



Course Code OGEE-532	Course Title Solar, Wind, and Biomass Energy	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) Prof Anastasis Polycarpou	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:

- Introduce students to renewable and sustainable forms of energy
- Provide solid knowledge on the fundamentals and principles underlying production of energy from solar, wind, and biomass
- Develop the tools for quantitative and qualitative performance analysis of solar, wind, and biomass energy systems
- Provide solid technical knowledge and skills related to the analysis and design of current energy conversion technologies

Learning Outcomes:

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

1. Explain the main characteristics, differences, advantages, and disadvantages of solar, wind, and biomass energy systems for particular geological and environmental situations
2. Use engineering tools and practices to analyze and evaluate the performance and efficiency of renewable and sustainable energy systems
3. Evaluate the natural resources of a particular site and provide quantified analysis for the potential performance of solar, wind, and biomass energy systems
4. Perform calculations for the design and sizing of an optimum renewable energy system based on solar, wind, or biomass
5. Describe various types of conversion technologies related to solar, wind, and biomass renewable energy systems
6. Discuss current contributions and future prospects of the aforementioned renewable energy systems to the local and global energy market

Course Contents:**Introduction to renewable and sustainable energy sources**

- Forms of energy, conversion, and efficiency
- Renewable energy sources
- Renewable system integration
- Promoting renewable energies

Solar energy

- Thermal energy systems
- Solar photovoltaic (PV) systems
- Types of PV modules and characteristics
- Types of PV systems (Grid connected, autonomous)
- Environmental impact and safety of PV systems
- PV integration, cost per kwh, PV resources, and future prospects

Bioenergy

- Biomass as fuel
- Bioenergy sources (energy crops, woody crops, wastes, etc.)
- Combustion of solid biomass
- Production of gaseous and liquid fuel from biomass
- Environmental benefits and impact from the use of biomass
- Biomass economics and future prospects

Wind energy

- Principles and the laws of physics behind wind harvesting
- Wind turbines
- Aerodynamics of wind turbines
- Power and energy from wind turbines
- Environmental impact and related issues
- Economics
- Wind energy prospects
- Offshore wind energy systems

Learning Activities and Teaching Methods:

Lectures, Projects, Discussion

Assessment Methods:

Homework, Project assignments, exams, final exam.

Required Textbooks / Reading:

Title	Author(s)	Publisher	Year	ISBN
Renewable Energy: Power for a Sustainable Future , 3 rd edition	Godfrey Boyle	Oxford University Press	2012	

Recomended Textbooks / Reading:

Title	Author(s)	Publisher	Year	ISBN
Sustainable Energy –Without the hot air	Mackay	UIT Cambridge	2009	
Renewable Energy: Physics, Engineering, Environmental Impacts, Economics & Planning. 4 th edition.	B. Sorensen	Elsevier /Academic Press	2010	