

# GE1305: FOUNDATION PHYSICS

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## Effective Term

Semester A 2023/24

## 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

AP1200/PHY1200 Foundation Physics

## 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 and important technologies. The students is assessed through an examination with conceptual questions (may require some simple calculations). The students can practice the use of concepts and principles to analyse physics phenomena or problems in tutorials. These tutorial questions are good training of the analytical skills used by physicists.

### Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if DEC-A1 DEC-A2 DEC-A3 app.)			
1	Cite and understand the basic concepts and principles of physics.		x		
2	Identify the relevant physics concepts and principles which play an important role in physical phenomena and relevant daily experience.		x	x	
3	Apply physics concepts and principles to analyse physical phenomena and relevant daily experience.				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.

### Learning and Teaching Activities (LTAs)

LTAs		Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures	Describe and explain the examples, concepts and principles of physics	1, 2	26 hours in total

2	Video viewing	Students will watch video programmes on physics experiments or documentaries on daily experience, technology, social issues / policies which prompt them to search scientific interpretations and explanation of the phenomena or issues.	1, 2	varies, during the lectures or tutorials
3	Tutorials	Students discuss with tutors on physics topics/ phenomena. The discussion trains the application of physics concepts and principles to analysis phenomena.	3	There is a total of five tutorials.

### Additional Information for LTAs

During the lectures and tutorials, the following topics may be used to raise the interest of the students and lead the student to the relevant physics concepts and principles. These examples can also train the students to apply the concepts and principles to analyse the phenomena and operation principles. This list of topics is not exhaustive and other topics will be included if necessary:

1. Relation between your mobile phone and your microwave oven and production of food.
2. Where does the energy we use come from?
3. Why do you need to hold the hand rails in MTR?
4. Friction actually helps us to move. Without friction can we walk?
5. How do microwave ovens cook?
6. What does happen in boiling water?
7. Why do we use dry ice instead of ice to keep your ice cream cold?
8. Relation between LCD TV and your ice tea.
9. What is the reason for buying a quantum dot TV? Is it really better?
10. Is OLED display really better than LCD display?
11. Why do grand pianos have the beautiful shape? What are the common components in a musical instrument?
12. Are the food radioactive after reheated in a microwave oven?
13. Why do we need nuclear power plant?
14. How does radiotherapy cure cancer?
15. Quantum physics we use everyday.
16. Strange quantum world: a particle is not 100% a particle?
17. How can we create weightlessness on earth?
18. How is the laser show effect created? Its relation to internet communication.
19. How do LED light bulbs work and how do they save energy?

Possible video for viewing during class:

1. "Slow Motion Musical Instruments | Mister C (Slow Mo #14)" Youtube
2. "Energy for the future: the grand vision" (TJ163.2 .E547 2001 DVD)
3. "Renewable Energy" (TJ808 .R4723 2008 DVD)
4. "Law of Conservation of Energy (Roller Coaster Demo)" Youtube
5. "Electromagnetic Waves" Youtube
6. "Laser : the extraordinary light for material processing" (TA1677 .L3747 2000 DVD)
7. "Light Fantastic" (QC363 .L54 2007 DVD)
8. "Classic sound waves films" (QC225 .C537 2006 DVD)
9. "Hiroshima" (D767.25.H6 H568 2006 DVD)
10. Other videos which

**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.

The Assignment will be completed in Canvas and consists of multiple choice questions or short answer questions. The main purpose of the assignment is to train students. They are allowed to have several attempts in answering the questions.

**Assessment Rubrics (AR)****Assessment Task**

1. Assignments

**Criterion**

Demonstrate understanding of physics concepts and principles through their application to solve some conceptual problems.

**Excellent (A+, A, A-)**

Demonstrate a high level of understanding of physics concepts and principles through their application to solve some conceptual problems.

**Good (B+, B, B-)**

Demonstrate a significant level of understanding of physics concepts and principles through their application to solve some conceptual problems.

**Fair (C+, C, C-)**

Demonstrate a moderate level of understanding of physics concepts and principles through their application to solve some conceptual problems.

**Marginal (D)**

Demonstrate a basic level of understanding of physics concepts and principles through their application to solve some conceptual problems.

**Failure (F)**

Not able to demonstrate a basic level of understanding of physics concepts and principles through their application to solve some conceptual problems.

**Assessment Task**

2. Examination

**Criterion**

Demonstrate ability to understand the physics concepts and principles and apply the concepts and principles to analyze physical phenomena and solve some conceptual problems.

**Excellent (A+, A, A-)**

Demonstrate a high level of ability to understand the physics concepts and principles and apply the concepts and principles to analyze physical phenomena and solve some conceptual problems.

**Good (B+, B, B-)**

Demonstrate a significant level of ability to understand the physics concepts and principles and apply the concepts and principles to analyze physical phenomena and solve some conceptual problems.

**Fair (C+, C, C-)**

Demonstrate a moderate level of ability to understand the physics concepts and principles and apply the concepts and principles to analyze physical phenomena and solve some conceptual problems.

**Marginal (D)**

Demonstrate a basic level of ability to understand the physics concepts and principles and apply the concepts and principles to analyze physical phenomena and solve some conceptual problems.

**Failure (F)**

Not able to demonstrate a basic level of ability to understand the physics concepts and principles and apply the concepts and principles to analyze physical phenomena and solve some conceptual problems.

**Part III Other Information****Keyword Syllabus****Newton' s Law of motion:**

Velocity, Acceleration, Force,

**Energy and Power:**

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

**Atoms and Heat:**

Building blocks of matter, Different Phases of Matter, Temperature and Thermal effects, Heat Engines and Refrigerators, Air Pressure

**Gravity, Force and Space:**

Gravitational force Launching rockets and Satellite, Solar system

**Nuclei and Radioactivity:**

Radioactivity, Seeing radiation, Radiation and death, Radiation to cure cancer, 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, wave in a stretched string, water waves and tsunamis, earthquakes, music, superposition of waves, introduction to electromagnetic waves and quantum waves

**Light:**

Light and colour, EM wave 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.

### 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.

### 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.
2	Recommended Textbook - 1. Conceptual Physics 12th Edition, P G Hewitt, Pearson.
3	Recommended Textbook - 2. Conceptual Physical Science 5th Edition, P G Hewitt, J A Suchocki, L A Hewitt, Pearson.
4	Recommended Textbook - 3. College Physics Paul Peter Urone, Roger Hinrichs, Kim Dirks, Manjula Sharma, Openstax College (for students who will take PHY1101, PHY1201 and PHY1400).

## 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 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

Examination and marks distribution.