MEEN 3110   **Thermodynamics II**   **Spring 2018**

Instructor: Xiaohua Li
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Lecture Time: MWF 11:30 a.m.-12:20 p.m. room B185
Instructor Office Hours: Open Office Policy. TuTR 1:00pm-3:00pm or by appointment

Required Textbook: Fundamentals of Engineering Thermodynamics, 8th
           M. J. Moran, H. N. Shapiro, D. D. Boettner and M.B. Bailey
           ISBN-13: 978-1118412930 (8th edition); ISBN-10: 1118412931 (8th edition)
Also required for exam： **Thermodynamics Tables, printed or booklet**

Reference Book: Thermodynamics: An Engineering Approach, 7th edition
           Çengel and Boles
           ISBN 10: 0-07-131111-4   ISBN 13: 978-0071311113

Course Description:

Thermodynamics II is the applications of fundamental thermodynamics laws and concepts. Course will discuss exergy analysis, vapor power system (Rankine cycle), gas power system (Otto cycle, Diesel cycle, Brayton cycle), refrigeration system/cycle, ideal gas mixture and psychrometric applications (air conditioning system).
Pre-requisites: MEEN 2210 Thermodynamics I.

Course Learning Outcomes (CLO):

Upon successful completion of this course, students will able to:
1. Demonstrate an ability to correctly apply the 1st and 2nd laws of thermodynamics
2. Demonstrate an ability to analyze exergy and exergy destruction for different thermodynamics systems
3. Demonstrate an understanding on how to improve thermal efficiency for different thermodynamics systems based on 1st and 2nd law of thermodynamics
4. Demonstrate an ability to model and analyze various vapor power and gas power cycles/systems
5. Demonstrate an understanding of gas mixtures and psychrometrics, and be able to analyze A/C systems
6. Demonstrate an ability to analyze reacting mixtures and simple combustion processes

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)										
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	SO8	SO9	SO10	SO11
1	X		X		X			X			
2	X				X			X			
3	X		X		X			X			
4	X		X		X			X			
5	X		X		X			X			
6	X				X				X		X

Grades:

Homework (10; all of them)	10%		≥ 90%	A
Quizzes (10; drop lowest 3)	10%		80-89.9%	B
Exam #1 (Ch 7 & 8)	25%		70-79.9%	C
Exam #2 (Ch 9)	25%		60-69.9%	D
Final (Exam #3) (Ch 10 & 12)	25%		< 60%	F
Attendance (5/6)	5%			
Total	100%			

Calculator Policy:

The use of a calculator is required and allowed on all homework, exams and quizzes. Calculators with graphing capabilities will be allowed in the course for homework and quizzes. However, only calculators currently allowed in the Fundamentals of Engineering (FE) and Professional Engineering (PE) exams will be allowed in ALL EXAMS (Exam #1, Exam #2 and Exam #3/final exam). **NO other calculators will be approved for exams.** Please refer to the National Council of Examiners for Engineering and Surveying (NCEES) calculator policy for the list of acceptable calculators.

Casio: All fx-115 and fx-991 models (Any Casio calculator must have "fx-115" or "fx-991" in its model name.)
Hewlett Packard: The HP 33s and HP 35s models, but no others
Texas Instruments: All TI-30X and TI-36X models (Any Texas Instruments calculator must have "TI-30X" or "TI-36X" in its model name.)

Homework Policy:

1.   "Homework Day": **Friday**. the day new homework will be assigned (HW assignment will be posted in Blackboard) and previous homework will be collected;
2.   Homework should be turned in on the due day before the lecture starts. **NO late homework will be collected.** **Exceptions**: medical emergence (student and

important ones), transportation/traffic emergency; religious holidays/duty, jury duty and military duty. **Documentary evidences** must be submitted.

3. Definition of "**late**": when class is over and instructor steps outside the classroom, homework turned in thereafter will be considered as "**late**" and will not be collected.
4. Solutions to homework will be available in Blackboard after 12:30 pm Friday
5. Having no textbook is not a valid excuse for not doing homework. It is the student's responsibility to acquire textbook for his/her study
6. Homework can be turned in earlier than the due day
7. Homework dropped in the instructor's departmental mailbox will NOT be collected
8. Homework slid through the door into the instructor's office will NOT be collected
9. Homework dropped in the "homework dropbox" in front of the department door will NOT be collected
10. Homework turned in other than the due day or outside classroom must be turned in to instructor either IN PERSON or through EMAIL.
11. If homework is turned in through email, it should be scanned (or pictured by a smart phone), legible, and emailed to instructor before the class ends (i.e., 12:20 pm is the deadline)
12. Homework should be stapled; instructor or TA will not be responsible for lost loose homework
13. Homework solutions from the students that appear to be the same or copied from a peer will not be graded. You can work with classmates if you have questions or problems, but you are responsible for your own work!

