ENGR 3150: Heat Transfer
Fall 2008
Tuesday/Thursday 2:00-3:15

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Office Hours: I maintain an "open door" policy, even though the door most times is closed (I like to listen to music while I work). However, it will be appreciated if you contact me in advance to make sure I will be there and so that I can plan for it. Drop ins are welcome, but I may sometimes be involved in other tight deadline activities, so your understanding is appreciated.

Text: Y.A. Çengel, *Heat and Mass Transfer – A Practical Approach*, 3rd Edition, McGraw Hill, 2007

Course Objectives

This course introduces the student to the different processes by which energy and mass are transferred and the laws governing these processes. The course has the following overriding objectives:

1. The student should appreciate the physical origins of the various transport processes. When confronted with an engineering problem, (s)he should be able to *identify the relevant transport processes*.
2. The student should be able to *perform engineering calculations* for problems involving heat and mass transfer. (S)he should be able to make *relevant simplifying assumptions* and perform calculations leading to the *rational design and/or improvement* of heat and mass transfer systems.
3. An important goal is to develop in the student *an appreciation of the vital role* heat and mass transfer processes play in the natural and industrial worlds.
4. The student should leave the course with confidence in his/her understanding of the basic principles of heat and mass transfer and his/her ability to apply these principles to engineering practice.

This course will also be structured to help prepare you for life as an engineer in the workplace. In-class examples and case studies will try to bring in real life applications of heat transfer to demonstrate the concepts. As a student, you will be expected to be prepared in advance for each lecture, just as in a real world situation such as going to a meeting or field assignment.

Participation in this course requires advance preparation and outside study. Lectures are intended as a supplement only to the complete topics covered; you are responsible for independent study to gain familiarity with the subject material in each section listed in the readings. You may be called on to discuss the concepts for today's class, so be prepared for each class. Various methods and styles for the lecture sessions will be used, ranging from PowerPoint presentations, example problems and student led discussions.

Exams will be open book, open notes, open mind - since life is an open book test.

Course Prerequisites: MATH 2700
Recommended Co-requisites: ENGR 3160 Fluid Mechanics, ENGR 3140 Thermodynamics

Course Topics

Part I: Introduction and Concepts
Part II: Conduction

- 1-D Steady-state conduction
- Extended surfaces
- Transient conduction

Part III: Convection

- Heat and mass transfer analogy
- External flow
- Internal flow
- Natural convection
- Boiling and condensation\
- Heat exchangers

Part IV: Thermal Radiation

- Blackbody radiation
- Gray and real surfaces
- View factors
- Radiation energy exchange

Part V: Applications and Course Review

Course Grading

In-class work	20%
(includes exercises, quizzes, lab[s] and participation at 5%)	
Homework or small projects	20%
Mid-term exam #1	20%
Mid-term exam #2	20%
Final exam	20%

Class participation will be 5% of the total for in-class work. Class participation is as defined below for attendance and maintaining an active presence and involvement in the class. Past experience has shown that the participation grade most often helps everyone in their grade, **except for the people who might need it the most**. By far the most common reason for people not doing well in this class is through non-attendance and not turning in assignments.

Regular updates will be provided to the class of the interim grades as we proceed through the semester.

General Course Policies

- ***Attendance.*** *Classroom attendance is mandatory*. In preparation for a professional position in the real world, absences are only allowed in case of illness, emergencies, or special circumstances. Part of the class participation grade will be based on attendance patterns. If you know in advance that you must be gone from class, a written notice (email with return receipt requested) is required in order to be considered for allowance to make up any work. Lectures will serve as an overall summary of the topic. You will be held responsible for any material discussed in the lecture, whether treated in the textbook or not. *There will be no opportunity to make up missed assignments, quizzes or classroom exercises unless approved in advance.* In case of serious illness or emergency, your grades will be prorated.
  A student may be withdrawn from this course by the instructor without notification to the student for excessive absences or for failure to complete necessary prerequisites. For this course, "excessive absences" is defined as absences from all of the first three class meetings or five (5) or more absences from any contiguous ten (10) scheduled class meetings.

- ***Lectures.*** Some lecture materials will be posted on WebCT before each class. These are prepared as a learning aid for you. Sometimes these will be gone through in class, while other times they will be available for you as reference material. Occasionally, the class may be asked to help provide a summary of the reading and topic material, so you are recommended to be prepared by at least reading the book sections in advance.
- ***Participation.*** You are encouraged to ask questions during the lecture regarding any aspects of the readings, homework, projects or lectures that are unclear to you. This will keep the class interesting for all and aid in learning by all. In addition, you may be called upon to answer questions, to comment on problem solutions, and/or lead discussions related to the lecture material. Demonstrating reasonable participation will require daily preparation and staying current with assignments. Daily observations of your class participation will be made and recorded through the semester and used to determine the participation portion of the final course grade. For each day recorded, 5 points will be given for active participation in the class session, 4 points for attendance only, and 3 points for attendance with some negative such as a late arrival and 0 for an unexcused absence. At the end of the semester, the points are totaled for everyone. The person with the highest total points is assigned a 100% on the participation portion and all others are scaled to that total point level. Note that participation counts 5% toward the overall course grade.
- ***In Class Assignments.*** In class exercises will be done either individually or in small groups. These generally will be worked through together in groups, but some may be given as a quiz. Exercises may be required to be finished at home and turned in next class session. **Bring calculator and extra paper to class each day to be prepared.**
- ***Alternative Learning Opportunities.*** Truly learning a subject involves more than just coming to class; it requires you to be an active participant and incorporate multiple methods. This course will cover the subject matter from a number or aspects, which could include the use of special purpose computer software packages and investigation study assignments.
- ***Exams.*** Midterm and final exams will be open book, open notes and open mind; because life is an open book test.
- ***Homework.*** Homework will be collected according to the scheduled dates listed in this syllabus. It is due before class starts.
- ***Communication Quality.*** The general policy of having at least 30% of the grade on written materials reflects the quality of written communication will be applied. **This includes the overall neatness of your work and the ability for me to understand what you put down.** Important to note: In industry and the workplace if you can not effectively communicate your results to your supervisor, clients, or co-workers, then you have not completed the task and in essence it never happened.

