

**ENGR 3203 – Thermodynamics**

Fall 2009

Department of Engineering and Physics

University of Central Oklahoma

<b>Location</b>	Howell Hall 100
<b>Time</b>	MWF 9:00 – 9:50 a.m.
<b>Instructor</b>	Evan Lemley, Ph.D.; Prof., Department of Engineering and Physics
<b>Office</b>	Howell Hall 221D
<b>Web</b>	<a href="http://evan.lemley.org/">http://evan.lemley.org/</a>
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<b>Phone</b>	(405)974-5473
<b>Office Hours</b>	MW 10:00 a.m. – 12:00 noon and R 10:00 – 11:00 a.m. or by appointment.
<b>Final</b>	W Dec 9, 2009 from 9:00 a.m. - 10:50 a.m.

**Course Description**

This course provides an introduction to the laws of thermodynamics. Thermodynamic properties are defined that describe the behavior and state of systems. The laws of thermodynamics are applied to control masses and control volumes. Thermodynamic analysis is applied to a variety of standard thermodynamic devices and cycles.

**Prerequisites**

ENGR 3203D Thermodynamics Drill (co-requisite enrollment)

PHY 2014 - Physics for Scientists and Engineers I and Lab

MATH 3103 - Differential Equations (or concurrent enrollment)

CHEM 1103 - General Chemistry I

**Drill Session**

The drill session is designed to give time to work on problem solving with guidance from someone with experience in solving Thermo problems. The drill session for Thermo is Tuesdays from 9:00 a.m. to 9:50 a.m. in Howell Hall 100. *There will be a weekly quiz in the drill session, that will constitute a significant portion of your grade.*

**Textbook**

Fundamentals of Thermodynamics, 7<sup>th</sup> ed., Sonntag, Borgnakke, and Van Wylen, Wiley, 2003, ISBN = 0-471-15232-3.

**Topics Covered:**

1. Thermodynamic properties for pure, simple, substances
2. Work and Heat Calculations
3. First Law of Thermodynamics closed and open systems
4. Reversibility/Irreversibility in mechanical systems

5. Entropy
6. Second Law of Thermodynamics for open and closed systems
7. Availability (time permitting)
8. Power Cycles and Vapor Compression Cycles (time permitting)

### **Calculator**

For exams in this course (unless specifically indicated otherwise) you may use any calculator on the following list:

<http://www.ncees.org/exams/calculators/index.php#approved>

### **Engineering Paper**

Engineering Paper -- available from the UCO bookstore and at Thompson's Bookstore. Please use engineering paper for all handwritten homework assignments.

### **Internet & E-mail**

Access to the Internet and ability to send and receive E-mail are required for the class. If you do not have a computer at home or a laptop you can use machines on the UCO campus: Look at

<http://technology.uco.edu/support/microcomplab.htm> for a full list of available general use computers on campus.

Note: E-mails directed to the entire class such as class announcements will go to your official UCO e-mail address (the address that ends in *uco.edu*).

### **Portable Electronic Devices - including cell phones/pmp's/laptops**

Please turn off any portable electronic devices during class. You may not access any portable electronic device during exams except calculators that are on the approved list.

### **Laptops**

Access to laptop computers during lectures is not prohibited. If it appears you are using your laptop for reasons other than those related to the lecture or class activities you will be asked to put the laptop away. Abuse of this privilege could result in a complete ban of laptops in the course.

### **Instruction Techniques**

Lecture will be used three days per week and a drill session one day per week.

### **Class Polices**

- Prepare before you arrive in class by reading sections ahead of time.
- Come to class (some lecture info will be placed on the course website – which you should review as well as attend class). Attendance in lecture sessions is **very strongly recommended and VVVVI**. This is not the only one way you learn, but come prepared for the session and you will learn as much as possible.

