City University of Hong Kong
Course Syllabus

offered by School of Energy and Environment
with effect from Semester A 2021/22

Part I Course Overview

Course Title:	Atmospheric Science – An Introductory Survey
Course Code:	SEE3201
Course Duration:	One semester
Credit Units:	3
Level:	B3
Proposed Area: *(for GE courses only)*	☐ Arts and Humanities ☐ Study of Societies, Social and Business Organisations ☐ Science and Technology
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Any one of the following courses: 1. PHY1200 Foundation Physics 2. PHY1201 General Physics I 3. SEE2001 Electromagnetic Principles for Energy Engineers or equivalent and Any two of the following MA courses: 1. MA1200 Calculus and Basic Linear Algebra I 2. MA1201 Calculus and Basic Linear Algebra II 3. MA1300 Enhanced Calculus and Linear Algebra I 4. MA1301 Enhanced Calculus and Linear Algebra II
Precursors: *(Course Code and Title)*	Nil
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

(A 150-word description about the course)

This advanced undergraduate course is designed for undergraduate students majoring in Environmental Science and Management, Energy Science and Engineering, and also those taking the Atmospheric and Climate Science Minor. It will provide students with knowledge of physical processes occurring in the atmosphere and the climate system, and enable them to discover and analyze issues related to the atmospheric environment and global climate change. Special reference will also be made to phenomena prevalent in Hong Kong and the South China region.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs[#]	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	Describe the thermal and dynamical structure of the atmosphere, the atmospheric general circulation, and the key components of the Earth's climate system	12.5%		✓	
2.	Relate basic thermodynamic and radiative processes in the atmosphere to the underlying physical laws	37.5%		✓	
3.	Relate basic dynamical processes in the atmosphere to the underlying physical laws	37.5%		✓	
4.	Discover and describe some climate change phenomena and explain them in terms of basic physical processes	12.5%		✓	
	** If weighting is assigned to CILOs, they should add up to 100%.*	100%			

[#] Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

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 self-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.

3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.				Hours/week (if applicable)
		1	2	3	4	
Lectures	Explain key concepts, such as theories related to weather system	✓	✓	✓	✓	
Tutorials	Solidify students' concepts with practice (Explain the physical processes	✓	✓	✓	✓	

	occurring in the atmosphere related to the daily weather information)					
Field trip	Visit to HKO (satellite image, weather map, weather instrument)				✓	
Group Project	Share different opinions on weather forecasting (cloud observation)		✓	✓	✓	

Scheduled activities: 2 hrs lecture + 1 hr tutorial. A tutorial will be given following the presentation of each complete topic within a CILO.

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.				Weighting*	Remarks
	1	2	3	4		
Continuous Assessment: __50__%						
Field trip Students will visit HKO to get some basic understanding of satellite image, weather map, weather instrument	✓	✓	✓	✓	10%	
Assignment Several assignments will be given throughout the semester. Through the assignments, students will demonstrate their understanding of the underlying concepts of the thermal and dynamical processes of the atmosphere	✓	✓	✓		20%	
Group project Students will work together to do weather forecasting based on cloud information.	✓	✓			20%	
Examination: __50__% (duration: 2 hours , if applicable)						
** The weightings should add up to 100%.*					100%	

Examination duration: 2 hrs
Percentage of coursework, examination, etc.: 50% by coursework; 50% by exam

To pass a course, a student must do ALL of the following:
1) obtain at least 30% of the total marks allocated towards coursework (combination of assignments, pop quizzes, term paper, lab reports and/ or quiz, if applicable);
2) obtain at least 30% of the total marks allocated towards final examination (if applicable); and
3) meet the criteria listed in the section on Assessment Rubrics.

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Field Trip	Ability to analyse questions related to temperature, precipitation and clouds	Excellent understanding of concepts and ability to analyse and solve problems related to temperature, precipitation and clouds	Good understanding of concepts and ability to analyse and solve problems related to temperature, precipitation and clouds	Acceptable understanding of concepts and ability to analyse and solve problems related to temperature, precipitation and clouds	Marginally acceptable understanding of concepts and ability to analyse and solve problems related to temperature, precipitation and clouds	Poor understanding of concepts and ability to analyse and solve problems related to temperature, precipitation and clouds
2. Assignment	Ability to evaluate and analyse questions related to clouds development and severe weather	Excellent understanding of concepts and ability to analyse and solve problems related to clouds development and severe weather	Good understanding of concepts and ability to analyse and solve problems related to clouds development and severe weather	Acceptable understanding of concepts and ability to analyse and solve problems related to clouds development and severe weather	Marginally acceptable understanding of concepts and ability to analyse and solve problems related to clouds development and severe weather	Poor understanding of concepts and ability to analyse and solve problems related to clouds development and severe weather
3. Group Project	Ability to analyse questions related to weather system	Excellent understanding of concepts and ability to analyse and solve problems related to weather system	Good understanding of concepts and ability to analyse and solve problems related to weather system	Acceptable understanding of concepts and ability to analyse and solve problems related to weather system	Marginally acceptable understanding of concepts and ability to analyse and solve problems related to weather system	Poor understanding of concepts and ability to analyse and solve problems related to weather system
4. Examination	Ability to analyse questions related to some climate change phenomena and explain them in terms of basic physical processes	Excellent understanding of concepts and ability to analyse and solve problems related to the thermodynamics	Good understanding of concepts and ability to analyse and solve problems related to the thermodynamics process of the atmosphere	Acceptable understanding of concepts and ability to analyse and solve problems related to the thermodynamics process of the atmosphere	Marginally acceptable understanding of concepts and ability to analyse and solve problems related to the thermodynamics process of the	Poor understanding of concepts and ability to analyse and solve problems related to the thermodynamics process of the atmosphere

		process of the atmosphere			atmosphere	

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

- The Earth' Atmosphere
  Composition of the atmosphere, structure of the atmosphere, greenhouse gases, and air pollutants
- The Earth' Changing Climate
  Radiative transfer, solar and terrestrial radiation, climate change
- Air temperature, Condensation and Clouds
- Cloud development, Precipitation & Severe weather
  The role of water in the atmosphere, Severe weather: Thunderstorm, Tornado and Tropical storm
- Thermodynamics of the atmosphere
  Applications of the first and second laws of thermodynamics, potential temperatures, adiabatic processes, thermodynamic diagrams.
- Atmospheric circulations
  Three cell model: Hadley Cell, Ferrel Cell, Polar Cell, Jet Streams, Air-Sea interaction, Walker circulation, ENSO, NAO, PDO
- Weather System and Weather Forecasting
  Air mass, Frontal system: Cold front, warm front, stationary front, occluded front, Weather map

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

1.	*Atmospheric Science–An introductory survey*, J.M. Wallace & P.V. Hobbs (Academic press/Elsevier, 2nd edition, 2006)
2.	*An Introduction to Dynamic Meteorology*, J R Holton (Academic Press, 3rd edition, 1992)
3.	*Atmosphere, Ocean and Climate Dynamics: An Introductory Text*, J. Marshall and R. A. Plumb (Academic Press, 2007)
4.	*The Physics of Atmospheres*, J T Houghton (Cambridge, 3rd edition, 2002)
5.	*Understanding Weather and Climate*, E Aguado and J E Burt (Prentice Hall 2001)