

## ME 431: Design of Solar Thermal Systems

<i>Course description:</i>	Design of solar thermal systems for heating and cooling of buildings, heating of water, electrical generation, industrial processes, and distillation.
<i>Number of credits:</i>	3
<i>Course Coordinator:</i>	R.F. Richards
<i>Prerequisites by course:</i>	ME 301; ME 303; ME 304; certified major in Mechanical Engineering
<i>Prerequisites by topic:</i>	<ol style="list-style-type: none"><li>1. First Law of Thermodynamics</li><li>2. Power and Refrigeration Cycles</li><li>3. Basic Heat Transfer</li></ol>
<i>Textbooks/other required materials:</i>	John A Duffie & William A. Beckman, <i>Solar Engineering of Thermal Processes</i> , Wiley 3 <sup>rd</sup> edition 2006.
<i>Course objectives:</i>	<ol style="list-style-type: none"><li>1. Understand the basic principles of design and operation of solar thermal energy conversion</li><li>2. Apply those principles to a wide variety of systems and applications</li></ol>
<i>Topics covered:</i>	<ol style="list-style-type: none"><li>1. Solar Radiation</li><li>2. Solar economics</li><li>3. Photovoltaics</li><li>4. Flat Plate Solar Collectors</li><li>5. Passive Solar Heating Systems</li><li>6. Active Solar Heating Systems</li><li>7. Solar Hot Water Systems</li><li>8. Solar Lighting</li><li>9. Concentrating Solar Collectors</li><li>10. Solar heat engines for electricity generation</li><li>11. Politics and policy</li></ol>
<i>Expected learning outcomes:</i>	Upon successful completion of the course, the students will be able to: <ol style="list-style-type: none"><li>1. Understand how to estimate available solar energy for a given site and application</li><li>2. Design a passive solar heating system for a building</li><li>3. Design an active solar heating system for a building</li><li>4. Understand the design and economics of solar thermal power plants</li></ol>
<i>Class schedule:</i>	Three 50-minute lectures per week, for one semester.

Laboratory schedule: None

Contribution to meeting the professional component: Engineering Topics

Relationship of course to student outcomes:  
3 strongly supported; 2 supported; 1 minimally supported

Student Outcomes Pre-Fall 2018  
(ABET EC2000)

a	b	c	d	e	f	g	h	i	j	k
		3		2						

Student Outcomes Fall 2018 forward  
(ABET EC2019)

1	2	3	4	5	6	7
2	3					

Prepared by: Andrea Butcherite and R.F. Richards      Date: May 30, 2018