



Course Code OGEE-531	Course Title Energy Efficiency	ECTS Credits 7.5
Prerequisites None	Department Engineering	Semester Fall, Spring
Type of Course Elective	Field Oil, Gas and Energy Engineering	Language of Instruction English
Level of Course 2 nd Cycle	Lecturer(s) Dr Constantinos Hadjistassou	Year of Study 1 st
Mode of Delivery Face-to-face	Work Placement N/A	Co-requisites None

Objectives of the Course:

The main objectives of the course are to:

- Explain the principle of energy (physics) and its importance to society;
- Introduce the concepts of energy efficiency and energy conservation;
- Outline the different forms of energy and power generation technologies;
- Familiarize participants with the modes of heat transfer and heat losses;
- Explain the concepts of thermal comfort and energy utilization in buildings;
- Guide attendees to identify energy conservation opportunities;
- Be able to determine heat gains and losses through cavity walls, air-infiltration & exfiltration;
- Acquaint themselves with energy use & conservation in the transportation sector & thermoelectric technologies;
- Familiarize participants with the concept of carbon footprint

Learning Outcomes:

After completion of the course students are expected to be able to:

1. Understand the concept of energy (physics) & its importance to modern lifestyle;
2. Distinguish between energy efficiency and energy conservation;
3. Acquaint with heating, refrigeration units, heat pumps, and ventilation systems;
4. Know the heat transfer processes as well as how heat losses manifest themselves;
5. Determine U-values, window heat losses, air-infiltration & exfiltration;
6. Become accustomed with thermal comfort and sick building syndrome;
7. Identify and implement energy saving opportunities and recognize energy efficient technologies;
8. Familiarize with thermal harvesting technologies such as thermoelectrics;
9. Familiarize with building materials options and moisture issues;
10. Discern the use of energy and carbon footprint.

Course Contents:

- Definition of energy in physics and popular misconceptions;
- Means for realizing energy efficiency and energy conservation schemes;
- Energy sources such as fossil fuels and power generation technologies such as: passive solar thermal, photovoltaics, concentrated solar thermal systems;
- Heat transfer mechanisms of conduction, convection and radiation;
- Orientation of dwellings, U-values of building elements & casings;
- Energy utilization in buildings, building insulation materials, the building envelope, heat losses and heat gains;
- Window thermal gains/losses, convective losses, air-quality;
- Refrigeration, air-conditioning, heat pumps, domestic hot water, ventilation systems;
- Factors governing thermal comfort levels and the sick building syndrome;
- Combined heat and power systems;
- Energy efficiency in transportation;
- Thermoelectric systems and their applications;
- Principles of energy audits, state-of-the-art technologies, equipment and measurements;
- Carbon footprint of services and processes.

Learning Activities and Teaching Methods:

Lectures, Projects, Discussion

Assessment Methods:

Homework, problem sheets, mid-term exam, final exam.

Required Textbooks / Reading:

Title	Author(s)	Publisher	Year	ISBN
Energy and the New Reality 1: Energy Efficiency and the Demand for Energy Services	Harvey LD Dunny	Earthscan	2010	9781844079124

Recommended Textbooks / Reading:

Title	Author(s)	Publisher	Year	ISBN
Sustainable Energy —	MacKay DJC	UIT (free e-book)	2009	9780954452933

Without the Hot Air				
Building Physics— Heat, Air and Moisture, 2 nd Ed.	Hens SLC Hugo	Wilhelm Ernst & Sohn	2012	783433602348
Fundamentals of Engineering Thermodynamics, 5 th Ed.	Moran JM & Shapiro NH	John Wiley & Sons	2006	9780470030370
Consumer Guide to Home Energy Savings, 9 th ed	Amann JT, Wilson A & Ackerly K	New Society Publishers	2007	9780865716025
Sustainable Energy — Without the Hot Air	MacKay DJC	UIT	2009	9780954452933