

The Hong Kong Polytechnic University

Subject Description Form

Please read the notes at the end of the table carefully before completing the form.

Subject Code	AP1D03
Subject Title	How Things Work: the Physics of Everyday Life
Credit Value	3
Level	1
Pre-requisite / Co-requisite/ Exclusion	NIL
Objectives	<p>This is an introductory physics course for students of all levels and in all disciplines. In this subject, the working principles and mechanisms of some working objects/household appliances/phenomena which are closely related to our everyday life will be introduced. The very basic background knowledge and concept in physics will be covered, with the aims of arousing their interest in physics and enlightening them in appreciating the impact of science and technology.</p>
Intended Learning Outcomes <i>(Note 1)</i>	<p>Upon completion of the subject, students will be able to:</p> <ul style="list-style-type: none">(a) describe and discuss the mechanisms of the working objects/household appliances/phenomena around us in everyday life,(b) apply the acquired knowledge to solve problems and related issues,(c) develop skills of logical thinking and communication for lifelong learning,(d) appreciate the significance of science and technology <p><u>Literacy:</u> Students are required to read articles in popular science and technology magazines besides reference books (ILO (c), (d)). Writing of essays is also required.</p> <p><u>Higher order thinking:</u> Studying the logics behind the science and technology to be exercising rigorous scientific methods and provides excellent training on higher order thinking (ILO (b), (c), (d)).</p> <p><u>Skills for life-long learning:</u> Development of a reading habit on popular science books and magazines (ILO (c)) and reflection the possible sustainable development in technology (ILO (b),(c), (d)) should aid life-long learning.</p>

<p>Subject Synopsis/ Indicative Syllabus <i>(Note 2)</i></p>	<p>This course is a practical introduction to physics and science in our daily environment. This is different approach to the 'traditional' way of teaching physics. Instead of working our way through the physics in a linear fashion, we shall pick topics from our everyday experiences as case study, and then find out what is the physics behind them and relationships to one another. We will emphasize logical deductions and the application of scientific methods rather than facts and detailed mathematics. Advanced mathematics is not required for this course, basic math with some trigonometry and simple algebra is utilized.</p> <p><u>Keyword Syllabus</u></p> <p>This course familiarizes students with some basic principles of physics by examining selected topics with case study.</p> <p>Mechanics: scalars and vectors; kinematics and dynamics; Newton’s laws; momentum, impulse, work and energy; Law of conservation. (Case study: Ice skating, rockets, bumper car etc.)</p> <p>Thermal physics: heat and internal energy; heat capacity; conduction, convection and radiation; latent heat. (Case study: Woodstoves, incandescent light, air conditioners etc.)</p> <p>Waves: nature of waves; wave motion; reflection and refraction; superposition of waves; standing waves; electromagnetic spectrum; sound waves. (Case study: Clocks, musical instruments, lasers, sunlight, LED, microwave ovens etc.)</p> <p>Electricity and Magnetism: charges; current and resistance; Ohm’s law; magnetic field; magnetic force on moving charges and current-carrying conductors; Faraday’s law and Lenz’s law. (Case study: Laser printer, motors, compass etc.)</p>											
<p>Teaching/Learning Methodology <i>(Note 3)</i></p>	<table border="1"> <thead> <tr> <th data-bbox="517 1552 703 1697">Teaching and Learning Method</th> <th data-bbox="703 1552 895 1697">Intended Subject Learning Outcome</th> <th data-bbox="895 1552 1474 1697">Remarks</th> </tr> </thead> <tbody> <tr> <td data-bbox="517 1697 703 1944">Lectures</td> <td data-bbox="703 1697 895 1944">(a), (c), (d)</td> <td data-bbox="895 1697 1474 1944">Lectures will be used to deliver the knowledge of the subject matters. In class demonstration / video will also be given in lectures. In class activity will be emphasized so that students will also participate in discussions during lectures.</td> </tr> <tr> <td data-bbox="517 1944 703 2096">Tutorials</td> <td data-bbox="703 1944 895 2096">(a), (b), (c), (d)</td> <td data-bbox="895 1944 1474 2096">Tutorials will be used to strengthen students’ thinking and understanding. Worksheets and quizzes will be given to students to let them practice what they have learnt. In addition,</td> </tr> </tbody> </table>			Teaching and Learning Method	Intended Subject Learning Outcome	Remarks	Lectures	(a), (c), (d)	Lectures will be used to deliver the knowledge of the subject matters. In class demonstration / video will also be given in lectures. In class activity will be emphasized so that students will also participate in discussions during lectures.	Tutorials	(a), (b), (c), (d)	Tutorials will be used to strengthen students’ thinking and understanding. Worksheets and quizzes will be given to students to let them practice what they have learnt. In addition,
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		hands-on case studies and small-group discussions on selected articles on new technologies of current interest as chosen by the lecturer and the students will be conducted. Group presentations on case studies of the science, development, and impacts of selected technologies will be carried out.
Laboratory	(b), (c)	Students will work in groups and conduct the experiments related to everyday objects and analyse the results. The goal of laboratory experiments will be to use everyday objects and technology to elucidate the fundamentals of the physical world.
Assignments	(b), (c), (d)	Students will do assignments to reinforce the knowledge taught in lectures, to extend the knowledge by further reading and critical thinking and to apply the knowledge.
Project	(a), (b), (c), (d)	Students will form groups and choose a topic (a list of topics will be provided by the lecturers at the first or second week of class) related to the course materials. The group will then be asked to investigate the topic in detail through literature and information searching and present their findings in a presentation and a report.

