

# ME 599 THERMAL SCIENCES AT NANOSCALE

UNIVERSITY OF KENTUCKY  
Department of Mechanical Engineering

## Fall 2006

- Professor: **M. Pinar Mengüç**  
269 RGAN Bldg.; Ph. 7-6336 x80658; E-mail: [menguc@engr.uky.edu](mailto:menguc@engr.uky.edu)
- Class Schedule: MWF 2:00 p.m. to 2:50 p.m., RGAN 203
- Office Hours: MW 10:15 a.m. - 11:00 (other times by appointment).
- Text Books: Gang Chen, Nano-Scale Energy Transport and Conversion, Oxford University Press, 2005.
- In addition, we will regularly distribute class notes and research articles, including material from a new book by B. Wong and M. P. Menguc.
- Teaching Assistant: None.
- Homeworks: There will be regular homework assignments. They will be handed out occasionally, and need to be turned in within one or two lectures later.
- Projects: There will be a "reading" project for graduate and professional students. All other assignments will be the same for all students.
- Midterm Exams: During the semester, there will be two 50-minute exams on the following dates:  
  
TBD (Fridays)
- Final Exam: Tuesday, December 13, 2005, 8 a.m. at RGAN 202
- Quizzes: None.
- Grading: Exams 20% each; Final 20%; Homeworks 30%; Reading Project 10%.

Course Goals:

This course will introduce you to the concepts of nano-scale thermal sciences. You will understand the fundamentals of energy carriers, including photons, phonons, electrons, and molecules; conceptualize wave and particle formulations. The topics to be discussed includes statistical thermodynamics, energy transfer via electron, electromagnetic, acoustic waves; Boltzmann equation and particle-model based transport phenomena; conduction and radiation analyses for thin films and rarefied gas flow models; Schrodinger equation and its solution for different systems; the details of energy states in solids.

You will develop the skills necessary to identify and analyze different modes of energy transfer and their interactions. You will learn to setup the governing equations of different systems at nano-scale and solve the equations for simple geometries. You will learn to read and interpret the papers published in scientific and trade journals to stay on top of your field.

Other:

You are expected to (i) have engineering standing; (ii) spend at least six (6) hours per week outside the classroom to study the material covered in this course; (iii) work on all HW problems assigned.