Philadelphia University

Faculty of Engineering - Department of Renewable Energy Engineering

First Semester 2024/2025

Course Information

Title:	Solar thermal energy (611421)
Prerequisite:	Introduction of renewable energy (611341)
Credit Hours:	3 credit hours (16 weeks per semester, approximately 44 contact hours)
Textbook:	Solar energy: principles of thermal collection and storage by S. P. Sukhatme, J. K. Nayak, 2016.
References:	• Solar Engineering of Thermal Processes 4th Edition by John A. Duffie, William A. Beckman. • https://www.iea.org/
Catalog Description:	This course deals with all aspects of solar thermal energy. Topics covered start with the relationship between sun and earth geometry. The solar constant and extraterrestrial radiation are then explained and calculated. The course then proceeds to the effect of the earth's atmosphere on sun radiation. The available solar radiation on Earth is calculated on horizontal as well as tilted surfaces. The physics properties of Opaque and transparent materials are covered in the context of their use in solar thermal energy systems. The course finally covers the construction, modeling, and performance evaluation of flat plat collectors as a basic solar thermal energy collector.
Website:	https://www.philadelphia.edu.jo/academics/zalmuala/

Instructor: Dr. Zaid Al Muala

Email: zalmuala@philadelphia.edu.jo

Office: Engineering building, room 6714, ext:2450.

Office hours: Sat.: 09:10 - 11:10
Sun.: 10:10 - 11:10 & 12:40 - 13:40
Mon.: 10:10 - 11:10 & 14:00 - 15:00
Tues.: 10:10 - 11:10 & 12:40 - 13:40

Course Topics

Week	Topic
1,2	Introduction to solar thermal energy
3,4	Solar radiation
5	Radiation characteristics of opaque materials
6, 7	Radiation transition through glazing: absorbed radiation
8,9	Flat plate collectors
10,11, 12	Concentrating collectors
13	Energy storage
14, 15	Solar thermal energy application
16	Review, and final exam

Course Learning Outcomes and Relation to ABET Student Outcomes: Upon successful completion of this course, a student should:

1.	Study solar thermal energy	[K1, K2]
2.	Able to deal with residential, commercial, and industrial applications	[K4]
3.	Understand solar radiation and heat transfer	[K1, K2]
4.	Use the plane and concentrated collectors,	[K2, K4]
5.	Illustrates water heating applications	[K2, K4]
6.	Be able to deal with water heating applications for heating and cooling the buildings,	[K2, K4]

Assessment Instruments:

Evaluation of students' performance (final grade) will be based on the following categories:

Exams:	Two written exams will be given. Each will cover about 3-weeks of lectures
Quizzes:	10-minute quizzes will be given to the students during the semester. These quizzes will cover material discussed during the previous lecture(s).
Homework:	Problem sets will be given to students. Homework should be solved individually and submitted before the due date.
	Copying homework is forbidden, any student caught copying the homework or any part of the homework will receive a zero mark for that homework
Participation:	Questions will be asked during the lectures and the student will be assessed based on his/her response
Final Exam:	The final exam will cover all the class material.

Grading policy:

First Exam	20%
Second Exam	20%
Homework	5%
Quizzes	15%
Final Exam	40%
Total:	100%

Attendance policy:

Absence from classes and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse, acceptable to and approved by the Dean of the relevant college/faculty, shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.

October, 2024