City University of Hong Kong
Course Syllabus

offered by Department of Physics
with effect from Semester A 2022/23

Part I Course Overview

Course Title:	**Environmental Physics**
Course Code:	**PHY6527**
Course Duration:	**1 semester**
Credit Units:	**3**
Level:	**P6**
Medium of Instruction:	**English**
Medium of Assessment:	**English**
Prerequisites: *(Course Code and Title)*	**Nil**
Precursors: *(Course Code and Title)*	**Nil**
Equivalent Courses: *(Course Code and Title)*	**Nil**
Exclusive Courses: *(Course Code and Title)*	**PHY8527 Environmental Physics**

Part II Course Details

1. Abstract

(A 150-word description about the course)

Physics has always been concerned with understanding the phenomena in natural environment. Environmental physics is essential for tacking environmental problems accompanying economic development and maintaining a well-balanced relationship between human activities and natural environment. This course aims to provide students an introduction to environmental physics. The elements of the environment (e.g., gases, liquids, plants, and animals) and their physical properties (e.g., mass, temperature, transport) will be discussed. Emphasis will be put on heat transfer and the effects of various radiations including nuclear radiation on the environment. By the end of this course, students can gain necessary knowledge and skills to address real environmental challenges, such as developing safe and clean energy and dealing with the forecasted climate change.

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 physical properties of important elements in environment such as gases and liquids.	20%	√		
2.	Describe the transport properties of heat and mass	20%		√	
3.	Explain the effect of radiation on plants, animals, and humans	20%	√		
4.	Develop physical models to estimate various environmental effects	20%		√	
5.	Identify the challenges in developing clean energy, dealing with climate change, and pollutants reduction	20%		√	
** If weighting is assigned to CILOs, they should add up to 100%.*		100%			

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	5		
1	Lectures	√	√	√	√	√		26 hrs/13 wks
2	Tutorials	√	√	√				6 hrs/ 6 wks
3	Group project and presentation				√	√		6 hrs/ 6 wks

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	5			
Continuous Assessment: 50%								
Assignment	√	√	√	√	√		10	
Presentation			√	√	√		20	Group project
Report			√	√	√		20	Group project
Examination: 50% (duration: 2 hours)								
Examination	√	√	√	√			50	
** The weightings should add up to 100%.*							100%	

5. Assessment Rubrics

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

Applicable to students admitted in Semester A 2022/23 and thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Assignment	Understanding important concepts in environmental physics; Ability to apply physics principles and models to estimate various environmental effects	High	Moderate	Basic	Not reaching marginal level
2. Presentation	Understanding the mechanisms of selected environmental physics topic; Identify challenges and develop possible solutions	High	Moderate	Basic	Not reaching marginal level
3. Report	Having an in-depth understanding of the physics related to selected environmental topic.	High	Moderate	Basic	Not reaching marginal level
4. Examination	Ability of solving analytical problems in environmental physics	High	Moderate	Basic	Not reaching marginal level

Applicable to students admitted before Semester A 2022/23

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Assignment	Understanding important concepts in environmental physics; Ability to apply physics principles and models to estimate various environmental effects	High	Significant	Moderate	Basic	Not reaching marginal level

2. Presentation	Understanding the mechanisms of selected environmental physics topic; Identify challenges and develop possible solutions	High	Significant	Moderate	Basic	Not reaching marginal level
3. Report	Having an in-depth understanding of the physics related to selected environmental topic.	High	Significant	Moderate	Basic	Not reaching marginal level
4. Examination	Ability of solving analytical problems in environmental physics	High	Significant	Moderate	Basic	Not reaching marginal level

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.)

- Properties of gases and liquids
- Pressure, volume, temperature, the first law of thermodynamics, specific heat, latent heat, lapse rate, water vapor
- Water content and potential, stable isotopes
- Transport of heat and mass
- General transfer equation, molecular transfer processes, viscosity, heat and thermal conductivity, mass transfer and diffusivity, diffusion coefficients, diffusion of particles
- Radiation environment
- Absorption and emission of radiation, black body radiation, Planck's law, reflection and refraction, radiance and irradiance
- Solar radiation, spectrum of solar radiation, attenuation of solar radiation in the atmosphere, solar radiation at the ground
- Terrestrial radiation
- Microclimatology of radiation
- Radiative properties of natural materials (e.g., water, soils, metals, and animals)
- Radiation interception by solid structures, plant canopies, and animal coats
- Nuclear power
- Nuclear fission and fusion, relation between radiation and health (e.g., exposure to radiation, radiation from nuclear accidents, and health aspects of fusion)
- The fuel cycle, waste management
- Heat transfer
- Convection, conduction, insulation
- Steady state heat balance of water surfaces, soil and vegetation
- Steady state heat balance of animals
- Dynamics of climate system, human-induced climate change, greenhouse effect
- Mass transfer
- Gases and water vapor, ventilation, mass transfer through coats and clothing
- Particles, steady and non-steady motion, particle deposition and transport, dispersion of pollutants
- Turbulence

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.)

1.	"Principles of Environmental Physics, Fourth Edition: Plants, Animals, and the Atmosphere", J. Monteith and M. Unsworth, Academic Press, 4th ed., 2013.
2.	"Environmental Physics: Sustainable Energy and Climate Change", E. Boeker and R. V. Grondelle, Wiley, 3rd ed., 2011.
3.	
4.	

2.2 Additional Readings

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