

GE1305: FOUNDATION PHYSICS

Effective Term

Semester A 2022/23

Part I Course Overview

Course Title

Foundation Physics

Subject Code

GE - Gateway Education

Course Number

1305

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

Technology has become a very important part of our life and career and our graduates will face various choices in the use of technology and technology related decisions in their future career. In this course, a non-mathematical approach is used to teach students physics concepts and principles, which are of general relevance and enable the students to develop well-informed opinions and choices in their professional career and everyday life. Students are also expected to learn in the course thinking skills of a physicist, which are evidence-based, critical and based on the framework of physical principles. The course will be run in a combination of lectures and tutorials with examples drawn from our everyday experience, important technologies, news, or even product marketing materials. Typical examples are experience in MTR, utilities in kitchens, mobile phones, musical instruments, renewable energy sources, LCD and OLED displays. The students is assessed through an examination with conceptual questions (there will be no numerical questions). The students can practice the use of concepts and principles to analyse a phenomenon or technology in tutorials. These tutorial questions are good training of the analytical skills used by physicists. Students, who have little high school background but will take PHY1101 “Introductory Classical Mechanics”, PHY1201 “General Physics I” or PHY1400 “Introductory Physics for Biologists”, should take this course with the additional tutorials as preparation for PHY1101, PHY1201 and PHY1400. In the extra tutorials, the necessary mathematical formulation and examples of numerical problems are taught to prepare the students for PHY1101, PHY1201 and PHY1400.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Cite and describe the basic principles of physics		x		
2	Identify and explain scientific information or reports relating to public policies or business decisions.		x	x	
3	Discuss current affairs relating to physics and technologies using the pertinent language and scientific reasoning				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.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures	Nil	1, 2	2
2	Video viewing	Students will watch video programmes on physics experiments or documentaries on social issues / policies involving controversies on scientific interpretations of information or data.	1, 2	varies
3	Group discussions	Students form groups and discuss on topics relating to social issues / policies which involve scientific interpretations of information or data.	3	1

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignments	1, 2, 3	30	

Continuous Assessment (%)

30

Examination (%)

70

Examination Duration (Hours)

2

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained

Assessment Rubrics (AR)**Assessment Task**

1. Assignments

Criterion

Demonstrate understanding of physics concepts and principles and their application.

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. Examination

Criterion

Demonstrate ability to understand the physics concepts and principles and use these information to understand examples discussed in lectures. Use the physics concepts and principles to explain physical phenomena or technology which are not discussed in details in lectures or group discussions to explain phenomena.

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

Energy and Power:

Forms of Energy, Conservation of Energy, Electric Car, Diet or Exercise, Renewable energy

Atoms and Heat:

Building blocks of the universe, Different States of Matter, Temperature and thermal effects, Global warming, Heat Engines and Refrigerators

Gravity, Force and Space:

Forces on objects, Launching rockets and Orbiting the earth, Global Positioning System (GPS), Black holes, Air pressure, Typhoons.

Nuclei and Radioactivity:

Radioactivity, Seeing radiation, Radiation and death, Radiation to cure cancer, C-14 dating, Environmental radioactivity, Fission, Fusion.

Chain Reactions, Nuclear Reactors and Atomic Bombs:

Various types of chain reactions, e.g. computer viruses, lightning and avalanches; Making a nuclear bomb, Nuclear Reactors and Daya Bay Nuclear Power Plant, Controlled fusion for power.

Electricity and Magnetism:

Charge and current, Finger sparks and lightning, magnets and compass, permanent magnets and electromagnets, magnetic recording, electric motors and generators, transformers, magnetic levitation, AC vs. DC.

Waves:

Sound waves, water waves and tsunamis, earthquakes, music, superposition of waves, introduction to electromagnetic waves and quantum waves

Light:

Light and colour, fiber optics, photography and images, mirages, rainbows, mirrors and lenses, polarized light and 3-D movies, LCD displays.

Invisible light:

Light beyond the visible spectrum, Infrared and ultraviolet, night vision, remote sensing, weather satellites, sunburn and sunblock, the ozone layer and ozone depleting chemicals, other invisible 'light' including x-rays, gamma rays, radio waves and microwaves.

Climate Change:

Global warming, Greenhouse effect and greenhouse gases, global warming vs. 'human-caused global warming', fossil fuels, renewable energy sources.

Quantum Physics:

'Particles are waves!', Minimum unit of energy, Laser and DVD, Photoelectric effect and digital camera, Semiconductor and computer chips, Electron microscope, 'Do you know your exact position?' – Uncertainty Principle.

Relativity:

'What is time?', 'Forever young' - time dilation, Invariance of the speed of light, $E = mc^2$ – Energy and Mass, Simultaneity, General relativity – a Theory of Gravity, GPS.

The Universe:

The Solar System, Galaxies, Dark Matter, Extraterrestrial Life and Drake's Equation, Telescope as a 'Time Machine', Expansion of the Universe, The Big Bang, The 3 K Cosmic Microwave Radiation, Creation of the Elements, Black Holes, Before the Big Bang, Theory of Everything.

Reading List

Compulsory Readings

Title	
1	Nil

Additional Readings

Title	
1	"Physics and Technology for Future Presidents – An Introduction to the Essential Physics Every World Leader Needs to Know", Richard A. Muller, Princeton University Press, 2010.

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

2, 3

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

1

PILO 3: Demonstrate critical thinking skills

2, 3

PILO 4: Interpret information and numerical data

2, 3

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

3

PILO 9: Value ethical and socially responsible actions

2

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

2, 3

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

Assignments