  For example, do not have the results of your problem buried somewhere in the middle of a spreadsheet or other program output, expecting that I will be able to sort through it and identify the answer. If the answer is not obviously noted, then it will not be found or counted.

- ***Grading.*** Grading will be curved based on the overall class breakdown.
- ***Ethical Conduct.*** Communication between students in working on in-class exercises and the design project is encouraged. Students are expected to maintain the high ethics of the engineering profession during the course; unethical behavior such as cheating on an exam will be dealt with severely according to the policies and procedures on academic honesty of the University of Georgia.

- ***General.*** Hats are not to be worn in the class; this simulates the professional work environment that you may be working at in the future. All cell phones, pagers, etc. are to be turned off before class starts.

Written Assignment Format:
The required format for exercises and homework turned in for grade is the following.

1. PROBLEM STATEMENT: Restate the problem including relevant values and proper units.
2. FIND: State what the "final output" of the problem is (one sentence or phase).
3. SOLUTION: Describe the general approach to get the solution in a logical order. Perform all calculations necessary to solve the problem. Write concisely and neatly. Place a box around the final solution.

Homework and other problem-type assignments must follow this general format or risk not being graded. Class project reports should follow a more formal report format.

University and Departmental Policies
ACADEMIC HONESTY
The University of Georgia seeks to promote and ensure academic honesty and personal integrity among students and other members of the University Community. A policy on academic honesty has been developed to serve these goals. All members of the academic community are responsible for knowing the policy and procedures on academic honesty. The document for academic honesty may be found at the web site for The University of Georgia Office of Senior Vice President for Academic Affairs and Provost.
All cases of suspected violation of the UGA Academic Honesty Policy will be reported and dealt with as appropriate.

ENGINEERING PROFESSIONALISM POLICY
Engineers make great contributions to society. Engineering is a very satisfying profession that provides many rewards but is demanding and requires hard work. The engineering profession is governed by a code of ethics. Engineering faculty at UGA expect students to act in a professional manner at all times and develop the work ethics required for a successful engineering career. Engineering students at UGA are responsible for maintaining the highest standards of professionalism and professional practice.
DEPARTMENTAL GRADING POLICY REGARDING COMMUNICATION SKILLS
Thirty percent of the grade on all written assignments (lab reports and papers) and oral presentations will be based on quality of communication. Spelling, grammar, punctuation, and clarity of writing are evidence of written communication quality. Enunciation, voice projection, clarity and logical order of the presentation and effective use of visual aids are evidence of oral communication quality.

Course Learning Objectives Matrix

Course Learning Objectives	Course Assessment Methods	Extent of Coverage of Program Outcomes (ABET Criterion 3)		Applicable Criterion 3 Program Outcomes
Upon successful completion of this course the student will be able to				
1. The student should appreciate the physical origins of the various transport processes. When confronted with an engineering problem, (s)he should be able to *identify the relevant transport processes.*	A,B,C	a-xxx b-xx c-xxx e-xxx		a. an ability to apply knowledge of the mathematical, physical, biological and engineering sciences b. an ability to design and conduct experiments as well as to analyze and interpret data c. an ability to implement logical design methodology in order to meet desired needs
2. The student should be able to *perform engineering calculations* for problems involving heat and mass transfer. (S)he should be able to make *relevant simplifying assumptions* and perform calculations leading to the *rational design and/or improvement* of heat and mass transfer systems.	A,B,C	a-xxx b-xx c-xxx e-xxx	f-xx g-xx k-xx	d. an ability to function on multi-disciplinary teams e. an ability to identify, formulate and solve engineering problems f. an understanding of professional and ethical responsibility g. an ability to communicate effectively
3. An important goal is to develop in the student *an appreciation of the vital role* heat and mass transfer processes play in the natural and industrial worlds.	A,B,C	a-xx c-xx f-xxx h-xxx	i-xx j-xxx	h. the broad education necessary to understand the impact of engineering solutions in a global and societal context i. a recognition of the need for and an ability to engage in life-long learning j. a knowledge of contemporary issues
4. The student should leave the course with confidence in his/her understanding of the basic principles of heat and mass transfer and his/her ability to apply these principles to engineering practice.	A,B,C	a-xx b-xx c-xxx	d-xxx e-xx g-xxx h-xxx k-xxx	k. an ability to use techniques, skills and modern engineering tools necessary for engineering practice

Assessment Method: A-Exams, B-In-class exercises, C-Projects