

**ENGR 4533/5910 Thermal Systems Design // CRN = 28324**

Spring 2006

Department of Physics and Engineering

University of Central Oklahoma

|                     |   |
|---------------------|---|
| <b>Location</b>     | Howell Hall 101   |
| <b>Time</b>         | TR 5:45 – 7:00 p.m.   |
| <b>Instructor</b>   | Evan Lemley, Ph.D.; Assoc. Prof. of Physics and Engineering         |
| <b>Office</b>       | Howell Hall 221L  |
| <b>Web</b>          | <a href="http://engrphys.lemley.org">http://engrphys.lemley.org</a> |
| <b>email</b>        | <a href="mailto:elemley@ucok.edu">elemley@ucok.edu</a>              |
| <b>Phone</b>        | (405)974-5473 // (405)204-5616                                      |
| <b>Office Hours</b> | MWF 10:00 - 10:50 a.m. or by appointment.                           |
| <b>Final</b>        | R May 4, 2006 from 5:30 a.m. - 7:20 p.m.                            |

**Course Description**

This course develops the concepts and methodology of system design, exergy analysis, and optimization applied to thermal-fluid systems. Topics include simulation of systems in which the system components are known and system parameters such as flow, temperature, and pressure are to be determined and design of systems involving the selection of right type, size and combinations of equipment to optimize system performance. A discussion of engineering ethics and economics relevant to design topics covered is included in this course.

**Prerequisites**

ENGR 3443 Thermal Fluid Engineering II (or both Thermodynamics and Fluid Mechanics) and MATH 3103 Differential Equations.

**Textbook (Required)**

*Thermal Design and Optimization*, Adrian Bejan, George Tsatsaronis, and Michael Moran, John Wiley, 1996.

ISBN: 0-471-58467-3

**Objectives**

Students will:

1. demonstrate an understanding of basic design methodology;
2. demonstrate an understanding of the code of engineering ethics;

3. demonstrate an understanding of background thermodynamics, fluid mechanics, and heat transfer;
4. demonstrate the ability to identify and understand workings of thermal-fluid systems such as power, refrigeration, heating/ ventilation/air conditioning, and pump/pipe systems;
5. apply principles of physics, thermodynamics, heat transfer, and fluid mechanics to analyze components and systems used in thermal-fluid systems;
6. demonstrate an understanding of design of a specified thermal-fluid system through a team design project;
7. demonstrate an understanding of computer simulation of thermal systems-fluid systems;
8. demonstrate an understanding of engineering economics applied to the design of a thermal-fluid system.

### **Calculator**

You must own a scientific calculator – *see the list of allowed calculators for exams in the Department of Physics and Engineering*. **Please bring your calculator to class for each meeting.**

### **Engineering Paper**

Please use engineering paper for all homework assignments.

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

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

<http://technology.ucok.edu/support/microcomplab.htm>

for a full list of available general use computers on campus.

### **Portable Electronic Devices (including cell phones)**

Please turn off any portable electronic devices (esp. cell phones) during class. You may not access any portable electronic device during exams except calculators that are on the approved list for Physics and Engineering courses.

### **Instruction Techniques**

Lecture will be used predominantly although sometimes recitation periods will be employed.

### **Class Polices**

Attendance is not required, but you will be responsible for any announcements or notes from class (and quizzes). 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.

**Homework**

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. Homework should be neatly written on only one side of your paper, 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 web-page:

[http://engrphys.lemley.org/courses/hwk\\_format.php](http://engrphys.lemley.org/courses/hwk_format.php)

for details on the presentation of HW problems.

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.

**Project**

There will be Team Design Projects in this course. Projects will constitute a significant portion of your grade. More information will be given to you as project assignments are made.

**Grading Policies**

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

|              |             |
|--------------|-------------|
| HW and Misc. | 10%         |
| Exams (x3)   | 10%         |
| Projects     | 30%         |
| Final Exam   | 30%         |
| <b>Total</b> | <b>100%</b> |

**Tentative Grading Scale**

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

**STUDENT INFORMATION SHEET / SYLLABUS ATTACHMENT**

See separate handout or go to:

<http://www.busn.ucok.edu/academicaffairs/FORMS/Student%20Information%20SheetSPR06rev.pdf>

| <b>ENGR 4533 Tentative Schedule for Spring 2006</b> |             |            |   |
|---|-------------|------------|---|
| <b>Week</b>   | <b>Date</b> | <b>Day</b> | <b>Sections Covered</b>                                 |
|   | 10Jan2006   | Tue        | Intro + 1.1 – 1.7, Thermo Review                        |
|   | 12Jan2006   | Thu        | Thermo Review   |
|   | 17Jan2006   | Tue        | Thermo Review   |
|   | 19Jan2006   | Thu        | Thermo/Fluids Review                                    |
|   | 24Jan2006   | Tue        | Thermo/Fluids Review                                    |
|   | 26Jan2006   | Thu        | Exergy/Availability Analysis                            |
|   | 31Jan2006   | Tue        | Exergy/Availability Analysis                            |
|   | 02Feb2006   | Thu        | Exergy/Availability Analysis                            |
|   | 07Feb2006   | Tue        | Exergy/Availability Analysis                            |
|   | 09Feb2006   | Thu        | Exergy/Availability Analysis                            |
|   | 14Feb2006   | Tue        | Heat Transfer   |
|   | 16Feb2006   | Thu        | Heat Transfer   |
|   | 21Feb2006   | Tue        | Heat Transfer   |
|   | 23Feb2006   | Thu        | Heat Transfer   |
|   | 28Feb2006   | Tue        | Heat/Fluid Flow Applications                            |
|   | 02Mar2006   | Thu        | <b>Exam 1</b>   |
|   | 07Mar2006   | Tue        | Heat/Fluid Flow Applications                            |
|   | 09Mar2006   | Thu        | Heat/Fluid Flow Applications                            |
|   | 14Mar2006   | Tue        | <b>NO CLASS – SPRING BREAK</b>                          |
|   | 16Mar2006   | Thu        | <b>NO CLASS – SPRING BREAK</b>                          |
|   | 21Mar2006   | Tue        | Heat/Fluid Flow Applications                            |
|   | 23Mar2006   | Thu        | Heat/Fluid Flow Applications // Project 1 Presentations |
|   | 28Mar2006   | Tue        | Thermo/Heat/Fluid Flow Applications                     |
|   | 30Mar2006   | Thu        | Thermo/Heat/Fluid Flow Applications                     |
|   | 04Apr2006   | Tue        | Thermo/Heat/Fluid Flow Applications                     |
|   | 06Apr2006   | Thu        | Economics   |
|   | 11Apr2006   | Tue        | Economics   |
|   | 13Apr2006   | Thu        | Economics   |
|   | 18Apr2006   | Tue        | Economics/Thermoeconomics                               |
|   | 20Apr2006   | Thu        | Thermoeconomics   |
|   | 25Apr2006   | Tue        | Thermoeconomics   |
|   | 27Apr2006   | Thu        | Thermoeconomics // Project 2 Presentations              |
|   | 04May2006   | Thu        | <b>FINAL – from 5:30 a.m. - 7:20 p.m. HOH 101</b>       |