

**The University of Jordan  
School of Engineering**



Department	Course Name	Course Number	Semester
Mechanical Engineering	Solar Energy	0904554	

**2005 Course Catalog Description**

Fundamentals of solar radiation; methods of solar radiation collection; thermal systems components and analysis; transfer of collected heat; storage of collected heat; domestic hot water system; introduction to solar energy applications.

**Instructors**

Name	E-mail	Sec	Office Hours		Lecture Time	

**Text Books**

	Text book 1	Text book 2
<b>Title</b>	Solar Engineering of Thermal Processes	(Handouts)
<b>Author(s)</b>	J. A. Duffie, W. A. Beckman	-
<b>Publisher, Year, Edition</b>	Wiley, 2006, 3 <sup>rd</sup> edition	-

**References**

<b>Books</b>	
<b>Journals</b>	
<b>Internet links</b>	<a href="http://oayadi.wix.com/course">http://oayadi.wix.com/course</a>

**Prerequisites**

<b>Prerequisites by topic</b>	<ol style="list-style-type: none"> <li>1. Basics of heat transfer, with concentration on conduction, fins, convection and radiation.</li> <li>2. Basics of fluid mechanics, with concentration on pressure drop in pipes.</li> <li>3. Basic thermodynamic concepts such as systems and properties; energy, work and heat.</li> </ol>
<b>Prerequisites by course</b>	Heat Transfer (1) - 0904441
<b>Co-requisites by course</b>	-
<b>Prerequisite for</b>	-

**Topics Covered**

Week	Topics	Chapter in Text	Sections
1	Solar radiation	Ch. 1	
2	Available solar radiation	Ch. 2	
3	Selected topics in heat transfer (A quick review)	Ch. 3	
4	Radiation transmission through covers and absorption by collectors	Ch. 4	
4	Theory of flat-plate collectors	Ch. 6	
5	Energy storage	Handout	
6	System thermal calculations	Handout	
7	Solar water heating	Handout	

## Mapping of Course Outcomes to ABET Student Outcomes

SOs	Course Outcomes
1	1. Understand the physics of solar radiation, solar times and angles. 2. Calculate the direction of solar radiation at any time and location. 3. Orient solar collection system at any time and location for maximum energy gain. 4. Model and predict thermal performance of a solar collection system
2	5. Select proper material for various components of solar energy collectors. 6. Evaluate energy storage capabilities of a solar collection system 7. Figure out the performance of various flat-plate solar collector combinations
6	8. Estimate and measure actual solar radiation at a surface of any orientation and position. 9. Select proper flat-plate solar collector for a desired job. 10. Evaluate the problems associated with local thermosyphonic solar collection systems.

### Evaluation

Assessment Tools	Expected Due Date	Weight
<b>First Exam</b>		30 %
<b>Second Exam</b>		30 %
<b>Final Exam</b>		40 %

### Contribution of Course to Meet the Professional Components

The course contributes to building the students' knowledge in energy and energy saving techniques.

### Relationship to Student Outcomes

SOs	1	2	3	4	5	6	7
<b>Availability</b>	X	X				X	

### Relationship to Mechanical Engineering Program Objectives (MEPOs)

MEPO1	MEPO2	MEPO3	MEPO4	MEPO5

### ABET Student Outcomes (SOs)

<b>1</b>	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
<b>2</b>	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
<b>3</b>	An ability to communicate effectively with a range of audiences
<b>4</b>	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
<b>5</b>	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
<b>6</b>	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
<b>7</b>	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

**Updated by ABET Committee, 2019**