The University of Jordan
School of Engineering

Department	Course Name	Course Number	Semester
Mechanical Engineering	Special Topics in Thermal Sciences: Renewable Energy; Technology, Economics and Environment	0954954	

2005 Course Catalog Description

Overview, Introduction to RES, Renewable energy systems, Introduction to Solar systems, Solar thermal, Photovoltaic (On Grid, Off Grid), CSP, Wind Energy, Other RES: Hydropower, Geothermal, Biomass/fuel.

Instructors

Name	E-mail	Sec	Office Hours		Lecture Time	

Text Books

	Text book 1	Text book 2
Title	Renewable Energy: Technology, Economics and Environment	
Author(s)	Martin Kaltschmitt, Wolfgang Streicher, Andreas Wiese	
Publisher, Year, Edition	Springer-Verlag Berlin, 2007, 1st edition, SI units	

References

Books	Photovoltaic Solar Energy Generation, A. Goetzberger, V.U. Hoffmann, Dpringer-Verlag Berlin, 2005.
Journals	
Internet links	PVGIS programme EU http://re.jrc.ec.europa.eu/pvgis/

Prerequisites

Prerequisites by topic	Fundamentals of Thermal power such as fluid mechanics, thermodynamics and heat transfer.
Prerequisites by course	5th Year level
Co-requisites by course	-
Prerequisite for	-

Topics Covered

Week	Topics	Chapter in Text	Sections
1, 2, 3	Introduction Introduction to Renewable energy RE Photovoltaics (PV): Sun PV: Silicon PV: Solar Cell		
4, 5, 6	PV: Grid Connected PV Systems PV: Stand-alone PV Systems PV: Design Stand-alone PV Systems		
7, 8	Hydropower Geothermal		
9, 10	Solar Thermal Wind Energy (WE): Introduction to Wind Energy		
11, 12	WE: Wind Resources WE: Analysis of Wind Data WE: Wind Turbines WE: Turbines Performance		

13, 14, 15	WE: Wind Powered Pumping Systems WE: Wind Farms BioEnergy Energy Economics		

Mapping of Course Outcomes to ABET Student Outcomes

SOs	Course Outcomes
2	1. Ability to apply knowledge of Thermal Sciences in the design of a renewable energy system. 2. Ability to distinguish the modes of heat transfer (conduction, convection and radiation) in the different solar systems. 3. Ability to design a renewable energy system (PV) for a certain application. 4. Ability to design a solar energy system (on grid or off grid PV) to the need of a certain demand of energy. 5. Ability to design an environment and sustainable energy system. 6. The Ability to use the calculation of heat transfer in producing a design for energy system. 7. An ability to calculate the design of solar energy for power plant. 8. Ability to calculate the heat transfer from solar collectors. 9. Ability to understand how to select and calculate the solar energy system for including the power of the steam turbines. 10. An ability to distinguish between the different types of Renewable Energy systems.
4	11. Ability to understand that the renewable energy systems can be used to power communities and it can be used for improvement humankind life. 12. An ability to have enough information about the impact of energy on the environment including the greenhouse effect and global warming.
5	13. The students will be able to work effectively on course project teams with team members who may have different backgrounds and technical skill levels.

Evaluation

Assessment Tools	Expected Due Date	Weight
Projects & Assignments		10%
Quizzes		10%
Midterm Exam		30%
Final Exam		50%

Contribution of Course to Meet the Professional Components

The course contributes to expose the students with the different types of the renewable energy systems with more concentration of the solar energy and wind energy. The course will contribute also to increase the awareness and information of the students about the climate change and global warming phenomena. The basic design for a PV system will be introduced in this course.

Relationship to Student Outcomes

SOs	1	2	3	4	5	6	7
Availability		X		X	X		

Relationship to Mechanical Engineering Program Objectives (MEPOs)

MEPO1	MEPO2	MEPO3	MEPO4	MEPO5

ABET Student Outcomes (SOs)	
1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3	An ability to communicate effectively with a range of audiences
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Updated by ABET Committee, 2024