

## Faculty of Engineering & Technology

### Renewable Energy

#### Information :

**Course Code :** EPR 413

**Level :** Undergraduate

**Course Hours :** 3.00- Hours

**Department :** Specialization of Electrical Power Engineering

#### Instructor Information :

Title	Name	Office hours
Associate Professor	Walid Atef Hafez Elmetwally Omran	7
Teaching Assistant	Abeer Tharwat Said Awad	

#### Area Of Study :

Develop the students understanding about the fundamentals of renewable energy systems, especially wind energy systems and photovoltaic (PV) systems.

Help the students identify the different components of wind energy systems and PV systems.

Allow the students to solve engineering problems related to wind energy systems and PV systems.

#### Description :

Wind Energy Systems: Power in the wind - Rotor aerodynamics and efficiency - Power curve of wind turbines - Electric generators used with wind turbines . Environmental impacts of wind turbines. Photovoltaic Systems: The solar resource - Types and characteristics of PV cells . Connection of PV cells, modules and arrays . Balance of system - Design of PV systems. Other Renewable Energy Resources: (e.g., Fuel cells - Wave energy . Hydro power . Tidal power . Concentrated Solar thermal systems).

#### Course outcomes :

##### a. Knowledge and Understanding: :

1 -	Define terms related to wind energy systems and PV systems.
2 -	Recall the operating principles of wind energy systems and PV systems
3 -	Memorize the components of wind energy systems and PV systems
4 -	Identify the principle of electricity generation from other renewable energy resources

##### b. Intellectual Skills: :

1 -	Classify the different topologies of wind energy systems and PV systems
2 -	Analyze the performance of wind energy systems and PV systems.
3 -	Illustrate the power conversion process in wind energy systems and PV systems
4 -	Design stand-alone PV systems to supply islanded loads

##### c. Professional and Practical Skills: :

1 -	Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results
2 -	Apply safe systems at work and observe the appropriate steps to manage risks

3 -	Perform experiments related to renewable energy systems
4 -	Prepare technical reports related to renewable energy systems
<b>d.General and Transferable Skills: :</b>	
1 -	Collaborate effectively within multidisciplinary team
2 -	Work in stressful environment and within constraints
3 -	Communicate effectively
4 -	Effectively manage tasks, time, and resources
5 -	Search for information and engage in life-long self learning discipline
6 -	Refer to relevant literatures

#### **Course Topic And Contents :**

Topic	No. of hours	Lecture	Tutorial / Practical
Introduction	5	3	2
Wind Energy Systems: (Power in the wind - Rotor aerodynamics and efficiency - Power curve of wind turbines - Electric generators used with wind turbines . Environmental impacts)	30	18	12
Photovoltaic Systems: (The solar resource - Types and characteristics of PV cells - Applications of PV systems and their design)	30	18	12
Other Renewable Energy Resources: (Fuel cells - Wave energy . Hydro power . Tidal power . Concentrated Solar thermal systems)	10	6	4

#### **Teaching And Learning Methodologies :**

Interactive lectures
Experiential learning
Self reading
Report writing
Collaborative projects
Problem-based learning

#### **Course Assessment :**

Methods of assessment	Relative weight %	Week No	Assess What
Final exam	40.00		
In Class Quizzes	5.00		
Laboratory	10.00		
Mid-Term exams	30.00		
Participation	5.00		
Project	10.00		

#### **Recommended books :**

- 1) Gilbert M. Masters %Renewable and Efficient Electric Power Systems, 2nd Edition+EA August 2013, Wiley-IEEE Press
- 2) Thomas Ackermann, %Wind Power in Power Systems, 2nd Edition+EA May 21, 2012, Willey.
- 3) Nicholas Jenkins and Janaka Ekanayake %Renewable Energy Engineering+EA Cambridge University Press, 2017