

Instructor: Xiaohua Li
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Email: xiaohua.li@unt.edu
Lecture Time: Tu & Th 11:30am-12:50pm room D215

Instructor Office Hours: Thursday 2:00pm-5:00pm or by appointment.

TA Office Hours: will be posted in blackboard later

Required Textbook: Introduction to Heat Transfer, 6th edition
Incropera, DeWitt, Berman, & Lavine
ISBN-13: 978-0-470-50196-2

Course Description:

3 hours. Fundamental concepts and properties of flow in differential and integral form, thermal boundary layers, pipe flow and heat transfer, turbulence, heat and fluid flow correlations for objects of simple shape. Basic concepts of steady and unsteady conduction, elements of radiation, black and gray body radiation, f-factor analysis, combined modes of heat transfer, simple heat exchange devices and systems

Pre-requisites: MEEN 3120 Fluid Mechanics.

Course Learning Outcomes (CLO):

Upon successful completion of this course, students will able to:

1. Apply conservation of mass, momentum, and energy to heat transfer problems.
2. Understand the concepts of one-dimensional steady-state heat conduction.
3. Understand the concepts of multi-dimensional steady-state heat conduction.
4. Understand the concepts of transient heat conduction.
5. Use thermal Ohm's law (thermal circuits) to solve heat transfer problems.
6. Understand the concepts of internal and external forced convection for both laminar and turbulent flows.
7. Understand the concepts of natural convection.
8. Perform heat exchanger analysis using both the e-NTU and LMTD method.
9. Understand the basic theory behind radiation heat transfer.

ABET Student Learning Outcomes (SO)

- a Ability to apply mathematics, science and engineering principles.
- b Ability to design and conduct experiments, analyze and interpret data.
- c Ability to design a system, component, or process to meet desired needs.
- d Ability to function on multidisciplinary teams.
- e Ability to identify, formulate and solve engineering problems.
- f Understanding of professional and ethical responsibility.
- g Ability to communicate effectively.
- h The broad education necessary to understand the impact of engineering solutions in a global and societal context.
- i Recognition of the need for and an ability to engage in life-long learning.
- j Knowledge of contemporary issues.
- k Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

| CLO | ABET Student Outcomes (SO) | | | | | | | | | | |
|-----|----------------------------|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k |
| 1 | X | | | | X | | | | | | |
| 2 | X | | | | X | | | | | | |
| 3 | X | | | | X | | | | | | |
| 4 | X | | | | X | | | | | | |
| 5 | X | | | | X | | | | | | |
| 6 | X | | | | X | | | | | | |
| 7 | X | | | | X | | | | | | |
| 8 | X | | | | X | | | | | | |
| 9 | X | | | | X | | | | | | |

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|---------------------------|----------------|-------------|---|
| Grades: Homework | 15% | $\geq 90\%$ | A |
| Pop Quizzes (highest 4/5) | 15% | 80-89.9% | B |
| Exam 1 | 20% | 70-79.9% | C |
| Exam 2 (noncumulative) | 20% | 60-69.9% | D |
| Exam 3 (noncumulative) | 20% | < 60% | F |
| Project | 10% | | |
| Attendance (5/6) | 5% | | |
| Total | 100%+5% | | |

Homework:

- (1) Please turn in your homework on the due day before the lecture starts. **NO late homework will be collected.**
- (2) Definition of “late”: when class is over and the instructor steps outside the classroom, homework turned in thereafter will be considered as “late” and will not be collected
- (3) Having no textbook is not a valid excuse for not doing your homework. It is the student’s responsibility to acquire textbook for his/her study
- (4) Homework can be turned in earlier than the due day
- (5) Homework dropped in the instructor’s departmental mailbox will NOT be collected
- (6) You can ask your friend/classmate to turn in homework for you
- (7) You can scan (or take a picture using smart phone) and email the homework before the class ends (12:50pm)
- (8) Homework must be stapled, instructor or TA will not be responsible for lost loose homework
- (9) Exceptions (late homework will be collected): medical emergence (student and important ones), transportation/traffic emergency; religious holidays/duty, jury duty and military duty. Evidences must be submitted.