- Take notes.
- Listen carefully.
- Keep background conversation and noise to a minimum in class and lab.
- You are responsible for paying attention to all class announcements and notes. Sometimes the course web-site may not have the latest announcements.
- Attendance is mandatory for all exams or other graded activities (e.g. project competitions or presentations).
- Cheating or academic dishonesty of any kind will not be tolerated (see Code of Student Conduct – [http://evan.lemley.org/courses/2006\\_2007\\_cosc.pdf](http://evan.lemley.org/courses/2006_2007_cosc.pdf) )

### **Errors**

It is possible given the amount of information covered that the instructor may occasionally make a mistake in a lecture or there will be either a poorly grasped or poorly explained topic. The instructor will attempt at the earliest possible opportunity to either correct the mistake or issue a different or better explanation of a particular topic.

### **Homework/Team Design Project/Programming Projects**

Working HW problems in a timely manner is the best way to do well on exams and in the class as a whole. Homework is due at the beginning of the class period on the due-date or due-day. Each HW problem you turn in is worth ten points. Some problems will be graded on detailed solutions and others will be graded on effort. I will **not** tell you ahead of time which or how many problems will be graded relative to a detailed solution, but on the returned and graded HW paper a check mark next to the problem number will indicate full effort (or ten points) and a numerical score (e.g. 8/10) next to the problem number will be used on those problems under more scrutiny.

### **Paper Homework**

Homework papers should be folded length-wise with your name written on the outside of the folded pages before turning it in. Each problem should fit all of the following criteria: clearly labeled, **one problem per sheet of paper**, legible and organized. HW papers that do not fit these criteria will be penalized accordingly. See the following link ( [http://evan.lemley.org/courses/hwk\\_format.php](http://evan.lemley.org/courses/hwk_format.php) ) for details on the presentation of HW problems. You may also visit the following site for an electronic version of the homework format requirements:

### **Electronic Assignments**

These may be homework, design projects, or programming projects. What will need to be turned in will vary, but whatever documents you need to submit should be attached to an e-mail message to Dr. Lemley. File names should be distinct from other students – following is the general format for file names:

***date\_assignment\_lname.ext***

where

*date* =

current date in MMDDYY format

*assignment* =

assignment (e.g. *hwk* for a homework & *dpr* for design project)

*lname* =

last name

*ext* =

file extension that indicates the type of file (e.g. *c* for program source, *xls* for a spreadsheet, *ppt* for a PowerPoint presentation, etc...)

For example if your last name is Jones, you have completed an assignment called design project 1, you are submitting on 09/12/07, and you are submitting a report (a MS Word document for example) about the project, then your filename needs to be:

***091207\_dpr1\_jones.doc***

### **Late Homework/Assignments**

Homework is generally due at the **beginning of class**. HW turned in after this time will have 20% deducted per late class period. For example: if a paper is turned in one minute after class begins on the day it is due, 20% will be deducted. If it is turned in one minute before the next class meeting time after the assignment is due, 20% will also be deducted. Dr. Lemley will check e-mail just before class – any electronic assignment must be received by the due date/time, or 20% will be deducted.

### **Project**

There will be a project in this course which will constitute a significant portion of your grade. More information will be given to you at the time the project assignment is made.

### **Grading Policies**

The following table shows the breakdown of credit for this course.

Weekly Quizzes / HW / Misc.	25%
Mid-term Exam	25%
Project	25%
Final	25%
<b>Total</b>	<b>100%</b>

### **Tentative Grading Scale**

90-100% -- A, 80-90% -- B, 70-80% -- C, 60-70% -- D, <60% -- F

### **Mid-Term and Final Exams**

The mid-term and final exams (a significant portion of the grade) in this course will be comprehensive of all material covered to the time of the exam. Attendance for all exams is required unless an event beyond the student's control intercedes. A missed exam may be excused if the student notifies the instructor as soon as possible (before the exam occurs if possible). Official notification of the reason for the missed exam should be sent via e-mail.

