ME 3100 –Thermodynamics and Heat Transfer

Spring 2018 - Section 001

TTh 3:30 – 4:45, Daniel Hall 413

Instructor: Yiqiang Han, Ph.D., yiqianh@clemson.edu

Office: 240 Fluor Daniel Engineering Innovation Building

Office Hours: MW 11:00 am – 12:00 pm, other times by appointment

Description: Study of the second law and entropy. Includes applications to fixed mass systems and control volumes; vapor and gas power cycles, refrigeration cycles. Teach students the fundamental principles of heat conduction and convection. Introduce heat exchangers. 3 Credit Hours.

Textbook: *Introduction to Thermal Systems Engineering,* by M. J. Moran, H. N. Shapiro, B. R. Munson, and D. P. DeWitt, John Wiley & Sons, 2003 (e-books will **not** be allowed during quizzes/exams as no computer usage is allowed).

Prereqs: Junior standing in an engineering program

Homework: Homework will be given periodically. Please write legibly and neatly on single-sided letter-size paper. Solve problem using a 'Given', 'Required' and 'Boxed Solution' form. It is strongly recommended to keep up to date on the suggested problems – these problems give you the practice you need in order to quickly recognize how to solve quiz and exam problems.

Homework solutions will be posted online after collecting homework in class, therefore, to be fair to everybody, no late homework will be accepted.

Quizzes: Short quizzes will be given periodically and may not be announced in ahead of time.

Exams: Two in-class tests will be given (these are listed with TENTATIVE dates on the course schedule). Actual date for each exam will be fixed at least one week in advance.

Final Exam: The final exam will be given according to the University Schedule and will be comprehensive. The University Schedule lists the final for this course as Friday, May 4th, 2017, 11:30 am - 2 pm. You MUST be able to make this exam time in order to take this class. There will be no alternate final exam time offered except to accommodate emergencies. Do not enroll in this class if you cannot make the final.

Grade Distribution:

Homework and Attendance	10%
Quizzes	10%
Two In-class Tests	50%
Final Exam	30%
Total	**100%**

Grading: The weighted average of your individual grades will be translated into a letter grade according to the following schedule:

- $90\% \leq A \leq 100\%$
- $80\% \leq B < 90\%$
- $70\% \leq C < 80\%$
- $60\% \leq D < 70\%$
- $F < 60\%$

For returned homework/quizzes/exams, you have one week from the day that the homework/quiz/exam is returned to the class to submit any inquires (i.e, requests for reevaluation) regarding grading. After the one-week period, no requests will be accepted and the individual grade on the homework/exam/quiz is permanent. Please note, one week is from the day I return to the class – not the day you pick it up if you do not come to class the day I return it.

Blackboard: Blackboard is used as a repository of course-related documents. There is no guarantee that a document/assignment will appear on Blackboard on a timely basis. It is your responsibility to monitor for assignments and handouts. Of note: 1. Lecture notes in PowerPoint or PDF format will be posted. These are mostly talking points, rather than a complete set of notes. The individual is responsible for taking good notes. 2. While I do my best to maintain timely information, sometimes things are late or omitted. The student is responsible for all materials covered in class. 3. Grades are recorded on Blackboard for your convenience. Your average is not computed on Blackboard. The Blackboard point totals are meaningless. 4. Iroar and Canvas will not be used for classroom purposes unless mandated by the Administration.

Lateness: In the event that the instructor is unavoidably delayed, class will be cancelled 15 minutes after the scheduled starting time. If a class must be cancelled, every effort will be made to distribute an announcement via e-mail, so please check your e-mail prior to coming to the classroom.

