

**The University of Jordan  
School of Engineering**



Department	Course Name	Course Number	Semester
Mechanical Engineering	Solar Energy	0904554	

**2019 Course Catalog Description**

Fundamentals of Solar radiation: The properties of sunlight. Spectral distribution of sunlight. Calculation of solar irradiance at surfaces. Solar thermal: Thermo-dynamical description of solar collectors. Optical properties of solar collectors. Selection of solar collectors. Solar thermal systems design for different applications: schemes and components. Solar electric: Solar cell systems. System components and their functions. Calculating output and dimensioning of solar cell systems. Analysis and simulation of a solar collector and panel system by computerized tools.

**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>	-
<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	

<b>Mapping of Course Outcomes to ABET Student Outcomes</b>							
<b>SOs</b>	<b>Course Outcomes</b>						
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.						
<b>Evaluation</b>							
<b>Assessment Tools</b>			<b>Expected Due Date</b>			<b>Weight</b>	
<b>Assignments</b>						20 %	
<b>Midterm Exam</b>						30 %	
<b>Final Exam</b>						50 %	
<b>Contribution of Course to Meet the Professional Components</b>							
The course contributes to building the students' knowledge in energy and energy saving techniques.							
<b>Relationship to Student Outcomes</b>							
<b>SOs</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>Availability</b>	X	X				X	
<b>Relationship to Mechanical Engineering Program Objectives (MEPOs)</b>							
<b>MEPO1</b>	<b>MEPO2</b>	<b>MEPO3</b>	<b>MEPO4</b>	<b>MEPO5</b>			
<b>ABET Student Outcomes (SOs)</b>							
<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, 2021**