Course Code	Course Title	ECTS Credits
OGEE-532DL	Solar, Wind, and Biomass Energy	7.5
Department	**Semester**	**Prerequisites**
Engineering	Fall, Spring	None
Type of Course	**Field**	**Language of Instruction**
Elective	Oil, Gas and Energy Engineering	English
Level of Course	**Year of Study**	**Lecturer(s)**
2nd Cycle	1st/2nd	Dr Marios Nestoros
Mode of Delivery	**Work Placement**	**Co-requisites**
Distance Learning	N/A	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:

- Explain the main characteristics, differences, advantages, and disadvantages of solar, wind, and biomass energy systems for particular geological and environmental situations
- Use engineering tools and practices to analyze and evaluate the performance and efficiency of renewable and sustainable energy systems
- Evaluate the natural resources of a particular site and provide quantified analysis for the potential performance of solar, wind, and biomass energy systems
- Perform calculations for the design and sizing of an optimum renewable energy system based on solar, wind, or biomass
- Describe various types of conversion technologies related to solar, wind, and biomass renewable energy systems
- 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, Online Questions, Projects, Discussion

Assessment Methods:

Assignments, Online Exercises, Final Exam

Required Textbooks/Reading:

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

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN

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