Zarqa University

Faculty of Engineering Technology
Department: Energy Engineering
Course title: Renewable Energy Systems

Prerequisite: 0904204, 0904462
Instructor: TBD
Lecture's time: TBD
Semester: TBD
Office Hours: TBD

Course description:

Global electricity demand, Structure of the Electricity Supply Industry; Grid operation; supply and demand, conventional and renewable energy sources, availability of the energy sources in the world, how electricity is made and transmitted, fundamentals of solar photovoltaic technology and the PV cell performance, determination of the PV modules efficiency, PV System components for different types of designs, solar systems types, sizing the stand-alone PV system, commercial and institutional PV systems, solar concentrators, solar hot water systems, history of biomass technology, biomass sources and biomass energy process, fundamentals of biomass combustion, introduction to geothermal energy and the principle of geothermal reservoirs, types of geothermal sources, types of hydrothermal resources, geothermal power production systems (analysis and operation), geothermal heat pumps, types of hydropower turbines, potential energy stored in the reservoir, introduction to nuclear energy and its operation principles, nuclear power plant components, wind turbine components, the power in the wind.

Aims of the course:

1. **Understand the global electricity demand and the structure of the electricity supply and industry.**
2. **Determine the conventional and renewable energy sources.**
3. **Study the availability of the energy sources in the world and how electricity is made and transmitted.**
4. **Study the concept of various renewable energy sources and its power conversion process.**
5. **Understand the fundamentals of the available renewable energy sources such as; solar, geothermal, hydro and wind.**
6. **Analyze the renewable energy sources systems production and operation.**

Intended Learning Outcomes (ILOs):

1. **Explain the global needs of electricity and the availability of alternative energy sources.**
2. **Explain the fundamentals of solar photovoltaic technology and the PV cell performance.**
3. **Determination of the PV modules efficiency, PV System components for different types of designs.**
4. **Understand the solar systems types; solar hot water systems.**
5. **Understand the biomass technology, biomass sources and biomass energy process, and also the fundamentals of biomass combustion process.**
6. **Explain geothermal energy and the principle of geothermal reservoirs with the types of geothermal sources available.**
7. **Explain the types of hydropower turbines and the potential energy stored in the reservoirs.**
8. **Analyze the nuclear energy and its operation principles with the nuclear power plant components.**
9. **Understand the wind energy, wind turbine components and calculation of the power in the wind.**

Course structures:

Week	C. Hrs	ILOs	Topics	Teaching Procedure	Assessment methods
1		1	**Global electricity demand, Structure of the Electricity Supply Industry; Grid operation; supply and demand**	**Lectures using power point + home work assignment**	**1st + 2nd examination Final examination Assessment of home work**
1,2		1	**Conventional and renewable energy sources, availability of the energy sources in the world, how electricity is made and transmitted**	**Lectures using power point + home work assignment**	**1st + 2nd examination Final examination Assessment of home work**
3		3	**Fundamentals of solar photovoltaic technology and the PV cell performance**	**Lectures using power point + home work assignment**	**1st + 2nd examination Final examination Assessment of home work**
3,4		3,4	**Determination of the PV modules efficiency, PV System components for different types of designs**	**Lectures using power point + home work assignment**	**1st + 2nd examination Final examination Assessment of home work**
5		4	**Solar systems types, sizing the stand-alone PV system, commercial and institutional PV systems**	**Lectures using power point + home work assignment**	**1st + 2nd examination Final examination Assessment of home work**
5,6		4	**Solar concentrators and solar hot water systems**	**Lectures using power point + home work assignment**	**1st + 2nd examination Final examination Assessment of home work**
7,8		5	**History of biomass technology, biomass sources and biomass energy process, fundamentals of biomass combustion**	**Lectures using power point + home work assignment**	**1st + 2nd examination Final examination Assessment of home work**
9,10		6	**Introduction to geothermal energy and the principle of geothermal reservoirs, types of geothermal sources**	**Lectures using power point + home work assignment**	**1st + 2nd examination Final examination Assessment of home work**

11		6	**Types of hydrothermal resources, geothermal power production systems (analysis and operation)**	**Lectures using power point + home work assignment**	**1st + 2nd examination Final examination Assessment of home work**
11		6	**Geothermal heat pumps**	**Lectures using power point + home work assignment**	**1st + 2nd examination Final examination Assessment of home work**
12,13		7	**Types of hydropower turbines and potential energy stored in the reservoirs**	**Lectures using power point + home work assignment**	**1st + 2nd examination Final examination Assessment of home work**
14		8	**Introduction to nuclear energy and its operation principles, nuclear power plant components**	**Lectures using power point + home work assignment**	**1st + 2nd examination Final examination Assessment of home work**
15		9	**Wind and Wind turbine components and calculation of the power available in the wind**	**Lectures using power point + home work assignment**	**Assessment of home work**
16			**Exam**		

Textbook:

"Renewable Energy Systems", Buchlar, David, Floyd, Thomas, Kissell, Thomas, Boston - Pearson Education - 2015.

Reference:

"Fundamentals of renewable energy systems", Mukherjee D, New Delhi - New Age International pub - 2007.

Lecturer hand outs

Assessment Methods:

Methods	Grade	Date
First examination	**20%**	**According to faculty time table**
Second examination	**20%**	
Final examination	**50%**	
Project assessment	**10%**	