Assessment Methods in Alignment with Intended Learning Outcomes

(Note 4)

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1. Assignments	20	√	√	√	√
2. Tests	20	√	√	√	√
3. Essay	30	√	√	√	√
4. Presentation	20	√	√	√	√
5. Laboratory Reports	10		√		√
Total	100 %				

Assignments (20%) and tests (20%) will focus on the study of basic principles of physics by examining selected topics. They mainly involves logical and scientific deductions, and in certain cases also simple mathematics.

	<p>During the laboratory session, students are required to analyse their experimental results using basic physical principles. They also have to answer pre-set questions and complete laboratory reports (10%).</p> <p>Students will form groups and choose a topic (a list of topics will be provided by the lecturers at the first or second week of class) related to the course materials. The group will then be asked to investigate the topic in detail through literature and information searching and present their findings in a presentation (20%) and an essay (30%).</p>	
Student Study Effort Expected	Class contact:	
	▪ Lectures	22 h
	▪ Tutorials	11 h
	▪ Laboratory	6 h
	Other student study effort:	
	▪ Reading, self-study and preparation of project	81 h
	Total student study effort	120 h
Reading List and References	<p><u>Textbook:</u> How Things Work: the Physics of Everyday Life, 5th Ed., Louis A. Bloomfield, Wiley, 2013.</p> <p><u>Other References:</u></p> <ol style="list-style-type: none"> 1. National Geographic Science of Everything: How Things Work in Our World, David Pogue, National Geographic Society, 2013. 2. The Science Book: Everything You Need to Know About the World and How It Works, Marshall Brain, National Geographic Society, 2011. 3. How Things Work, Steve Parker, Miles Kelly Publishing, 2010. 4. Cool Stuff and How It Works, Chris Woodford, DK Children, 2005. 5. How Things Are Made: From Automobiles to Zippers, 2nd Ed., Sharon Rose, Black Dog & Leventhal Publishers, 2003. 	

Note 1: Intended Learning Outcomes

Intended learning outcomes should state what students should be able to do or attain upon completion of the subject. Subject outcomes are expected to contribute to the attainment of the overall programme outcomes.

Note 2: Subject Synopsis/ Indicative Syllabus

The syllabus should adequately address the intended learning outcomes. At the same time over-crowding of the syllabus should be avoided.

Note 3: Teaching/Learning Methodology

This section should include a brief description of the teaching and learning methods to be employed to facilitate learning, and a justification of how the methods are aligned with the intended learning outcomes of the subject.

Note 4: Assessment Method

This section should include the assessment method(s) to be used and its relative weighting, and indicate which of the subject intended learning outcomes that each method purports to assess. It should also provide a brief explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.