

FORT LEWIS COLLEGE
Department of Physics and Engineering

COURSE: ENGR 330 – Heat Transfer
2:30 – 3:50 TR, 680 BH

TERM: Fall 2009

INSTRUCTOR: Dr. Laurie Williams

Office: 601 BH; Office Hours: 10:10 – 11:00 MWF, 2:30-3:25 MW, 1:25 – 2:20 T or by appointment

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COURSE DESCRIPTION: This is a survey course of basic heat transfer: conduction, convection, and radiation. The approach is to present the fundamental governing equation for each mechanism and discuss the relevant simplifications for practical engineering applications. Topics covered will include steady state and transient heat conduction; convection heat transfer correlations for internal and external flows, as well as free and forced convection, with some applications of heat exchangers; and a basic understanding of radiation heat transfer applied to gray body radiation exchange, including simple spectral analysis.

COURSE OUTCOMES (with corresponding [ABET Criteria/outcomes](#)):

1. Understand the rudiments of conduction, convection and radiation, including Fourier's Law, Newton's Law of Cooling and the Stefan-Boltzmann Law. (Criterion (a)).
2. Recognize when a one-dimensional conduction model is adequate and be able to solve such problems using analytical means; e.g., by solving a differential equation or applying a network model, where appropriate (Criterion (a, e, and k)).
3. Understand the application of the many convection correlations used for various shapes, fluids, and flow conditions. This understanding will be demonstrated by being able to use appropriate correlations for forced versus free convection, internal versus external flows, and the use of the two commonly applied procedures for designing heat exchangers. (Criterion (a, e, and k)).
4. Have a basic understanding of radiation heat transfer applied to simple gray bodies. This understanding will be demonstrated by the ability to compute heat transfer between a body totally surrounded by a gray body, as well as radiation exchange between multiple surfaces forming an enclosure. (Criterion (a, e, and k)).
5. Complete at least one open-ended design problem, and write a concise summary based on the outcome of their design. (Criterion (a, c, e, g, j and k))

PREREQUISITES and EXPECTATIONS: Prerequisite courses include Math 223 and Engr 321. I expect each student to attend all classes and complete all homework assignments. Be at class on time and turn in your homework on time.

TEXTBOOK: Introduction to Heat Transfer, 5th Ed., F.P. Incropera, John Wiley & Sons Publisher.

READING ASSIGNMENT: Complete the reading assignments before each class. Even a superficial first reading the night before will improve your comprehension and retention of the material covered in class.

HOMEWORK PROBLEMS: Homework is as assigned on the [course schedule](#). Homework problems are due at 4:00 PM on the class day following the assignment date unless otherwise stated. Homework should be turned in to the box located in the hall outside the entrance to room 670A and labeled Heat Transfer, Engr 330. **ALL PROBLEMS ARE TO BE WORKED ON ENGINEERING PAPER AND NEATLY EXECUTED USING STANDARD ENGINEERING FORMAT (SEE NOTES BELOW). NO MORE THAN 1 PROBLEM PER PAGE. POINTS WILL BE DEDUCTED ON HOMEWORK THAT DOES NOT COMPLY WITH THE FORMAT SPECIFIED. SLOPPY WORK WILL NOT BE GRADED. HOMEWORK ASSIGNMENTS WHICH ARE LATE WILL BE REDUCED BY 25% FOR EACH CALENDAR DAY LATE. PROBLEMS MORE THAN 4 DAYS LATE WILL NOT BE ACCEPTED. YOU ARE EXPECTED TO DATE LATE ASSIGNMENTS – AN HONOR SYSTEM WILL BE RESPECTED.**

HOMEWORK FORMAT: Your solutions to homework problems should consist of the following steps:

- Known; State briefly and concisely what is known about the problem; do not repeat the problem statement
- Find: State briefly and concisely what must be found.
- Schematic: Draw a schematic of the physical system. Identify relevant ht transfer processes appropriately.
- Properties: List property values needed and obtained.
- Analysis: Develop your analysis completely (SHOW ALL STEPS) before submitting numerical values. Perform the calculations needed to obtain the desired result.
- Present and highlight (i.e., in a box) the answers with appropriate units.

You are encouraged to work with others; however, the work you turn in must be your own.

The solutions to all assigned problems will be posted on the course moodle site by the end of the day Friday – prior to the assignment due date. The underlying assumption here is that each of you is a mature and responsible learner who wishes to understand the material and obtain a good grade. Homework is intended to be a learning tool rather than an assessment instrument.

HOMEWORK GRADING: Homework sets will be evaluated on a quality rating from 0 to 5 as shown below.

Rating	Comments
5	All problems assigned were completed, worked in detail, and followed the specified format.
4	At least 75% of the assignment was completed, worked in detail and followed the specified format.
3	Incomplete solutions 50% of the time, some copying
2	Vague and incomplete solutions more than 75% of the time, possible copying.
1	Submitted only a few problems with large probability of copying
0	No homework submitted.

DESIGN PROJECT: As mentioned in the Course Outcomes, you will be expected to complete at least one open-ended design problem, and submit a short (5-7 page) report outlining your results and methodology. I will provide the problem later in the semester. Reports are to be typed in Microsoft Word (or similar text processing program), and are to be checked by you for accurate spelling and grammar. As an engineering professional, you will find that the appearance and accuracy of your written documents will matter as much as their technical content; therefore, your reports will be graded on writing quality as well as content. You are encouraged to take advantage of the Fort Lewis writing center for assistance. This design project will be due in class on October 16, 2009

CLASSROOM POLICY: Cell phone calls and text messaging is distracting and rude – neither will be tolerated during the designated class time. Please turn your phones off and put them away, failure to comply with this request may result in the professor asking you to leave the class and 5 points will be deducted for the day.

GRADING: Your final course grade will be determined by the percentage of points the student has earned out of the total possible, as indicated below.

1. Three exams (including a cumulative final exam) (55%) **ALL EXAMS WILL BE OPEN BOOK.**
2. Random Quizzes (15%)
3. Design Project (15%)
4. Homework (15%)
5. **Failure to earn a minimum average exam score of 60 percent will result in an automatic failure in this course – regardless of any other percentages noted above.**

ATTENDANCE: Attendance in class is a required part of this course. Random quizzes can not be made up as a result of an unexcused absence. If a class is missed, the student is still responsible for the material covered and any announcements that may have been made, as well as making arrangements for missed assignments or exams (attendance on scheduled test days is mandatory excepting only those situations which are demonstrably beyond the student's control).

WITHDRAWALS:

- 1) Withdrawals from the course may be made until September 15, without a record.
- 2) Withdrawals beginning September 16th require the instructor to assign a grade of “W” or “F”.
- 3) **After October 23th, no withdrawals from the course are allowed for students with a failing grade.**

POLICY: The following policies (including special needs accommodation) may affect students in this course. Please carefully read these. http://faculty.fortlewis.edu/tyler_c/home/phys-engr_syllabus.htm

SPECIAL NEEDS: "Students with disabilities who require reasonable accommodations to fully participate in course activities or meet course requirements must register with the Disability Services Office. If you qualify for services through the Disability office, bring your letter of accommodations to me as soon as possible."