SOUTHEASTERN LOUISIANA UNIVERSITY
Department of Computer Science & Industrial Technology
ET 361 – Solar Thermal Systems
Spring 2016

Instructor: Junkun Ma
Office Location: Room 329B, Fayard Hall
Phone: (985)549-2501
E-mail: junkun.ma@selu.edu
Lecture Time: TBA (Independent Study)
Lecture Location: Fayard Hall 329C
Office Hours: 9:30AM~12:00PM & 1:00PM~5:00PM Tu
10:00AM~12:00PM Fr ONLINE office hour
Other time by appointment

THE FOLLOWING IS A TENTATIVE PLAN. THE INSTRUCTOR RESERVES THE RIGHT TO MAKE CHANGES DURING THE SEMESTER BASED ON PROGRESS AND CHANGES OF OTHER CONDITIONS.

Course Description:
This course introduces fundamentals of solar thermal process, solar thermal systems and their applications. Topics include solar radiation, solar thermal materials, solar thermal collectors, solar energy storage, solar cooling, solar thermal power systems, solar thermal efficiency evaluation, and economics of solar systems. Three credits will be awarded upon successful completion of this course.

Course Objectives:
1. To apply fundamental concepts of solar thermal systems in practical design
2. To design and analyze solar thermal collectors
3. Design and analyze solar thermal energy storage systems
4. Design and analyze solar thermal control systems
5. Incorporate solar thermal systems into traditional energy systems
6. Conduct economical analysis for solar thermal systems

Course Materials:
Reference:
Grades:
1. Grades will be assigned according to the departmental scale.
   - 90-100 = A, Superior
   - 80-89 = B, Very Good
   - 70-79 = C, Average
   - 60-69 = D, Below Average
   - 0-68 = F, Failure

Note: Students **MUST** score a “C’ or above in all courses within their major. Otherwise, they must repeat the course.

2. Basis for assigning grades:
   a) Assignments: 100 points
   b) Projects: 100 points

If you have any problem with this grading system, please make an appointment to talk with the instructor immediately! **NO LATE HOMEWORK WILL BE ACCEPTED.** Students with unexcused absences will **NOT** be able to make-up exams or homework! A grade of **ZERO (0)** will be assigned to missing exams or homework! Students are required to provide documentation for legal absence before any make-ups.

Important Dates and Notes:
1. **Wednesday, January 13, 2016 ~ Thursday, January 14, 2016** is the Drop/Add period. Students can make schedule adjustment without receiving a ‘W’ grade for each class dropped. Students may make final schedule adjustments by **5:00PM on Thursday, January 14, 2016.**

2. **Monday, February 15, 2016** is the last day to apply for Spring 2016 graduation, and Summer/Fall 2016 graduation without late fee.

3. Students will **NOT** automatically be dropped from classes. Students who choose to drop from this class must do so via LEONET by the university deadline of **Friday, March 11, 2016 before 12:30PM.** It is also the deadline to resign from the university.

4. The time and location of the **final exam** for this class will be **announced during the last week of lecture.**

5. **Friday, May 6, 2016** is the last day of classes.

6. **Friday, May 20, 2016** is the deadline to return rental textbook without fine. Student accounts will be charged for any rental books not returned by **12:30PM on Friday May 20, 2016.**

7. If you are a qualified student with a disability seeking accommodations under the Americans with Disabilities Act, you are required to self-identify with the Office of Disability Services, Room 117, Mims Hall. No accommodations will be granted without documentation from the Office of Disability Services.
8. Student behavior/Classroom decorum: "Free discussion, inquiry, and expression are encouraged in this class. Classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of students to benefit from the instruction is not acceptable. Examples may include routinely entering class late or departing early; use of beepers, cellular telephones’ or other electronic devices; repeatedly talking in class without being recognized; talking while others are speaking; or arguing in a way that is crossing the civility line.” In the event of a situation where a student legitimately needs to carry a beeper/cellular telephone to class, prior notice and approval by the instructor is required.” Otherwise, ALL PAGERS, BEEPERS, CELLULAR TELEPHONES AND OTHER ELECTRONIC DEVICES ARE TO BE TURNED OFF OR TURNED TO SILENT MODE BEFORE YOU ENTER THE CLASSROOM.