Missing Classes / Exams: Missing an exam or quiz will result in zero credit, unless a valid, documented excuse is provided. A comprehensive makeup exam will be given the week prior to the final exam for individuals with excused absences from the regular exams. A valid excuse is something which is truly beyond your control, such as a medical emergency, or an activity that is a valid part of your education and requires you to miss class. You must provide me with an official document in order for your absence to be excused at least one week in advance. Examples of valid, documentable excuses are: medical emergencies, travel with a university-recognized team, death in your immediate family, activity in a department- or university-recognized organization (e.g. ASME, SAE ...). Examples of invalid excuses are: vacations, family activities, an airline ticket booked prior to the start of this course, a cramped schedule due to other course work, etc.

Phones/Laptops: All cell phones and laptops must be turned off during class. No receiving/sending text messages or e-mail will be allowed. You will be asked to leave the classroom if your cell phone/laptop is used, rings, etc.

Honor Code: The Clemson University statement on academic integrity applies to all students in this class and will be rigorously enforced. That statement can be found at:

http://www.clemson.edu/academics/academic-integrity/

You are required to go to this URL and read this policy. Cheating includes giving or receiving assistance of any kind on an exam or quiz by any means. Cheating will immediately result in a failure in this course. This will be strictly enforced. Cheating, in addition to being a violation of the university honor code, is also a violation of this syllabus.

Academic Irregularity: "As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a 'high seminary of learning.' Fundamental to this vision is a mutual commitment to truthfulness, honor and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating or stealing in any form."

Disability Access: Students with disabilities who need accommodations should make an appointment with Dr. Arlene Stewart, Director of Disabilities Services, to discuss specific needs within the first month of classes. Students should present a Faculty Accommodation Letter from Student Disabilities Services (located in 239 Academic Success Building) when they meet with instructors. Accommodations are not retroactive and new Faculty Accommodation Letters must be presented each semester.

Title IX: Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity (e.g., opposition to prohibited discrimination or participation in any complaint process, etc.) in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. This policy is located at http://www.clemson.edu/campus-life/campus-services/access/title-ix/. Mr. Jerry Knighton is the Clemson University Title IX Coordinator. He also is the Director of Access and Equity. His office is located at 111 Holtzendorff Hall, 864.656.3181 (voice) or 864.565.0899 (TDD).

Course Outline and Tentative Class Schedule

#	Topics	Text	Number of Lectures
1	Introduction/Definition of Thermal Engineering Systems	Ch 1 - 2	1
2	1st Law of Thermodynamics for Closed and Open Systems Energy and Work Engineering Devices and Cycles	Ch 3	2
3	Property Evaluations using Tables Ideal Gas Model	Ch 4	1
4	Conservation of Energy, Control Volume Analysis	Ch 5	2
5	2nd Law Statements, Reversible and Irreversible Processes 2nd Law Aspects of Refrigeration and Heat Pump Cycles Maximum Performance Measures, Carnot Cycle	Ch 6	2
6	Entropy Property, Entropy Change of an Ideal Gas TdS Equations, Isentropic Processes Isentropic Efficiency of Turbines and Compressors	Ch 7	2
	Midterm Exam, 25% Final Grade	Ch 1-7	Feb. 20
7	Vapor Power Systems Rankine Cycle, Reheat, Superheat Regenerative Power Cycles Vapor-Compression Refrigeration Systems Vapor-Compression Heat Pump Systems	Ch 8	4
8	Gas Power Systems Internal Combustion Engines and Gas Turbine Power Systems Reheat, Regeneration and Intercooling Otto and Diesel Cycles, Brayton/Gas Turbine Cycle	Ch 9	3
	Midterm Exam, 25% Final Grade	Ch 8-9	Apr. 3
9	Introduction to Heat Transfer First law in Heat Transfer Surface Energy Balance	Ch 15	2
10	Heat Conduction Steady State vs. Transient Fins	Ch 16	3
11	Heat Convection Forced Convection: External vs. Internal Free Convection Heat Exchangers	Ch 17	3
12	Radiation Problem Review	Ch 18	1
	Final Exam, 30% Final Grade	Ch 1-9, 15-18	May 5, 11:30-14:00