ME 508 – NANO/MICROSCALE ENERGY AND HEAT TRANSFER – SPRING 2014

CATALOG DESCRIPTION: Review of limitations of macroscopic energy transport models; Energy transport and conversion mechanisms at the micro/nano/molecular scale; Energy transfer in nanostructured energy devices; Related topics on the transport of electrons, phonons and molecules; Molecular Dynamics simulation.

PREREQUISITE: Graduate Standing or consent of the instructor.

CLASSROOM: Engineering B 143. TIME: TR 11.15 a.m. to 12.30 p.m.

INSTRUCTOR: Dr. Emmanuel C. Nsofor
Office: E 020 Engineering Building
Phone: 453-7021
E-mail: nsofor@engr.siu.edu
Office Hours: TR 2.30 p.m. to 5.30 p.m. (or by appointment).

TEXTBOOK: Nano/Microscale Heat Transfer, 1st Edition by Zhuomin Zhang, McGraw Hill Higher Education, 2007, ISBN: 9780071436748 or ISBN: 007143674X. Information on the price can be obtained online through SIUC webpage – SalukiNet, Bookstore or 536-3321.

COURSE OBJECTIVE: As energy management and conversion devices reduce in size to the nanoscale, the mechanisms and principles become significantly different from macroscopic mechanisms and principles. In this course, students will learn the concepts of energy transfer, processes, principles and mechanisms at the nanoscale and acquire relevant skills for analysis and development of the new energy systems.

SOFTWARE: You should be familiar with your choice of software/programs such as FORTRAN, MATLAB, EES etc. for solving equations or be able to write computer programs for solving the equations.

COURSE WEB ADDRESS: From https://online.siu.edu/

ADMINISTRATION OF THE COURSE: You are expected to attend all classes. Attendance will be registered. All homework and projects must be turned in at the beginning of class on due dates. The guidelines given for the presentation of problems should be followed strictly.

For the homework assignments, you are encouraged to consult other students or the instructor if you run into problems. **Consulting is allowed but not copying.**

The overall course grade will be based on the following:

Homework Problems	25%
Mid Semester Test	25%
Comprehensive Problems/Research Paper Synopsis	25%
Final Examination	25%

GRADES:		
	A	90 – 100%
	B	80 – Less than 90%
	C	70 – Less than 80%
	D	60 – Less that 70%
	F	Less than 60%

OUTLINE OF THE TOPICS

1. Introduction
2. Review of Macroscopic Thermodynamics and Heat Transfer
3. Introduction to Thermal Energy Flow in Nanoscale Structures
4. Elements of Statistical Thermodynamics and Quantum Theory
5. Kinetic Theory and the Transport Equations
6. Micro/Nanofluidics and Heat Transfer
7. Heat Transfer in Fluids with Nanoparticle Suspensions
8. Introduction to Molecular Dynamics Simulations
9. Thermal Radiation

SCHEDULE/DUE DATES

Mid Semester Test	Thursday, March 6 at 11.15 a.m.
Homework and Projects	Due dates will be given when these are assigned.
*Final Examination	Tuesday May 6 at 7.50 a.m.

*Will be confirmed on the last day of class as it is subject to change.

Note: The professor reserves the right to make changes to the program as necessary at any time.

SIUC EMERGENCY PROCEDURES

Southern Illinois University Carbondale is committed to providing a safe and healthy environment for study and work. Because some health and safety circumstances are beyond our control, we ask that you become familiar with the SIUC Emergency Response Plan and Building Emergency Response Team (BERT) program. Emergency response information is available on posters in buildings on campus, available on BERT's website at www.bert.siu.edu, Department of Public Safety's website www.dps.siu.edu (disaster drop down) and in the Emergency Response Guidelines pamphlet. Know how to respond to each type of emergency.

Instructors will provide guidance and direction to students in the classroom in the event of an emergency affecting your location. **It is important that you follow these instructions and stay with your instructor during an evacuation or sheltering emergency**. The Building Emergency Response Team (BERT) will provide assistance to your instructor in evacuating the building or sheltering within the facility.