EMCH 594 - Solar Heating

Credit hours – 3  Contact hours – 50 minutes MWF or 75 minutes TTh

Instructor – Jeff Morehouse


Specific Course information:
   a. EMCH 594 - Solar Heating. (3) Solar radiation; review of heat transfer and radiation characteristics of relevant materials; flat plate and focusing collectors; energy storage models for design of solar heating systems; system design by computer simulation; direct conversion by solar cells.
   b. Prerequisites: EMCH 290, EMCH 354 or ECHE 321
   c. Mechanical Engineering Elective

Course Goals:
   a. Outcomes
      1. The student will apply solar geometry to the determination of solar radiation on an arbitrarily oriented surface.
      2. The student will comprehend collector and storage design parameters used in the analysis of device and system efficiency and operation.
      3. The student will comprehend the parameters used in calculating the life-cycle system costs associated with solar hot water and heating systems.
      4. The student will have the ability to design a hot water solar system and a solar space heating system using the F-Chart computer code.
      5. The student will have knowledge of the operational fundamentals and parameters associated with photovoltaic cells.

   b. Relationship of Course to Program Objectives: The importance of each course objective to meeting the program outcomes is indicated with the following scale: 3 = major importance; 2 = moderate importance; 1 = minimal importance. Blank if not related.

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<tr>
<th>Program Outcomes (see list for complete description)</th>
<th>Course Outcomes</th>
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<td>CO 1</td>
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<tr>
<td>1.1. analyze, design and realize</td>
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<td>1.2. computation techniques</td>
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<td>1.3. design and interpret experiments</td>
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<td>1.4. apply linear algebra, calculus</td>
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<td>1.5. apply statistical methods</td>
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<td>1.6. understand chemistry and physics</td>
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<tr>
<td>2.1. engineering economic analyses</td>
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<td>2.2. plan and execute projects</td>
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2.3. oral and written communications
2.4. professional responsibility
2.5. multi-disciplinary teams
2.6. life-long learning
3.1. engineering in modern society
3.2. literature, arts, humanities.
3.3. foreign language

Topics Covered:
3. Concentrating collectors: optics and types.
4. Flat plate collectors: efficiency and design parameters.
5. Thermal storage: thumb-rules for design and simulation models.
6. Life-cycle system cost economics.
7. Space and hot water heating systems: active system (F-Chart) and passive system (LCR) design methods.
8. Photovoltaics: operational fundamentals and operating parameters.

Person Who Prepared This Description and Date of Preparation:
Jeffrey H. Morehouse, (August 2004 Revision: new text)