Form 2B

City University of Hong Kong

Information on a Course
offered by School of Energy and Environment
with effect from Semester A in 2013 / 2014

Part I

Course Title: Emerging Energy Technologies

Course Code: SEE6118

Course Duration: One semester

No. of Credit Units: 3

Level: P6

Medium of Instruction: English

Prerequisites: Nil

Precursors: Nil

Equivalent Courses: SEE8125 Emerging Energy Technologies

Exclusive Courses: Nil

Part II

1. Course Aims:

The course aims to provide students with the fundamental knowledge on the emerging energy technologies. This includes technologies that are expected to be the next state-of-the-art in the near future, from innovative clean energy conversion to energy storage. The acquired knowledge shall equip students for the rapidly evolving energy frontiers, and serve as a common ground for potential innovations in these technologies.

2. Course Intended Learning Outcomes (CILOs)

Upon successful completion of this course, students should be able to:

No	CILOs	Level of Importance
1	Describe basic principles in the conversion of fossil fuel (coal and natural gas) to ultraclean fuel, as well as their importance in the future energy equation; describe the process of carbon capture and storage and its importance in the integration of fossil fuel utilisation.	1
2	Describe the various means of solar energy conversion from first to third generation photovoltaic solar cells, and photoelectrochemical conversion; describe the working principles of different fuel cells, namely hydrogen fuel cell, direct methanol fuel cell and solid oxide fuel cell.	1
3	Describe the principles of energy storage through lithium ion batteries and supercapacitors, and their advantages; describe the principles of hydrogen storage such as metal hydrides and carbon nanotubes.	1
4	Describe the principles and applications of biomass energy, the theory behind the conversion processes, advantages and limitations of various biofuels production technologies.	1

3. Teaching and Learning Activities (TLAs)

(Indicative of likely activities and tasks designed to facilitate students' achievement of the CILOs. Final details will be provided to students in their first week of attendance in this course)

CILO No.	TLAs	Hours/week (if applicable)
CILO 1	Lectures; Tutorials	3
CILO 2	Lectures; Lab-based mini project	3
CILO 3	Lectures; Tutorials	3
CILO 4	Lectures; Lab-based mini project	3

4. Assessment Tasks/Activities

(Indicative of likely activities and tasks designed to assess how well the students achieve the CILOs. Final details will be provided to students in their first week of attendance in this course)

CILO No.	Type of Assessment Tasks/Activities	Weighting (if applicable)	Remarks
CILO 1	Quiz (10%); Assignments (10%);	20%	
CILO 2	Quiz (5%); Assignments (5%); Project report (20%)	30%	
CILO 3	Quiz (10%); Assignments (10%);	20%	
CILO 4	Quiz (5%); Assignments (5%); Project report (20%)	30%	

Coursework: 100%

5. Grading of Student Achievement: Refer to Grading of Courses in the Academic Regulations for Taught Postgraduate Degrees.

Grade A

The student completes all assessment tasks/activities and the work demonstrates excellent understanding of the scientific principles and the working mechanisms. He/she can thoroughly identify and explain how the principles are applied to science and technology for solving energy-related problems. The student's work shows strong evidence of original thinking, supported by a variety of properly documented information sources other than taught materials. He/she is able to communicate ideas effectively and persuasively via written texts and/or oral presentation.

Grade B

The student completes all assessment tasks/activities and can describe and explain the scientific principles. He/she provides a detailed evaluation of how the principles are applied to science and technology for solving energy-related problems. He/she demonstrates an ability to integrate taught concepts, analytical techniques and applications via clear oral and/or written communication.

Grade C

The student completes all assessment tasks/activities and can describe and explain some scientific principles. He/she provides simple but accurate evaluations of how the principles are applied to science and technology for solving energy-related problems. He/she can communicate ideas clearly in written texts and/or in oral presentations.

Grade D

The student completes all assessment tasks/activities but can only briefly describe some scientific principles. Only some of the analysis is appropriate to show how the principles are applied to science and technology for solving energy-related problems. He/she can communicate simple ideas in writing and/or oral presentation.

Grade F

The student fails to complete all assessment tasks/activities and/or cannot accurately describe and explain the scientific principles. He/she fails to identify and explain how the principles are applied to science and technology for solving energy-related problems objectively or systematically. He/she is weak in communicating ideas and/or the student's work shows evidence of plagiarism.

Part III

Keyword Syllabus:

Ultraclean fossil fuel conversion:
Gas-to-liquid conversion
Clean coal technologies
Carbon capture and storage

Energy conversion:
First, second and third generation solar cells
Photoelectrochemical conversion
Hydrogen fuel cells, direct methanol fuel cells, solid oxide fuel cells

Energy storage:
Lithium-ion batteries
Supercapacitor
Hydrogen storage

Biofuel conversion:
Biomass
First, second and third generation biofuels
Microbial fuel cells
Biochemical principles

Recommended Reading:

Raimondi, F., Scherer, G.G., Kötz, R., Wokaun, A. Nanoparticles in energy technology: Examples from electrochemistry and catalysis, *Angew. Chem. Int. Ed.* **2005**, *44*, 2190.

Somorjai, G.A., Frei, H., Park, J.Y. Advancing the frontiers in nanocatalysis, biointerfaces and renewable energy conversion by innovations of surface techniques, *J. Am. Chem. Soc.* **2009**, *131*, 16589.

Kamat, P.V. Meeting the clean energy demand. Nanostructure architectures for solar energy conversion, *J. Phys. Chem. C*, **2007**, *111*, 2834.

Winter, M., Brodd, R.J. What are batteries, fuel cells, and supercapacitors? *Chem. Rev.* **2004**, *104*, 4245.

Wall, J., C. S. Harwood, and A. L. Demain (eds.). 2008. Bioenergy. ASM Press.