

ENGR 3443 Fluid Mechanics (Thermal Fluid Engineering II)

Spring 2008

Department of Engineering and Physics

University of Central Oklahoma

Location	Howell Hall 100
Time	MW 4:00 - 5:15 p.m.
Instructor	Evan Lemley, Ph.D.; Prof. of Engineering and Physics
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Phone	(405)974-5473
Office Hours	MW 1:30 - 2:30 p.m. and R 2:00 – 3:00 p.m. or by appointment.
Final	F May 9, 2008 from 3:00 - 4:50 p.m.

Course Description

This course includes the study of fluid properties, fluid statics, conservation equations, inviscid flow, dimensional analysis and similitude, boundary layer theory, viscous internal and external flow, and fluid measurement techniques.

Prerequisites

ENGR 3203 Thermodynamics and MATH 3103 Differential Equations

Textbook

Fluid Mechanics, Frank M. White, 6th Edition, McGraw-Hill, 2008.

General Topics

1. Introduction – fluid properties and definitions, and units
2. Pressure Distribution in a Fluid (Fluid Statics)
3. Fluid Flow – Integral Formulation and use of Bernoulli's Equation
4. Differential Analysis of Fluid Flow and Introduction to Potential Flow
5. Dimensional Analysis
6. Viscous Flow – Internal and External

Calculator

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

Engineering Paper

Engineering Paper -- available from the UCO bookstore, Thompson's Bookstore, and Triangle A&E at Broadway Ext. and 63rd. 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.

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 *ucok.edu*).

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 Engineering and Physics courses.

Instruction Techniques

Lecture will be used predominantly although sometimes recitation periods will be employed. Lectures often involve examples and are ***encouraged to be as interactive as possible***.

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).
- 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.

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. 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) 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 other projects that require an electronic document to be sent to Dr. Lemley.. 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_lname_assignment.ext

where

date = current date in MMDDYY format
lname = last name
assignment = assignment (e.g. hw for a homework, dpr for design project, prg for a programming project)
ext =

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

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 the course.

HW and Misc.	15%
Exams (x3)	10%
Project	25%
Final Exam	30%
Total	100%

Tentative Grading Scale

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

Final Exam Policy and Exam Attendance

The final exam in this course will be comprehensive and will take place as shown in the tentative schedule included in the syllabus. In the case that a student scores higher on the final exam than their lowest regular exam, the lowest regular exam score will be replaced by the final exam score. In no event will the final exam score be discarded. 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.

STUDENT INFORMATION SHEET / SYLLABUS ATTACHMENT

See separate handout or go to:

<http://www.busn.ucok.edu/academicaffairs/FORMS/Student%20Information%20SheetSPR07.pdf>

ENGR 3443 Tentative Schedule for Spring 2008			
Week	Date	Day	Sections Covered
1	14Jan2008	Mon	Syllabus and Introduction
	16Jan2008	Wed	Ch. 1 Fluid Properties
	21Jan2008	Mon	NO CLASS – MLK Day
1	23Jan2008	Wed	Ch. 1 Fluid Properties
1	28Jan2008	Mon	Ch. 2 Pressure Gradient in a Fluid & Manometers
	30Jan2008	Wed	Ch. 2 Forces on Submerged Surfaces
2	04Feb2008	Mon	Ch. 2 Buoyancy and Pressure Dist. In Rigid-Body Motion
	06Feb2008	Wed	Ch. 3 Physical Laws and Reynold's Transport Theorem & Conservation of Mass
5	11Feb2008	Mon	Exam 1
	13Feb2008	Wed	Ch. 3 The Momentum Equation and Angular Momentum
6	18Feb2008	Mon	Ch. 3 Energy and Bernoulli's Equation
	20Feb2008	Wed	Ch. 4 Acceleration of a Fluid Particle and D.E. of Mass Conservation
7	25Feb2008	Mon	Ch. 4 Stress in a Fluid – Parallel plates, cylindrical viscometer
	27Feb2008	Wed	Ch.4 D.E. for Momentum – Navier Stokes Equations
8	03Mar2008	Mon	Ch. 4 Stream Function & Vorticity
	05Mar2008	Wed	Ch. 4 Potential Flow
9	10Mar2008	Mon	Ch. 5 Modeling and Dimensional Analysis; Rayleigh Method
	12Mar2008	Wed	Exam 2
10	17Mar2008	Mon	NO CLASS – SPRING BREAK
	19Mar2008	Wed	NO CLASS – SPRING BREAK
11	24Mar2008	Mon	Ch. 5 Buckingham Pi Theorem Common Dimensionless Numbers
	26Mar2008	Wed	Ch. 6 Reynolds' Number and Turbulence, Entrance Effects & Laminar Flow in a Circular Pipe
12	31Mar2008	Mon	Ch. 6 Turbulent Flow in a Circular Pipe & Flow through rough pipes and Moody's Diagram
	02Apr2008	Wed	Ch. 6 Pipe Flow Problems and Moody's Diagram & Flow in Non-Circular Ducts
	04Apr2008	Fri	Last Day to Drop
13	07Apr2008	Mon	Ch. 6 Pipe Flow Problems and Moody's Diagram & Flow in Non-Circular Ducts
	09Apr2008	Wed	Ch. 6 Minor Losses & Flow Reduction Meters
14	14Apr2008	Mon	Ch. 6 Solving Pipe Networks – The Hardy-Cross Method
	16Apr2008	Wed	Ch. 7 Boundary Layer Equations and Solutions for Laminar Case
15	21Apr2008	Mon	Exam 3
	23Apr2008	Wed	Ch. 7 Turbulent BL Solutions
16	28Apr2008	Mon	Ch. 7 Experimental External Flows – Drag
	30Apr2008	Wed	Ch. 7 Experimental External Flows – Lift
17	09May2008	Fri	FINAL – 3:00 – 4:50 p.m. HOH 101