

MAE 5316: Thermal Conduction (Sections 001 and 002)
Fall 2012
Mechanical and Aerospace Engineering Department
The University of Texas at Arlington

Thermal Conduction is a fundamental graduate-level course that develops an understanding of the flow of heat by conduction. This course provides the basic skills and tools necessary for detailed design and analysis of engineering systems in which thermal conduction plays a significant role. This course is based on and teaches a considerable amount of engineering mathematics, particularly the analysis of ordinary differential equations. Concepts learnt in this class will be helpful for real-life applications in engineering as well as for advanced graduate-level research work.

Class location and timing: Tue Thurs 12:30pm – 2:00pm, Nedderman Hall 109

Instructor: Dr. Ankur Jain

Instructor's Office: Engineering Lab Building (ELB), Rm 203

Class Website: elearn.uta.edu (Blackboard)

Email Address (*primary means of communication*): jaina@uta.edu

Phone Number: 817-272-9338

Office Hours: Thursdays and Fridays 9:00am-9:45am, ELB-203

Course Content: Fundamental laws, initial and boundary conditions, basic equations for isotropic and anisotropic media, related physical problems and steady and transient temperature distributions in solid structures.

Textbook: Material for the class will be sourced from a number of thermal conduction textbooks. The textbook for the course shall be: 'Heat Conduction Using Green's Functions', K.D. Cole, J.V. Beck, A. Haji-Sheikh and B. Litkouhi, 2nd Edition, Taylor & Francis, 2010.

Reference Books: In addition to the textbook, a number of other reference books will be utilized throughout the course. Some of these are:

1. 'Analytical Methods in Conduction Heat Transfer', G.E. Myers, 2nd Ed., AMCHT Publications, Madison, WI, 1998.
2. 'Heat Conduction', M.N. Özisik, 2nd Ed., Wiley-Interscience, 1993.
3. 'Conduction of Heat in Solids', H.S. Carslaw & J.C. Jaeger, 2nd Ed., Oxford University Press, 1986.

Important Dates: 10-Sep – Census Date; 31 Oct – Last Day to Drop Class; 13-Nov – No class (Instructor on travel. Make-up class TBA); 22-Nov – No class (Thanksgiving); 10-Dec – Final Project Due.

Tentative Course Schedule:

| Number of Lectures | Topics |
|--------------------|--|
| 1 | General introduction |
| 2 | Mathematical foundations |
| 3 | Basic concepts of thermal conduction. Fourier's law. Boltzmann transport equation. |
| 4 | Steady state conduction in various coordinates. |
| 3 | Transient conduction. |
| 2 | Solution of conduction problems through numerical analysis. |
| 3 | Other methods of solving conduction problems. |
| 2 | A few advanced problems in heat conduction. |
| 4 | Microscopic origins of conduction |
| 2 | Reviews (just before exams) |
| 2 | Exams |

The schedule may undergo minor tweaks based on class needs and requirements.

Quizzes and Exams: Two exams will be conducted during class hours. Dates will be announced well in advance. Around 6-7 quizzes will be given during class time. Quizzes will be unannounced. Scores on **all** quizzes will count towards the final grade.

Homework Assignments: Homeworks are a key medium of learning in this course. Homeworks are expected to be worked upon individually, unless specified otherwise. Around 8 homework assignments will be given. Homeworks are expected to be turned in by the deadline. For each day that a homework is late, the score considered for grading will be halved. Homework will not be accepted more than three days after due date. Prior arrangements must be made with the instructor if your homework is expected to be late due to medical or other extenuating reasons. Electronic copies of homeworks will not be accepted. Best 6 homework scores will be counted towards grading.

Final Project: A final project will be assigned towards the last one-third of the semester, and will comprise of an extended homework problem involving somewhat more work than a typical homework assignment. Final project is due Dec 10.

Attendance: Attendance is mandatory. It is easy to lose track of the materials and get completely lost if you miss too many classes. Please attend all classes.

Grading Policy: Final score will be calculated based on the following weights: Final Project – 15%, Homeworks – 15%, Exam 1 – 20%, Exam 2 – 30%, Quizzes – 20%. Tentative final grade policy is as follows: A=85%+, B=75-85, C=60-75, D=50-60, F=50 or below.

Calculator Policy: Only nonprogrammable calculators with basic computational features, such as arithmetic and transcendental functions will be allowed during exams. *The only calculators allowed for exams without prior permission are TI-30XA and TI-30XIIS.* If you wish to use any other calculator, please obtain instructor's approval in advance.

Use of Laptops Policy: Laptops and other electronic devices could be an effective method for taking notes. However, this particular class involves significant mathematics, making it best to take notes on paper. The use of laptops and other electronic devices during class is not permitted.

Other Notes:

1. **Classroom etiquette:** Please be on time for the class. Working on laptops/cellphones, texting, working on other courses, etc. are not permitted.
2. **Two-way interaction:** It is very boring to teach and learn if students do not ask questions! Asking questions during lectures is highly encouraged. Please do not feel shy. No question is too silly to ask!
3. **E-mail communication:** E-mail is the preferred means for communicating with the instructor outside class. To ensure that emails are read and responded to promptly, please include 'MAE5316' in the subject line. Please use your UT Arlington email address.
4. **Drop Policy:** Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance.** Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://www.uta.edu/ses/fao>).
5. **Americans with Disabilities Act:** The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the *Americans with Disabilities Act (ADA)*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

6. **Academic Integrity:** At UT Arlington, academic dishonesty is completely unacceptable and will not be tolerated in any form, including (but not limited to) “cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts” (UT System Regents’ Rule 50101, §2.2). Suspected violations of academic integrity standards will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student’s suspension or expulsion from the University.
7. **Student Support Services:** UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may contact the Maverick Resource Hotline by calling 817-272-6107, sending a message to resources@uta.edu, or visiting www.uta.edu/resources.
8. **Electronic Communication:** UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.
9. **Student Feedback Survey:** At the end of each term, students enrolled in classes categorized as lecture, seminar, or laboratory will be asked to complete an online Student Feedback Survey (SFS) about the course and how it was taught. Instructions on how to access the SFS system will be sent directly to students through MavMail approximately 10 days before the end of the term. UT Arlington’s effort to solicit, gather, tabulate, and publish student feedback data is required by state law; student participation in the SFS program is voluntary.
10. **Final Review Week:** A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Good Luck with MAE5316 and all your other endeavors this semester!