Exams and Quizzes:

- (1) Quizzes are open book and open notes. **Exams are closed book closed notes with formula sheets.**
- (2) Formula sheets can be maximum 5 pages, A4 or letter size, both sides
- (3) Each student is responsible for preparing his/her own formula sheets.
- (4) Formula sheets could include anything BUT: solutions to homework or examples. Student who failed to follow this rule will score zero in the exam and this cheating matter will be reported to the department and university.
- (5) Formula sheets must be turned in with the exam papers (in the case of formula sheets were not checked by the instructor during the exam). Student who failed to follow this rule will score zero in the exam and this cheating matter will be reported to the department and university.
- (6) **There will be NO make-up quiz.**
- (7) **There will be NO make-up exam.** Exceptions: medical emergence (student and important ones), transportation/traffic emergency; religious holidays/duty, jury duty and military duty. Evidences must be submitted.
- (8) **Final exam date: Dec. 10th 2013, Tuesday, 10:30 a.m. - 12:30 p.m. D215**

Disability Accommodations: If you need academic accommodations for disability you must have document which verifies the disability and makes you eligible for accommodations, then you can schedule an appointment with the instructor to make appropriate arrangements.

Academic Dishonesty:

There is a zero tolerance policy. Cheating of whatsoever will result in an automatic 'F' in this course and the matter will be turned over to the appropriate student disciplinary committee.

IMPORTANT EXAM DATES

Exam #1: Sept. 26th, 2013, Thursday, 11:30am-12:50pm at room D215

Exam #2: Oct. 22nd, 2013, Tuesday, 11:30am-12:50pm at room D215

Exam #3: Dec. 10th, 2013, Tuesday, 11:00am-1:00pm at room D215

Group Project:

- (1) Final reports: due 10:30 am, Dec. 10th, 2013 (the final exam day);
- (2) Final reports should be emailed to instructor: xiaohua.li@unt.edu
- (3) Group presentations will be scheduled in the dead week (Dec. 3rd & 5th 2013)
- (4) Details and sample project reports will be posted in blackboard later

MEEN 3210.001 Heat Transfer
Schedule Overview
 (Subject to change)

| Week | Date | Lecture Topics |
|------|---|---|
| #1 | Aug.28 th - Aug.30 th | Overview of syllabus Ch.1: introduction to heat transfer: three modes of heat transfer |
| #2 | Sept.2 nd – Sept.6 th | Ch.1: introduction to heat transfer: Thermodynamics & Heat Transfer Ch 2: introduction to conduction: Thermal Conductivities |
| #3 | Sept.9 th – Sept.13 th | Ch 2: introduction to conduction: The Heat Equation Ch 3: One Dimensional, Steady-State Conduction: Plain Wall and Thermal Resistance Concept |
| #4 | Sept.16 th – Sept.20 th | Ch 3: One Dimensional, Steady-State Conduction: Thermal Circuit Method Ch 3: One Dimensional, Steady-State Conduction: Extended Surface; Fin Array |
| #5 | Sept.23 rd – Sept.27 th | Ch 3: One Dimensional, Steady-State Conduction: Session for Homework & Examples <u>Exam #1: covers Ch 1,2 and 3 (09/26 Thursday)</u> |
| #6 | Sept.30 th – Oct.4 th | Ch 4: Two-dimensional Steady State Conduction: Analytical Method for 2D Steady State Heat Transfer Ch 4: Two-dimensional Steady State Conduction: Finite Difference Method for 2D Steady State Heat Transfer |
| #7 | Oct. 7 th – Oct.11 th | Ch 5: Transient conduction: LCM method Ch 5: Transient conduction: Exact Solution & one term approximation |
| #8 | Oct. 14 th – Oct.18 st | Ch 6: Introduction to convection: Convection Boundary Layers Ch 6: Introduction to convection: Boundary Layers Similarity |
| #9 | Oct. 21 st – Oct.25 th | <u>Exam #2: covers Ch4, 5 and 6 (10/22 Tuesday)</u> Ch 7: External Flow: Flat Plate in Parallel Flow |
| #10 | Oct.28 th – Nov.1 st | Ch 7: External Flow: Cylinder & Sphere in Cross Flow Ch 8: Internal Flow : Hydrodynamic & thermal considerations |
| #11 | Nov.4 th – Nov.8 th | Ch 8: Internal Flow : Energy Balance Ch 8: Internal Flow: Convection Correlations |
| #12 | Nov.11 th – Nov.15 th | Ch 9: Free convection Ch 11: Heat exchangers: LMTD Method |
| #13 | Nov.18 th –Nov.22 nd | Ch 11: Heat exchangers: NTU Method Ch 11: Heat exchangers: session for Examples and Homework |
| #14 | Nov.25 th – Nov. 29 th | Ch 12: Introduction to Radiation No class on Nov.28 th (Happy Thanksgiving) |
| #15 | Dec.2 nd – Dec. 6 th | Project Presentations |
| #16 | Dec 10 th | Exam #3 (Final): covers Ch7, 8, 9, 11 and 12. (Dec. 10 th Tuesday: 11:00-1:00) |

Document History:

Dr. Sandra Boetcher prepared on 1/08/2011

Dr. Xiaohua Li, modified on 1/10/2012; 1/13/2013; 8/23/2013