Classroom behavior that is deemed inappropriate and cannot be resolved by the student and the faculty member may be referred to the Office of Judicial Affairs for administrative or disciplinary review as per the Code of Student Conduct which may be found at http://www.selu.edu/admin/stu_affairs/handbook/.

9. Academic Integrity: Students should note that repercussions of academic integrity are discussed in the university catalogue. “Cheating on examinations, plagiarism, improper acknowledgment of sources in essays and the use of a single essay or paper in more than one course without permission are considered very serious offenses and shall be grounds for disciplinary action”.

10. The students Southeastern Louisiana University e-mail address MUST be used for all e-mail communication between students and faculty/administration/staff. Students are encouraged to check their Southeastern e-mail frequently for important communications from the university.

11. University policy states that the lab is not a place for children. Students are not to bring their children to the lab.

Course Requirements:
1. Adherence to departmental policies and procedures, which you were provided.

2. Regular and punctual class attendance. Students who have unexcused absences will receive the grade of zero (0) for all tests, quizzes, and/or lab experiments missed. When any student receives unexcused absences (e.g., ten percent of the total classes) in any class prior to the published withdrawal date, the instructor may withdraw the student with a grade of W.

Course Outline:
1. Introduction
   A. Course overview
   B. Syllabus
   C. Course outline
2. The Sun and Solar Radiation
   A. The sun
   B. The solar constant
   C. Spectral distribution of extraterrestrial radiation
   D. Definitions
   E. Direction of beam radiation
   F. Shading
3. Available Solar Radiation
   A. Fundamental concepts
   B. Pyrheliometers & Pyranometers
   C. Solar radiation data
   D. Atmospheric attenuation of solar radiation
   E. Hourly radiation
   F. Radiation on sloped surface
   G. Radiation augmentation
   H. Effects of receiving surface orientation
4. Heat transfer
   A. The electromagnetic spectrum
   B. Planck and Wien displacement law
   C. Radiation intensity and flux
   D. Infrared and sky radiation
   E. Heat transfer
5. Solar Thermal Materials
   A. Absorption and emission
   B. Kirchhoff’s law
   C. Relationship among absorption, emission and reflection
   D. Surface radiation properties
   E. Angular dependence of solar absorption
6. Radiation transmission through glazing
   A. Reflection of radiation
   B. Absorption by glazing
   C. Transmittance for diffuse radiation
   D. Effects of surface
   E. Absorbed solar radiation
7. Flat-plate collectors
A. Basic of flat-plate collectors
B. Temperature distribution
C. Heat loss
D. Effects of dust and shade
E. Collector performance and test
F. Fluid flow flat-plate collectors

8. Concentrating Collectors
   A. Basic of concentrating collectors
   B. Thermal and optical performance
   C. Performance of concentrating collectors
   D. Effects of orientation
   E. Other concentration collectors

9. Solar Energy Storage
   A. Process loads and solar collector outputs
   B. Solar energy storage
   C. Energy storage devices
   D. Phase change materials for energy storage
   E. Chemical energy storage
   F. Battery storage

10. Solar Process Loads
    A. Time-dependent loads
    B. Hot-water loads
    C. Space heating loads
    D. Building loss
    E. Building energy storage capacity
    F. Cooling loads
    G. Swimming pool heating loads

11. Solar process economics
    A. Costs of solar process systems
    B. Life-cycle saving
    C. Other economic analyses
    D. Discount and inflation

12. Applications
    A. Active and passive solar water heating
    B. Active building heating
    C. Passive and hybrid building heating
    D. Solar cooling
    E. Solar industrial process heat
    F. Solar thermal power systems
G. Solar ponds

13. Design Methods
   A. Simulation in solar process design
   B. Design of active systems: f-chart
   C. Design of passive and hybrid heating systems

**BIBLIOGRAPHY**


