only for individual-base use, no copying from other students is allowed.

Student-generated Question (SGQ)

Each student should generate ONE Multiple Choice (MC) question with FIVE choices (1 correct choice + 4 wrong choices) based on the contents of the lecture notes. Please read the detailed marking scheme posted on Canvas.

Written Report of an Open-ended Question (OEQ)

Each student has to submit an individual report and its topic must be chosen from one of the open-ended questions posted. Students can refer to the detailed marking scheme posted on Canvas.

Final Exam

Closed-book exam covering all (taught) chapters. There are 41 MC questions and 4 short quantitative questions.

Students can bring three A4-sized cheat sheets (6 sides together, either hand-written notes or electronic typing notes). The cheat sheets are only for individual-base use, no copying from other students is allowed.

Communication and Feedback

Scores and feedback comments, if appropriate, will be posted on the Canvas course website within two weeks after the quizzes/tests/submission deadlines/exam. Students who have further questions about the scores and feedback should consult the instructor within five working days after they are posted.

Resubmission/Make-up Policy

PRS/MCQ Quizzes

Late submissions or resubmissions will not be accepted.

SGQ and OEQ Reports

Marks will be deducted for late submissions according to the following formula:

For submissions that are late for N days

Score = Original Score $\times (1 - 0.2 \times N)$ for $N = 1, 2, 3, 4$

Score = 0 for $N \geq 5$

MC and Strip Sequence Test

No makeup will be offered except for sufficiently valid reasons, such as physical illnesses (with medical certification).

Final Exam

Make up exam will be offered only for requests submitted to and approved by ARR officially.

Policy on using Generative AI

Students are prohibited from using generative artificial intelligence (AI) in PRS/MCQ quizzes, or to produce any materials or content in their SGQ student-generated questions.

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.