Format of Homework:
(1) Each Homework assignment has 10 problems; each problem has 20 points; therefore, each Homework assignment has a total of 200 points.
(2) Use engineering paper only (noncompliance: 20 points off; cumulative)
(3) Only solve one problem per page of engineering paper **(noncompliance: 10 points off; cumulative)**. You may extend that problem into another page but then should begin the next problem on a new page if you require more room. If more than one page is needed for a solution you should number each page and the first page should be marked with a "continued on next page" note on the bottom.
(4) Done in pencil, no ink. **(noncompliance: 10 points off; cumulative)**
(5) No cross outs, use an eraser. **(noncompliance: 10 points off; cumulative)**
(6) Homework set number, name, date, course number, and page number(s) on the top of the page. **(noncompliance: 10 points off; cumulative)**
(7) Solution – provide all the details so that anybody can easily follow your solutions and problem-solving approach. All intermediate values should be identified with the variable name and units (e.g., F_1=50 N; X_c = 2.1 m).**(noncompliance: 10 points off; cumulative)**
(8) Answer – the **Final Answer** at the end of the problem should be identified with the **variable name, include units, and inside a box.** Include an arrow (from the far right side of the page) pointing to each final answer.
(noncompliance: 10 points off; cumulative)
Example:

$\boxed{F_1 = 50 \text{ N}}$ ⟵
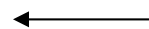
Exam Policy:

(1) Exams are closed book and closed notes with approved formula sheets only
(2) **Formula sheets:** Use the formula sheets provided only, NOTHING ELSE. Do not write/mark anything on the formula sheets provided so they could be reused;
(2) **Thermodynamics tables:** thermodynamics tables are needed for all exams. Instructor will NOT provide thermodynamics tables. Students need to print/buy thermodynamics tables for their study and exams.
(3) **Calculator: ONLY** FE exam approved calculator models allowed
      Casio: All fx-115 and fx-991 models;
      Hewlett Packard: The HP 33s and HP 35s models;
      Texas Instruments: All TI-30X and TI-36X models;
(4) Using ANY unauthorized/unapproved materials during the exam is prohibited and considered as cheating.
(5) Exchanging (either borrowing or giving) ANYTHING without the approval from the proctor, including but not limited to, calculators/scratch papers/formula sheets/ thermodynamics tables/writing tools during the exam between/among students is prohibited and considered as cheating.
(6) Using cell PHONE for WHATEVER purpose during the exam is prohibited and considered as cheating.
(7) Using Internet through any device during the exam is prohibited and considered as cheating.
(8) Peeking, talking or discussing (either by oral/written/sign language) between/among students during the exam is prohibited and considered as cheating.
(9) Using any type of earpiece/earbuds/earphone/Bluetooth/Stereo Headset (except with doctor's prescription/notes) during the exam is prohibited and considered as cheating.
(10) Using any type of smart glasses (except with doctor's prescription/notes) during the exam is prohibited and considered as cheating.
(11) Using any type of smart watches during the exam is prohibited and considered as cheating.
(12) Cheating will result in SCORE ZERO in the exam and "F" grade for this course
(13) Cheating will be reported to the Department, College and University
(14) 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. Documentary evidences must be submitted.
(15) Makeup exam should be scheduled within one week after the regular exam date.

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 for academic dishonesty. 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.

Professionalism:
One of the goals of this course is to teach students about professionalism, including the standards and expected behavior of your chosen profession. With this in mind, students are expected to demonstrate a behavior consistent with the conduct of an individual practicing in the engineering profession. Students are expected to: (1) come prepared for class; (2) respect faculty and peers; (3) demonstrate responsibility and accountability for your own actions; (4) sensitivity and appreciation for diverse cultures, backgrounds, and life experiences; (5) offer and accepts constructive criticism in a productive manner; (6) demonstrate an attitude that fosters professional behavior among peers and faculty; (7) be punctual to class meetings; (8) maintain a good work ethic and integrity; and (9) recognize the classroom as a professional workplace.

