v. 1, January 2, 2012

Syllabus

ME/NE 311

Introduction to Thermal and Fluid Sciences

Winter 2012

Instructor:	Name:	Dr. Kendra Sharp
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Class Schedule:	TR 10:00-11:50AM
Course Textbook:	Introduction to Thermal and Fluid Engineering D. Kaminski and M. Jensen, 1st Edition, Wiley
Course Prerequisites:	MTH 256 and ENGR 212
Office Hours (Prof):	TBA
Teaching Assistant:	TBA

Course Description and Learning Outcomes:

In this course, the basic concepts of fluid mechanics, thermodynamics and heat transfer will be introduced. Conservation of mass, energy, momentum and the second law of thermodynamics will be covered. By the end of this course, you must demonstrate the ability to…

1. State and illustrate the principles of conservation of mass and energy to open and closed systems, both transient and steady state.
2. State and illustrate the second law of thermodynamics, i.e. entropy analysis and its basic concepts including the possibility and impossibility of processes, Carnot devices, and reversibility and irreversibility.
3. Apply conservation of momentum to control volumes in a systematic approach.
4. Identify appropriate modes of heat transfer, and solve problems with conduction, convection, radiation and/or phase change heat transfer.
5. Define states and evaluate property data for problem solving using tables, charts and formulas.

Prerequisites:

The material covered in this course requires a solid working understanding of certain mathematical and physical concepts. The prereqs are enforced.

Classes/Attendance:

Each of you is responsible for the material covered during class, whether or not you choose to attend. Class time is designed to supplement the reading and homework, not to repeat or replace it. Class time is intended to be interactive and will include class participation in solving problems, and whenever possible, the use of small group discussions or activities. Use of recording or communication devices of any kind is not permitted during class without prior permission from the instructor. Any changes to dates of exams and quizzes and to assigned homework problems will be announced in class. It is your responsibility to remain informed of the progress of the course and in the event of an absence, you are encouraged to find out what you missed from a classmate.

Please put away your cell phones during class. We have a 10-minute break each class period during which you can catch up on texts/email/calls.

Professional travel to workshops and conferences is required of all tenure/tenure-track faculty. I anticipate being on professional travel for at least three instructional days during the term; course material will be covered via alternative means.

E-mail:

Messages about the class and homework hints will be sent out to an ONID distribution list. To receive these messages you need to create an ONID account (@onid.orst.edu). Instructions for creating such accounts are posted at onid.oregonstate.edu. Your address on this list is not changeable; therefore, if you wish to receive messages at another account you will have to forward messages from your ONID account to your desired e-mail address. It is difficult to handle *detailed* questions regarding concepts, homework

problems, etc. via email, so such questions are appropriate for discussing in person during office hours. My typical email response time is 1-2 days, though occasionally it is either shorter or longer due to circumstance (e.g. I am on travel).

Reading Assignments/Guides:

You are responsible for completing the reading assignments. Completing them prior to the related class period is an effective method for improving comprehension. Reading guides will be made available on Blackboard to aid in the reading/reviewing process. These reading guides will be helpful for assessment activity preparation and answers to questions posed in these reading guides will not be posted. The reading guides are neither submitted nor graded, and you are encouraged to work with your friends on them when you or they are in need of assistance.

Homework Assignments:

Homework problems are designed to develop your problem-solving skills and provide practice of the conservation principles on which you will be tested. You are encouraged to work through the examples in the text as if they were homework problems (i.e. without looking at the solutions), prior to working the assigned problems. Solutions to the homework assignments will be posted on blackboard.

Quizzes:

In-class graded quizzes are scheduled throughout the term as shown on the syllabus. They may be given at any time during the class period. Additional graded activities may be announced in class and administered via blackboard. Quiz dates and quiz material are subject to change. Quizzes will focus mainly on reading guides and homework scheduled for completion by the day of the quiz. Make-up quizzes will ***not*** be given under any circumstance. To account for unavoidable absences/illnesses, the lowest evaluative quiz score will be dropped.

Exams:

One midterm will be given during the regular class period. On exams, you will be required to answer conceptual questions as well as to apply, to entirely new problems, the *fundamental principles* outlined in the objectives. Problems on the exams will require *symbolic* solutions with intermediate steps provided for full credit. Numeric solutions, if requested, will generally carry only a small percentage, if any, of the point value of a problem. Make-up exams will only be given for situations **approved** by the instructor **prior** to the start of the exam, except under clearly unavoidable or emergency circumstances. Unapproved absences from an exam will result in a grade of zero (0) for the exam missed. For approved absences, a make-up exam will be given at a time convenient for the instructor either in written or oral form.

Any errors in grading must be addressed in writing, on a sheet stapled to the front of the exam, within one week of receiving your graded quiz or exam. Equity in grading across the class is viewed as important, thus problem "re-grades" require my full attention and careful consideration (which is not possible in the few minutes before or after class). Please be aware that, upon resubmission, the entire exam may be re-graded to ensure consistency. For ABET purposes, a minimum random sample of 10% of the exams will be photocopied prior to being returned.

