ENGR 311
Thermodynamics
Fall 2005

		Instructor	
Instructor:	Name:	Dr. D. V. Pence	
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Class Schedule:	MWF	1:00-1:50 p.m.	216 Covell
Course Textbook:	Fundamentals of Engineering Thermodynamics M. J. Moran and H. N. Shapiro, 5th Edition, Wiley		
Course Prerequisites:	MTH 254		
Office Hours:	Tuesday	10:00-11:30 a.m.	
	Wednesday	2:00-3:30 p.m.	
	Friday	9:00-10:00 a.m.	
	Other times by appointment.		

Course Description and Objectives:

Thermodynamics is the science of energy and entropy dealing specifically with the properties of substances in relation to heat and work. By the end of the term, students should be able to:

1. state and illustrate the first law of thermodynamics, i.e., the conservation of mass and energy and its basic concepts including: conversion of energy from one form to another and transfer of energy from the surroundings to the system in the form of heat and work,
2. state and illustrate the second law of thermodynamics, i.e., entropy analysis and its basic concepts including: possibility and impossibility of processes, Carnot devices, reversibility and irreversibility, and efficiency,
3. apply the first and second laws of thermodynamics to identify, formulate and solve engineering problems for (i) closed systems, (ii) open systems under steady state and transient (uniform state) conditions, and (iii) thermodynamic cycles, and
4. obtain the required thermodynamic property data using tables and charts to solve problems involving ideal and non-ideal substances.

Classes/Attendance:

Each of you is responsible for the material covered during lecture. Lectures are designed to supplement the reading material in the text, not to repeat or replace it. Class time is intended to be interactive and will include the use of small discussion groups, class discussions, and class participation in solving problems.

Although attendance during lectures is not required, it is highly recommended. Changes to exam dates and to homework assignments and their respective due dates will be periodically announced in class. It is the sole responsibility of each student to remain informed of the course progress.

E-mail:

Each student is expected to create, access, and read e-mail on an ONID account (@onid.orst.edu). Instructions for creating such accounts are posted at www.onid.orst.edu. Please note that a distribution list has been created electronically by the college using ONID e-mail addresses. Your address on this list is not changeable; therefore, to receive messages at another account you will have to forward messages from your ONID account to your desired e-mail address. Messages about changes to class and homework hints are regularly sent out to students on this list. Please refrain from sending *detailed* questions regarding concepts, homework problems, etc. on e-mail. You are encouraged to stop by during office hours to ask such questions.

Reading Assignments:

To enhance the learning process, it is beneficial to read the assigned material and complete the reading guide prior to attending the class period during which the material will be discussed. Major topics and difficult concepts presented in the text will be covered in more detail during lecture. A second reading closely following the lecture is also extremely beneficial to the learning process. Also note that (1) all assigned reading material and (2) material covered in class, whether or not it is assigned as homework, will be fair game for exams.

Reading Guides:

Reading guides, to be posted at http://classes.engr.oregonstate.edu/engr/fall2005/engr311-002, are provided to help you take notes from the assigned reading material. Although completion of these guides is not a required part of the course, and therefore they will not be collected or graded, completed reading guides will (1) serve as part of your notes, (2) aid in your participation in classroom discussions, and (3) help prepare you for exams.

Homework Assignments/Quizzes:

Homework problems are designed to develop your problem-solving skills and provide practice of the thermodynamic principles on which you will be tested. It is suggested that after a second reading of the material, as recommended under the *reading assignments* section, you work through the examples in the text as if they were homework problems without the solutions available, prior to working the assigned problems. Homework will not be graded.

Quizzes will be given each Friday (except for September 30) during the first 10-15 minutes of class. Everyone is entitled to drop or miss (but not both) ONLY ONE quiz grade at the end of the term. No make-up quizzes will be given. **No exceptions**.

Exams:

Two midterm exams will be given during the regular class period. On exams, you will be required to apply, to entirely new problems, the fundamental principles outlined in the objectives. These principles will be discussed in class, covered in assigned reading material, and developed through homework assignments. 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 exams 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. In order to ensure that make-up exams are as difficult as the original missed exam, make-up exams will intentionally be made more difficult than the original. If you have encountered a mistake in the grading of your exam, it will gladly be investigated. To have the error considered, please write a professional memo clearly explaining the grading error with a request to rectify the error. Unclear or nonprofessional memos will be returned without consideration. Attach the memo to the front of the exam and give to the instructor **no later** than one week after exams were returned to the class. Note that (1) the exam can have no writing on it other than that done during the exam, (2) the entire exam will be re-graded at the instructor's convenience, (3) if a grading error does not exist and the request is deemed frivolous, the instructor reserves the right to remove extra points for having had their time wasted, and (4) for ABET purposes, a random sample of 10% of the exams, as a minimum, will be photocopied prior to being returned.