Classroom Inclusivity Statement
I consider this classroom to be a place where you will be treated with respect, and I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

IMPORTANT EXAM DATES
Exam #1 (tentative; depends on when chapter 8 is finished; Covers Ch 7 & 8**):**
 Monday, Feb.19th, 2018

Exam #2 (tentative; depends on when chapter 9 is finished; Covers Ch 9 only**):**
 Wednesday, March 14th, 2018

Exam #3 (UNT official final exam schedule**; Covers Ch 10 & 12**):
 Monday, May 7; 10:30 am-12:30 pm

UNT Official Academic Calendar: Spring 2018	
Date	**Event**
January 15, 2018	MLK Day (no classes; university closed)
January 16, 2018	First Class Day
March 12-16, 2018	Spring Break (no classes)
May 2-3, 2018	Pre-finals Days
May 3, 2018	Last Class Day
May 4, 2018	Reading Day (no classes)
May 5-11, 2018	Finals

Last day to drop a class with W/WF: April 2nd 2018
Important event: Engineering & Computer Science Internship & Career Fair
Wednesday, Feb. 28th, 2018; 9am-1pm; Discovery Park

MEEN 3110 Thermodynamics II
Schedule Overview
(Please note the schedule may change based on the needs during the semester)

Week	Date	Monday (50mins)	Wednesday (50mins)	Friday (50mins)
#1	Jan.15th - Jan.29th	**MLK day; no lecture;**	Overview of syllabus	Chapter 7: 7.1-7.3 Introducing Exergy; Exergy of a System
#2	Jan.22nd - Jan.26th	Chapter 7: 7.4 Closed System Exergy Balance	Chapter 7: 7.4 Closed System Exergy Balance	Chapter 7: 7.5 Exergy Rate Balance for Control Volumes at Steady State **Quiz#1: Ch 7.1-7.4**
#3	Jan.29th – Feb.2nd	Chapter 7: 7.5 Exergy Rate Balance for Control Volumes at Steady State	Chapter 7: 7.6 Exergetic (Second Law) Efficiency	Chapter 7: 7.6 Exergetic (Second Law) Efficiency
#4	Feb.5th – Feb.9th	Chapter 7: 7.6 Exergetic (Second Law) Efficiency **Quiz#2: Ch 7.5-7.6**	Chapter 8: 8.1-8.2 The Rankine Cycle	Chapter 8: 8.1-8.2 The Rankine Cycle
#5	Feb.12th – Feb.16th	Chapter 8: 8.1-8.2 The Rankine Cycle **Quiz#3: Ch 8.1-8.2**	Chapter 8: 8.3-8.4 Improving Rankine Cycle Performance	Chapter 8: 8.3-8.4 Improving Rankine Cycle Performance **Quiz#4: Ch 8.3-8.4**
#6	Feb.19th – Feb.23rd	**Exam #1: Covers Ch 7 and 8**	Chapter 9: 9.1-9.2 Engine Terminology; Otto Cycle	Chapter 9: 9.1-9.2 Engine Terminology; Otto Cycle
#7	Feb.26th – Mar.2nd	Chapter 9: 9.3-9.4 Diesel Cycle;	**Feb 28th, 2018; Wednesday, Engineering Career Fair No class; dress up and bring your resume**	Chapter 9: 9.3-9.4 Diesel Cycle; **Quiz#5: Ch 9.1-9.4**
#8	Mar.5th – Mar.9th	Chapter 9: 9.5-9.6 Brayton Cycle	Chapter 9: 9.5-9.6 Brayton Cycle	Chapter 9: 9.5-9.6 modified Brayton Cycle **Quiz#6: Ch 9.5-9.6**
#9	Mar.12th – Mar.16th	**Spring break; no classes**	**Spring break; no classes**	**Spring break; no classes**
#10	Mar.19th – Mar.23rd	Chapter 9: 9.5-9.6 modified Brayton Cycle	**Exam #2: Covers Ch 9 only**	Chapter 10: 10.1-10.3 Analyzing Vapor-Compression Refrigeration Systems
#11	Mar.26th – Mar.30th	Chapter 10: 10.1-10.3 Analyzing Vapor-Compression Refrigeration Systems	Chapter 10: 10.1-10.3 Analyzing Vapor-Compression Refrigeration Systems **Quiz#7: Ch 10.1-3**	Chapter 10: 10.1-10.3 Analyzing Vapor-Compression Refrigeration Systems
#12	April 2nd – April 5th	Chapter 12: 12.1-12.3 Describing Mixture; Evaluating properties	Chapter 12: 12.1-12.3 Describing Mixture; Evaluating properties	Chapter 12: 12.4-12.5 Psychrometric Principles **Quiz#8: Ch 12.1-4**
#13	April 9th – April 13th	Chapter 12: 12.4-12.5 Psychrometric Principles	Chapter 12: 12.4-12.5 Psychrometric Chart **Quiz#9: Ch 12.5**	Chapter 12: 12.4-12.5 Psychrometric Principles: humidification
#14	April 16th – April 20th	Chapter 12: 12.4-12.5 Psychrometric Principles: humidification	Chapter 12: 12.6-12.8 Dehumidification	Chapter 12: 12.6-12.8 Dehumidification
#15	April 23rd – April 27th	Chapter 12: 12.8 Analyzing Air-Conditioning Processes: Evaporative cooling **Quiz#10: Ch 12.6-12.8**	Chapter 12: 12.8 Analyzing Air-Conditioning Processes: Mixing Air Streams	Chapter 12: 12.8 Analyzing Air-Conditioning Processes: Mixing Air Streams
#16	April 30th – May 4th	**Review/HW session**	**May-2nd; Pre-final day; last lecture; Review/HW session**	**No class**
#17	May 5th – May 11th	**Final Exam: Monday, May 7; 10:30 am-12:30 pm; Covers Ch 10 and 12**		

