Τίτλος (Ελλ.)	Τίτλος (Αγγλ.)	Υπεύθυνος	Διδάσκοντες
Τεχνολογίες ηλεκτροπαραγωγής από ΑΠΕ	Electricity and power production from RET	Γ. ΠΑΠΑΔΑΚΗΣ (G. Papadakis)	Γ. ΠΑΠΑΔΑΚΗΣ (G. Papadakis) Χ-Σ. ΚΑΡΑΒΑΣ (Ch-S. Karavas) Γ. ΚΥΡΙΑΚΑΡΑΚΟΣ (G. Kyriakarakos)

Περιγραφή - Description

This course is dedicated in communicating the fundamentals of electricity production technologies from renewable energy and design principles of such systems, including the challenges of integrating renewables and other technologies into the distribution network and transmission network (bulk-power system) while maintaining safe, efficient, and cost-effective grids. The course provides an understanding to renewable sources and technologies such as solar energy, photovoltaics, concentrating solar power systems, wind and wind converters, hydro, geothermal, biomass, wave and tidal power, smart grid and microgrids and electricity storage. The course will also provide an understanding of the concepts of sustainability, systems thinking and Life Cycle Analysis (LCA) and incorporation of these concepts into renewable energy systems. The class will explore the potential advantages of low-carbon energy in developing a low-carbon economy and society.

Learning objectives

This course will be focused on academic achievement, acquisition of knowledge and enhancement of comprehension of information regarding renewable energy sources and technologies for electricity production and their sustainable applications. Students will practice knowledge-based critical thinking and solution offering about established and emerging innovative technologies for electricity production. Students completing this course will be able to:

- Identify renewable energy sources and estimate their potential;
- Have an understanding of the existing and emerging RET for electricity production;
- Understand the different components and main configurations of RET;
- Analyse components and configurations of renewable power generation, energy storage, distribution and transmission networks for renewable energy systems;
- Have an understanding of the needs of the EU network and understand the challenges for the development and operation of renewable energy systems;
- Have an understanding of LCA and applications;
- Develop a critical thinking about sustainability & resilience; and
- Determine potential solutions for energy needs and problems by incorporating renewable energy technologies for electricity production.

WEEK	Lectures
1ST	The EU electric power industry and grid - (Karavas)
2ND	The solar resource, solar geometry and panel orientation and tracking – (Papadakis)
3RD	Photovoltaic materials and electrical characteristics - (Papadakis)
4TH	Photovoltaic modules and systems (grid connected & standalone) - (Papadakis)
5TH	Concentrating solar power systems – (Papadakis)
6TH	The wind resource – (Papadakis)
7TH	Energy and power in the wind - Estimating wind turbine energy production - (Papadakis)
8TH	Wind turbine types, generators and basic wind turbine rotor aerodynamics - (Papadakis/Karavas)
9TH	Hydroelectric power – Biomass – Geothermal energy – Wave energy conversion – Tidal power (Papadakis/invited)
10TH	Smart grid - Microgrids - Electricity storage – Electric vehicles (Karavas/Kyriakarakos)

11TH	Hydrogen production from renewable energy – Fuel cells (Kyriakarakos)
12TH	Economics of renewable energy – (Kyriakarakos)
13TH	Renewable energy and the environment and sustainable development – (Papadakis)

Assignments - indicative

1. Design and estimation of yearly energy production of fixed, one axis and two axis tracking photovoltaic park (Karavas)

2. Design and modelling of a large-scale photovoltaic plant (Karavas/Kyriakarakos)

3. Estimation of yearly energy production of a wind turbine/park at a location with given wind potential (Papadakis)

4. An assignment on Life-Cycle Environment Impact of renewables (Papadakis/Kyriakarakos)

Exams, marking and student assessment

Assignments: 60%, Written exam(s): 40%