Hong Kong Baptist University
Faculty of Science – Department of Physics

Title (Units): **PHYS 3017 GREEN ENERGY LAB WITH COMPUTERS and PERSONAL MOBILE DEVICES (3,0,3)**

Course Aims: This laboratory subject provides an introductory level to graphical and moving blocks programming for green energy related data measurements encountered by science students, using Android, iOS, Arduino, and/or LabVIEW, as the programming platform.

Pre-requisite: Year 3 standing or consent of Instructor

Course Reviewed by: Dr. Mau-hing Chan and Dr. Junxue Fu

Course Intended Learning Outcomes (CILOs):

No.	Upon successful completion of this course, students should be able to:
1	Apply graphical/moving blocks programming under different platforms such as Android, iOS, Arduino, and/or LabVIEW.
2	Manipulate green energy related data measurements.
3	Use portable mobile devices to communicate with scientific instruments for remote and automatic data acquisition.
4	Manipulate experimental data and signal processing.
5	Organize scientific lab reports.

Teaching & Learning Activities (TLAs)

CILOs	TLAs will include the following:
1-4	Lectures will be given to describe the working principles of green energy related data measurements, including the architectures of PCs, portable mobile devices, and microcontrollers, interface and communication methodologies between devices of different platforms, sampling theorem, analogue against digital signals, electronic noises, sensor network architecture, wireless data transmission, and self-powered sensors.

Hong Kong Baptist University
Faculty of Science - Department of Physics

CILOs	TLAs will include the following:
1-5	Using gadgets to demonstrate various self-powered sensors, wireless data acquisition, and remote desktop representation of data.
1-5	Step-by-step instructions of graphical programming will be given, then students design their own graphical/moving blocks programmes to implement various conditions of data measurements and instrument control.
1-5	Develop practical skills to process data and write scientific reports

Assessment Methods (AMs):

No.	Assessment Methods	Weighting	CILOs to be addressed	Remarks
1	Continuous assessment such as programme source codes	50%	1-5	A series of experiments with different sensors and hardware are provided for students to practice graphical programming under different platforms. After completion of programme design, students are requested to submit their source codes for assessment.
2	Lab reports	50%	1-5	One to two mini projects will be given to challenge students. Lab reports will be used to reflect on what students have learnt in this laboratory subject.

Learning Outcomes and Weighting:

Content	CILO No.	Teaching (lab hours)
I. Lectures	1- 4	6
II. Series of experiments for graphical/moving blocks programming	1- 5	15 - 18
III. Projects	4- 5	12 - 15

Textbook: No textbook, lab manuals provided.

References: No reference, Lab manuals and data sheets provided.

Hong Kong Baptist University
Faculty of Science – Department of Physics

Course Content in Outline:

	Topic	**Hours**
I.	Lectures: A. Concepts of mobile and remote data measurements B. Architectures of PCs, portable mobile devices, and microcontrollers C. Interface and communication methodologies between devices of different platforms D. Sampling theorem E. Analogue against digital signals F. Electronic noises G. Sensor network architecture H. Wireless data transmission I. Self-powered sensors	6
II.	Laboratory Sessions: Introduction to Graphical Programme A. Virtual instrument (VI) with LabVIEW and building blocks in Android, iOS, Arduino, and/or LabVIEW B. Data representations in graphical platforms C. Strings, arrays, matrix, and clusters D. Loops and structures E. Making SubVI (subroutine in structured programme, eg. in LabVIEW) F. File I/O G. Simple data acquisition graphical programmes H. Built-in Sensing elements in portable mobile devices I. Remote desktop	15 – 18

	Topic	**Hours**
III.	Mini Projects (1 – 2 Projects) A. Greenhouse Effect Simulation B. Characterization of Solar Cells C. Photograph Spectroscopy D. Biosensing of human pulse rate, heart and lung sounds, and pulse oximetry E. Characterization of various vibration sources F. Solar Tracking Platform	12 - 15