Document History: Dr. Xiaohua Li, Prepared on 01/16/2018

Spring 2018 Final Exams - Discovery Park

Pre-finals days are Wednesday, May 2 - Thursday May 3. Reading Day is May 4 and no classes will meet.

* Evening Classes: have their final exams during the earliest usual class time this week.

Always check with the class instructor or academic department with questions pertaining to a specific course or exam

Saturday, May 5	
This class...	Has a final exam at this time...
All Saturday classes & All INET Classes with On Campus Finals	Contact Department
MWF 10:30 a.m.	8:00 a.m. - 10:00 a.m.
MWF 1:30 p.m.	10:30 a.m. - 12:30 p.m.
MWF 4:30 p.m.	1:30 p.m. - 3:30 p.m.
F 2:30 p.m. - 5:20 p.m.	1:30 p.m. - 3:30 p.m.
Monday, May 7	
This class...	Has a final exam at this time...
MWF 8:30 a.m.	8:00 a.m. - 10:00 a.m.
MWF 11:30 a.m.	**10:30 a.m. - 12:30 p.m.**
MWF 2:30 p.m.	1:30 p.m. - 3:30 p.m.
M 2:30 - 5:20 p.m.	1:30 p.m. - 3:30 p.m.
MW 2:30 p.m. - 3:50 p.m.	1:30 p.m. - 3:30 p.m.
Tuesday, May 8	
This class...	Has a final exam at this time...
TR 8:30 a.m.	8:00 a.m. - 10:00 a.m.
TR 11:30 a.m.	10:30 a.m. - 12:30 p.m.
TR 2:30 p.m.	1:30 p.m. - 3:30 p.m.
T 2:30 p.m. - 5:20 p.m.	1:30 p.m. - 3:30 p.m.
Wednesday, May 9	
This class...	Has a final exam at this time...
MWF 9:30 a.m.	8:00 a.m. - 10:00 a.m.
MWF 12:30 p.m.	10:30 a.m. - 12:30 p.m.
MWF 3:30 p.m.	1:30 p.m. - 3:30 p.m.
W 2:30 p.m. - 5:20 p.m.	1:30 p.m. - 3:30 p.m.
MW 4:00 p.m. - 5:20PM	1:30 p.m. - 3:30 p.m.
Thursday, May 10	
This class...	Has a final exam at this time...
TR 10:00 a.m.	8:00 a.m. - 10:00 a.m.
TR 1:00 p.m.	10:30 a.m. - 12:30 p.m.
TR 4:00 p.m.	1:30 p.m. - 3:30 p.m.
R 2:30 p.m. - 5:20 p.m.	1:30 p.m. - 3:30 p.m.