1. ME 5312, Solar Thermal Engineering

2. 4 credits, 4 contact hours.

3. Instructors: J. Davidson, V. Srinivasan


5. Specific course information:
   b. Prerequisites: ME 3331, ME 3332, CSE upper division or grad student.
   c. Elective course for ME students.

6. Course outcomes (related ABET student outcomes indicated in square brackets):
   a. An understanding of solar energy options and the role of solar energy in achieving a sustainable energy future. [4]
   b. An ability to apply mass, momentum, and energy balances to solar thermal systems and their design. [1,2]
   c. An ability to measure solar radiation and analyze the available data to predict solar irradiance as a function of time, geographic location, and orientation. [1,6]
   d. An ability to apply heat transfer analysis to collectors, heat exchangers and thermal storage. [1]
   e. 5. An ability to utilize numerical methods to design solar thermal systems. [1,2]
   f. An understanding of how photovoltaic cells operate. [1]
   g. An ability to apply economic analyses to evaluate solar and competing non-solar technologies. [1,4]
   h. An ability to design a solar system. [1,2,7]
   i. An ability to work as part of a team and to present a design in oral and written reports. [3,5]

7. Course topics:
   a. Overview of current technology and emerging trends in solar thermal energy.
   c. Solar radiation measurement and data processing.
   d. Heat transfer analysis of solar collectors with review and application of radiation, conduction and convective heat transfer.
e. Liquid and air collector characterization and test procedures.
f. Heat exchanger design and characterization.
g. Thermal energy storage.
h. Design of systems for space and water heating.
i. Determination of thermal loads for space and water heating.
j. System analysis and computational tools to predict annual energy savings.
k. Economic analyses of solar systems including payback and life cycle costing.