

Hong Kong Baptist University
Faculty of Science – Department of Physics

Title (Units): **PHYS 2019 EXPERIMENTAL LAB II (1,0,3)**

Course Aims: By way of a series of experiments related to principles and application of physical laws, this practical course introduces Year 2 students to the basic concepts and methodologies behind experimentation. This lab course covers the topics on wave, electricity and magnetism.

Pre-requisite: PHYS 2005 Heat and Motion or consent of instructor.

Course Reviewed by: Dr. Jue Shi and Dr. Mau Hing Chan

Course Intended Learning Outcomes (CILOs):

No.	Upon successful completion of this course, students should be able to:
1	Plan and perform measurements in the lab to quantitatively explore physical laws.
2	Produce the desired technological outcomes based on sound understanding of appropriate physics laws and principles.
3	Operate scientific instruments to acquire useful data.
4	Analyze experimental data and error, and assess different technologies.
5	Write a clear lab report.

Teaching & Learning Activities (TLAs)

CILOs	TLAs will include the following:
1-5	By conducting four experiments either independently or in groups, students will learn how to apply principles and laws of physics to measure distinct quantities, and how to conduct experiments and analyze data to assess technological performance.
1-5	Students will practice experimental skills and perform measurements through game-based tasks and learn how to logically achieve the experimental objectives.
2, 5	By writing lab reports for the four individual experiments, students will practice and learn how to analyze experimental data and derive a sound scientific understanding of physical laws and modern technology.

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Assessment Methods (AMs):

No.	Assessment Methods	Weighting	CILOs to be addressed	Remarks
1	Game scores	50%	1-3	In most experiments, students are asked to fulfill specific missions in the lab. These missions are carefully designed to test students' understanding of the physics principles behind natural phenomena and modern technology as well as their ability to use lab instruments.
2	Lab reports	50%	1-5	Written reports on experiments when clarity of presentation, quality of results, and answers to problems posed in the lab manual are graded.

Learning Outcomes and Weighting:

Content	CILO No.	Teaching (lab hours)
Experiments (4 in total)	1- 5	24

Textbook: No textbook, lab manuals provided.

References:

1. P.R. Bevington and D.K. Robinson, Data Reduction and Error Analysis, 3rd ed., McGraw-Hill 2003.
2. D. Halliday, R. Resnick, and K.S. Krane, Physics, 5th Ed., Vols. 1 and 2, Wiley, 2001.

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Course Content in Outline:

	<u>Topic</u>	<u>Hours</u>
	Four experiments selected from the following:	
I.	Damped harmonic oscillation	6
	To study the working principle of wave and harvest of wave energy, such as tidal energy.	
II.	Wireless energy transfer	6
	To study the working principle of induction charging and heating, and evaluate efficiency of the energy transfer process	
III.	Solar cell and solar concentrator	6
	To study working principles of solar cell and the use of solar concentrator to harvest solar energy.	
IV.	Hydro power and wind energy	6
	To study the working principles of turbines and how it makes use of renewable energy sources, such as hydro power and wind energy.	
V.	Speed of ultrasonic wave in solution	6
	To study how physical properties of a solution, such as salt concentration, affect its refractive index and the propagation speed of ultrasonic wave in the solution based on acousto-optic effect.	
VI.	Piezoelectric effect and its applications	6
	To study the piezoelectric coefficient and resonant frequency of piezoelectric materials and learn how these properties are exploited in, e.g., energy harvesting.	
VII.	Optical diffraction	6
	To study the principle of optical diffraction and the diffraction equation using holographic diffraction grating film.	
VIII.	Microwave/visible Michelson Interferometer	6
	To study the principles and applications of interferometer using a Michelson Interferometer.	