Pro-Green Diploma

PRGR 620 Energy Systems & Sustainable Environments – Summer 2017

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Overview of the Course

This course introduces students to the concept of sustainability in the context of energy use. It stresses on the different aspects involved in our daily-life use of energy: environmental, societal, political, financial, etc. It covers technologies and means used in improving the sustainability of current fossil-fuel (coal, oil and gas) based energy systems, electric and nuclear systems by reducing their environmental and societal impacts. Finally, it introduces different renewable ('clean') energy technologies that can be used as alternatives to traditional ('dirty') energy systems.

Credit Hours

2 credit hours (equivalent to a total of 30 lectures of 50 minutes each)

Delivery Format

This course will be delivered online through Moodle. Course content may be accessed by clicking on the following link: http://moodle.aub.edu.lb/

Course Prerequisites

None

Course Goals

The general objective of this course is to familiarize students with the problems associated with our daily-life use of energy (environmental, societal, economic, political …) and to introduce solutions to these problems. The course does not go deep in the technological aspects of the solutions as these will be covered individually in other courses of the PROGREEN curriculum, but rather focuses on putting them in the context of achieving a sustainable energy future.

Course Objectives

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

1- Identify different forms and sources of energy and their availability
2- Identify the environmental and health impacts of energy systems
3- Assess the environmental and health impacts of energy systems
4- Identify the implications of energy use on a political, societal, economic and environmental level
5- Estimate the cost of energy in domestic, industrial and transportation applications
6- Identify means of reducing the environmental impact of fossil-fuel-based energy systems

7- Assess the importance of renewable energy and green technologies as alternatives to fossil-fueled energy

Topics Covered

- **Module 1**: Introducing Energy Systems & Sustainability
  - Energy Sustainability and its Importance
    - The Current global Energy System
    - Environmental and Socio-Political Aspects of Energy Usage
    - Towards Low-Carbon Energy Systems
- **Module 2:** Primary Energy and its Usage
    - Energy and Power
    - Units and Dimensions
    - Forms of Energy
    - Energy Efficiency
- **Module 3**: Coal Systems
    - The Coal Resource
    - Furnaces and Boilers
    - Coal Combustion Flue Gases
    - Heat to Motive Power (Steam Engines and Steam Turbines)
    - Power Station Turbine Systems
    - The Future of Coal-Fired Systems
- **Module 4:** Oil and Gas Systems
    - Oil and Gas Resources
    - Oil and Gas Engines (SI, CI and Gas Turbine Engines)
    - Pollution Reduction in Oil and Gas Systems
    - Future Availability of Oil
- **Module 5:** Electricity
    - Electricity Generation: Chemical (Batteries), Electromagnetic (Generators)
    - The Expanding Uses of Electricity (Lighting, Traction Drives, Heating and Cooling)
    - Large-Scale Electricity Generation
    - Combined Heat and Power
    - Transmission and Distribution
- **Module 6**: Nuclear Power
    - Radioactivity
    - Nuclear Power Production (Nuclear Fission and Nuclear Fusion)
    - Nuclear Fuel Cycles (Open and Closed Cycles)
    - Nuclear Power Today (Safety, Generation Costs, Uranium Availability)
- **Module 7**: Towards a Sustainable Energy Future
    - Cleaning-Up Fossil Fuels
    - Geo-Engineering Solutions
    - Hydrogen Fuel (Fuel Cell Technology, Hydrogen as a Combustion Fuel)
    - Reducing Energy Demand
    - Renewable Energy Solutions

Texts and Supplementary Materials

Required Text

• Godfrey Boyle, Bob Everett and Janet Ramage, Energy Systems and Sustainability: Power for a Sustainable Future, **Oxford, 2003**

Technical Requirements

• Intermediate computer skills

Grading Policy

The grades for this course break down as follows:

Quiz 1	12 pts
Quiz 2	8 pts
Quiz 3	8 pts
Quiz 4	16 pts
Quiz 5	24 pts
Quiz 6	12 pts
Quiz 7	20 pts
Total Points	**100 pts**

Description of Course Requirements (assessments)

Knowledge Checks

You will take quizzes (Knowledge checks) throughout the semester (at the end of each Module), all delivered via Moodle. These quizzes are multiple-choice questions. The quiz content will be largely based on video lectures and readings.

Internet Etiquette

Netiquette (short for "network etiquette" or "Internet etiquette") is a set of social conventions that facilitate interaction over networks.

General Rules

1. Make your messages easier to read by making your paragraphs short and to the point.
2. TYPING IN ALL CAPS IS CONSIDERED SHOUTING ON THE INTERNET.
3. Messages in all lowercase letters can be difficult to read, instead, use normal capitalization.
4. *Asterisks* surrounding a word can be used to make a stronger point.
5. Be careful when using sarcasm and humor. Without face-to-face communications your joke may be viewed as criticism. When being humorous, use emoticons to express humor. (Tilt your head to the left to see the emoticon smile) :-) = happy face for humor
6. Never give your user ID or password to another person. System administrators that need to access your account for maintenance or to correct problems will have full privileges to your account.

Make-up Policy

Failure to take a quiz during the assigned period will result in a grade of zero for that quiz unless the student has personally contacted the instructor and received permission to miss the quiz. A quiz missed due to a valid excuse must be made up within one week of the original assigned date. The student is responsible for arranging the make-up session with the course instructor.