Hong Kong Baptist University
Faculty of Science – Department of Physics

Title (Units): **PHYS1005 INTRODUCTION TO GREEN ENERGY (3,3,1)**

Course Aims: This course introduces basic physics concepts and engineering toolbox for applications in innovative green energy technologies and smart environment that empower the sustainable development of energy intensive cities, such as Hong Kong. It explores quantitative principles and methodologies underlying efficient energy harvesting, conversion, storage and usage, which are essential part of the technological prerequisite towards building modern smart cities.

Pre-requisite: None

Course Reviewed by: Dr. Jue Shi and Prof. Changsong Zhou

Course Intended Learning Outcomes (CILOs):

No.	Upon successful completion of this course, students should be able to:
1	Explain the fundamental principles of physics underlying energy harvesting, conversion, storage and usage;
2	Explain how different green energy technologies work at the conceptual level;
3	Describe specific green energy technologies that can be applied in green buildings, transport systems and environment;
4	Solve simple energy-related problems using quantitative physical methods;
5	Discuss how green energy technologies can contribute to sustainable city development.

Teaching & Learning Activities (TLAs)

CILOs	TLAs will include the following:
1-5	Through course lectures, students will learn fundamental physical principles behind green energy technologies and how these technologies can be employed to reduce overall energy consumption and increase renewable energy production.
1-4	Through in-class discussions guided by the instructor, students will learn how to assess and analyze green energy technologies based on physical principles and quantitative methods.

Hong Kong Baptist University
Faculty of Science – Department of Physics

CILOs	TLAs will include the following:
3-5	Through homework and in-class demonstrations of examples, students will learn how to use mathematical tools and equations of physical laws to solve simple energy-related problems.
4, 5	By doing group projects, students will combine knowledge of green energy technologies and practical skills to design and assemble simple energy-efficient or energy-monitoring device.

Assessment Methods (AMs):

Type of Assessment Methods	Weighting	CILOs to be addressed	Description of Assessment Tasks
Continuous Assessment (assignments, midterm examination)	50-60%	1-5	Continuous assessments are designed to measure students' ability to apply basic physical concepts and quantitative methods that they learn in class to assess, analyze and apply different green energy technologies.
Final Examination	40-50%	1-5	Final examination is designed to evaluate the students' overall understanding of the course topics.

Learning Outcomes and Weighting:

Content	CILOs	Teaching (in hours)
I. Basic concepts	1-5	12
II. Modern green energy technologies (examples)	1-4	18
III. Applications (examples)	1-5	9

Textbook: None

Hong Kong Baptist University
Faculty of Science – Department of Physics

References: 1. P.G. Hewitt. Conceptual Physics. 12th Ed, Pearson, 2015
2. C. Beggs. Energy: Management, Supply and Conservation. 1st Ed, Elsevier, 2009.
3. R.A. Muller. Physics and Technology for Future Presidents: An Introduction to the Essential Physics Every World Leader Needs to Know. Princeton, 2010.
4. R.A. Serway and J.W. Jewett. Physics for Scientists and Engineers with Modern Physics. 9th Ed, Cengage Learning, 2013.
5. B.L. Capehart, W.C. Turner and W.J. Kennedy. Guide to Energy Management. 7th Ed, Fairmont Press Inc., 2011.
6. L. Bloomfield. How Everything Works, Wiley, 2007

Course Content in Outline:

	Topic	**Hours**
I.	Basic concepts	12
	A. Energy supply and consumption: a physics perspective	
	B. Electricity production and transmission	
	C. Energy harvesting	
	D. Energy storage	
	E. Energy analysis methods	
II.	Modern green energy technologies (examples)	18
	A. Energy-efficient technologies (e.g., energy-efficient electrical services, energy-efficient heating, air-conditioning and ventilation)	
	B. Clean energy technologies (e.g., clean coal, carbon fixation, nuclear energy)	
	C. Renewable energy technologies (e.g., solar, wind, hydroelectric)	
	D. Energy management and audit tools	
III.	Applications in smart and sustainable city development (examples)	9
	A. Smart grid	
	B. Green and intelligent buildings	
	C. Green and intelligent transport systems	

*The 12 hours on basic concepts may be distributed throughout the course in order to explain the technologies and applications outlined under topics II and III.