Cheating/Student Conduct:

There is a "zero tolerance" policy in effect for cheating in this class. Cheating on a quiz or an exam will result in grade of zero on that quiz or exam. All cheating and student conduct issues will be handled in strict accordance to the university's policies as noted at *http://oregonstate.edu/admin/stucon/regs.htm.*

Grading:

Your quiz and midterm grades will be posted on Blackboard. You are encouraged to monitor them to ensure they have been properly entered; any errors must be brought to the attention of our TA or Prof. Sharp prior to the last day of class.

Students will be expected to solve thermal-fluid science problems using a systematic, problem-solving approach. This systematic approach, upon which the student will be graded, requires the student to:

1. recognize the difference between variable mass and fixed mass systems,
2. draw appropriate control volume or control system boundaries,
3. determine relevant governing equation(s),
4. select the proper form of the governing equation(s),
5. identify relevant assumption(s),
6. select the appropriate property model,
7. distinguish boundary work from other forms of work,
8. master the sign convention for work and heat transfer used in the present text,
9. properly simplify the governing equation(s),
10. identify states and properties of a given state,
11. employ correct unit conversions, and

12. assess the solution using sound engineering judgment.

The final course grade will be determined using the following breakdown:

Graded quizzes	30 %
Midterm	30 %
Final Exam	40 %

An absolute scale of grading will be used to assess the final grade. A numerical grade of 90 is guaranteed an A–, etc.

90	A–
80	B–
70	C–
60	D–

Disability Accommodations:

"Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 541-737-4098."

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Draft Course Schedule: (Subject to change)

Date			Topic	Reading	Guide	Homework	Solu-tions	Week	Quizzes
Jan	10	T	Chapter 1 – Thermal Fluid Science Introduction and Concepts	1.1 – 1.5	1	1.3, 1.10	1	1	
	12	R	Chapter 2 – Closed System First Law, Properties and Units	2.1 – 2.3 2.5 – 2.7	2	2.1, 2.12, 2.16	2		#1 (Calculus)
	17	T	Chapter 2 – Work and Energy, Specific Heat	2.8 – 2.10 2.4, 2.11	3	2.6, 2.19, 2.32	3	2	
	19	R	Chapter 2 – Polytropic Processes, First Law Applications	2.12 2.13 – 2.14	4	2.37, 2.43	4		#2 (solutions and guides 1 and 2)
	24	T	Chapter 3 – First Law Transients & Modes of Heat Transfer	3.1 3.2 – 3.4	5	3.1, 3.5, 3.7, 3.11, 3.16	5	3	
	26	R	Chapter 3 – Resistance Analogies for Heat Transfer	3.5, 3.7 – 3.8	6	3.18, 3.32	6		
	31	T	Chapter 4 – Hydrostatics and Manometry	4.1-4.2.1	7	4.3, 4.14	7	4	
Feb	2	R	Chapter 4 – Forces on Flat Surfaces, Buoyancy, and Conservation of Mass	4.2.3, 4.2.5, 4.3 – 4.4	8	4.18, 4.29, 4.33	8		#3 (solutions and guides 3 thru 6)
	7	T	Chapter 4 – Conservation of Energy & Bernoulli Equation	4.5 – 4.6	9	4.36, 4.39, 4.40	9	5	
	9	R	Chapter 4 – Fluid Measurements & Conservation of Linear Momentum	4.7 – 4.8	10	4.46, 4.50, 4.53	10		#4 (solutions and guides 7 and 8)
	14	T	Chapter 5 – Thermodynamic Properties: Pure Substances and Two-Phase Systems	5.1 – 5.4	11	5.5, 5.11, 5.14, 5.21, 5.24	11	6	
	16	R	Chapter 5 – Thermodynamic Properties: State Principle & Tables Midterm **(Ch. 1-4)**	5.5 – 5.6	12	5.30, 5.33, 5.39	12		
	21	T	Chapter 6 – Open System First Law: Component Analysis (turbines, pumps/compressors)	6.1, 6.3, 6.4	13	6.11, 6.16, 6.24	13	7	
	23	R	Chapter 6 – Open System First Law: Transient & Component Analysis (nozzles/diffusers, valves, mixing chambers, heat exchangers)	6.2, 6.5 – 6.7	14	6.1, 6.28, 6.30, 6.39	14		
	28	T	Chapter 7 – Second Law: Closed Systems Cycles & Temperature Scale	7.1 – 7.4	15	7.3, 7.5	15	8	
Mar	1	R	Chapter 7 – Reversible Cycles, Entropy, Entropy Change	7.5-7.8	16	7.7, 7.13, 7.20	16		#5 (solutions and guides 9 thru 12)
	6	T	Chapter 7 –Entropy Change Ideal Gases	7.10	17	7.23, 7.25	17	9	
	8	R	Chapter 7 – Second Law Closed System Analysis (continued)	7.11	18	7.27, 7.28	18		

	13	T	Catch-up/Review					10	
	15	R	Catch-up/Review						#6 (solutions and guides 13-16)