### **Exam and Quiz Preparation Do's and Don'ts**

**DO** the following:

- Work all assigned problems independently first, then consult with other students, instructor, drill instructor...
- Work as many random problems as possible (this will best simulate exam conditions). It is good if you have the solution available for comparison.
- Ask questions and talk to others about assigned problems
- Read the book and look at sections of the book before the class meeting in which they are discussed.
- Take notes in class (if you just sit there you will not retain nearly as much)
- Ask questions in class
- Be engaged in class

**DON'T DO** the following:

- Look at the solutions manual or someone else's work before you have attempted a problem yourself.
- Assume you can figure out the assigned problems in the few days before the exam (start figuring them out early)
- Work with others before you have tried problems yourself
- Memorize assigned problems/quiz problems/etc... (will not help you on an exam)

### **STUDENT INFORMATION SHEET / SYLLABUS ATTACHMENT**

Go to: <http://www.uco.edu/academicaffairs/FORMS/StudentInfoSheet.pdf>

### **DISABILITY SUPPORT SERVICES**

[http://www.uco.edu/disability\\_support/](http://www.uco.edu/disability_support/)

<b>ENGR 3203 Tentative Schedule for Fall 2009</b>			
<b>Week</b>	<b>Date</b>	<b>Day</b>	<b>Planned Activities</b>
1	08/17/09	Mon	Syllabus & Intro / Thermo Concepts
	08/19/09	Wed	Thermo Concepts
	08/21/09	Fri	Thermo Concepts
2	08/24/09	Mon	Thermo Concepts
	08/26/09	Wed	Properties of pure substances
	08/28/09	Fri	Properties of pure substances
3	08/31/09	Mon	Properties of pure substances
	09/02/09	Wed	Properties of pure substances
	09/04/09	Fri	Properties of pure substances
4	09/07/09	Mon	<b>NO CLASS – Labor Day</b>
	09/09/09	Wed	Work & Heat
	09/11/09	Fri	Work & Heat
5	09/14/09	Mon	Work & Heat
	09/16/09	Wed	Work & Heat
	09/18/09	Fri	FLT – Closed Systems
6	09/21/09	Mon	FLT – Closed Systems
	09/23/09	Wed	FLT – Closed Systems
	09/25/09	Fri	Enthalpy
7	09/28/09	Mon	Constant Pressure/Volume Specific Heats
	09/30/09	Wed	Properties for Ideal Gases
	10/02/09	Fri	Control Volume Analysis for FLT
8	10/05/09	Mon	Control Volume Analysis for FLT – Steady-State
	10/07/09	Wed	Control Volume Analysis for FLT – Steady-State
	10/09/09	Fri	Control Volume Analysis for FLT – Transient
9	10/12/09	Mon	Heat Engines & Refrigerators
	10/14/09	Wed	<b>Mid-Term Exam</b>
	10/16/09	Fri	<b>NO CLASS – Fall Break</b>
10	10/19/09	Mon	Heat Engines & Refrigerators
	10/21/09	Wed	Reversibility & Irreversibility
	10/23/09	Fri	Carnot Cycle
11	10/26/09	Mon	Carnot Cycle
	10/28/09	Wed	Entropy
	10/30/09	Fri	<b>Entropy – Last Day to Drop</b>
12	11/02/09	Mon	Entropy – Generation
	11/04/09	Wed	Entropy changes of solids, liquids, and gases
	11/06/09	Fri	Entropy changes of solids, liquids, and gases
13	11/09/09	Mon	SLT for Control Volumes
	11/11/09	Wed	SLT for Control Volumes
	11/13/09	Fri	SLT for Control Volumes
14	11/16/09	Mon	SLT for Control Volumes
	11/18/09	Wed	Irreversibility & Availability
	11/20/09	Fri	Irreversibility & Availability
15	11/23/09	Mon	Irreversibility & Availability
	11/25/09	Wed	<b>NO CLASS – Thanksgiving</b>
	11/27/09	Fri	<b>NO CLASS – Thanksgiving</b>
16	11/30/09	Mon	Power and Refrigeration Systems
	12/02/09	Wed	Power and Refrigeration Systems
	12/04/09	Fri	Power and Refrigeration Systems
17	12/09/09	Wed	<b>FINAL – 9:00 – 10:50 a.m. HOH 100</b>