Cheating/Student Conduct:

There is a "zero tolerance" policy in effect for cheating in this class. *Copying* of any material to be turned in for a grade is considered cheating. Cheating will result in a grade of zero on a test and a grade of zero for the entire homework set containing a copied homework problem. All cheating and student conduct issues will be handled in strict accordance to the university's policies as noted at *http://osu.orst.edu/admin/stucon/regs.htm.*

Grading:

Students will be expected to solve thermodynamics 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 equations,
4. select the proper form of the governing equations,
5. identify relevant assumptions,
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 equations,
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:

Quizzes (7 or 8)	20 %
Exams (2 @ 25%)	50 %
Final Exam	30 %

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–
64	D
Below 64	F

Course Schedule: (changes possible)

Date			Topic	Reading *	Guide $	Homework Assignment	Completion Date
Sep	26	M	Ch. 1: Introductory Concepts and Definitions	1.1 – 1.7	#1	1.14	10/7
	28	W	Ch. 1: Introductory Concepts and Definitions	1.1 – 1.7		1.29, 1.32**, 1.36, 1.56	10/7
	30	F	Ch. 2: Energy and Work	2.1 – 2.3	#2a	2.18	10/7
Oct	3	M	Ch. 2: Work and Heat Transfer	2.4	#2b	2.26, 2.33	10/14
	5	W	Ch. 2: System Analysis	2.5		2.63, 2.70	10/14
	7	F	Ch. 2: System Cycle Analysis	2.6		2.75, 2.80, 2.84	10/14
	10	M	Ch. 3: Evaluating Properties (Fixed State)	3.1 – 3.3.4	#3	3.2, 3.11, 3.12, 3.23,3.31	10/21
	12	W	Ch. 3. Evaluating Properties (Tables & Real Gas Models)	3.3.5 – 3.4		3.41, 3.55, 3.68, 3.75	10/21
	14	F	Ch. 3. Evaluating Properties (Ideal Gas Model)	3.5 – 3.7		3.88, 3.99, 3.106	10/21
	17	M	Ch. 3. Evaluating Properties (I.G. Polytropic models)	3.8	#4	3.105	10/28
	19	W	Ch. 4: Conservation of Mass (Control Volume)	4.1	#5	4.2**, 4.10	10/28
	21	F	Ch. 4: Conservation of Energy (Control Volume)	4.2	#6	4.22, 4.29, 4.44	10/28
	24	M	Ch. 4: Steady State Analysis (Control Volume)	4.3	#7	4.56, 4.58, 4.75	11/4
	26	W	**EXAM #1** (through Ch. 3)			None	
	28	F	**NO CLASS**			None	
	31	M	Ch. 4: Steady State Analysis (Control Volume)	4.3		4.67	11/11
Nov	2	W	Ch. 4: Transient Analysis (Control Volume)	4.4		4.89, 4.98	11/11
	4	F	Ch. 5: Second Law Statements of Clausius and Kelvin	5.1 – 5.4	#8	5.21, 5.43, 5.51	11/11
	7	M	Ch. 5: Second Law of Thermodynamics (Carnot Cycle)	5.5 – 5.6	#9	5.62, 5.63	11/18
	9	W	Ch. 6: Using Entropy (Clausius Inequality & Entropy)	6.1–6.3	#10	6.23, 6.26 a&b	11/18
	11	F	Ch. 6: Entropy Changes (Internally Reversible Processes)	6.4	#11	6.34, 6.41	11/18
	14	M	Ch. 6: Isentropic Processes	6.7	#12	6.132	11/25
	16	W	Ch. 6: Isentropic Processes	6.7			
	18	F	**EXAM #2** (through Ch. 5)			None	
	21	M	Ch. 6: Second Law for Closed Systems	6.5	#13	6.53, 6.56, 6.64	12/2
	23	W	Ch. 6: Second Law for Open Systems (Control Volumes)	6.6	#14	6.115, 6.122, 6.112, 6.119	12/2
	25	F	**Thanksgiving Day Holiday**			None	
	28	M	Ch. 6: Second Law – Open Sys. (Isentropic Efficiency)	6.8		6.149, 6.155	12/7
	30	W	Ch. 6: Second Law - Open Systems (Int. Rev. Processes)	6.9		6.173	12/7
Dec	2	F	Uniform State – Uniform Flow (Control Volumes)			6.128a, 6.136	12/7
Dec	7	W	**Comprehensive Final Exam** (4:00 – 5:50 p.m.)				

** Reading material will be covered during lecture on the date listed.*
$ Guides are posted on the course web site and correspond with the reading assignments.
*** Computer generated plots/solutions required.*
NOTE: Skip the IT portion of any assigned homework problem.