UNIVERSITY OF IDAHO
Department of Mechanical Engineering

ENGR 335 – Engineering Fluid Mechanics
Spring 2015

Course Instructor

Instructor:	Tao Xing, Ph.D., P.E.
Office:	EP 324F
Office Hours:	8:00 – 09:20 am MWF or by appointment
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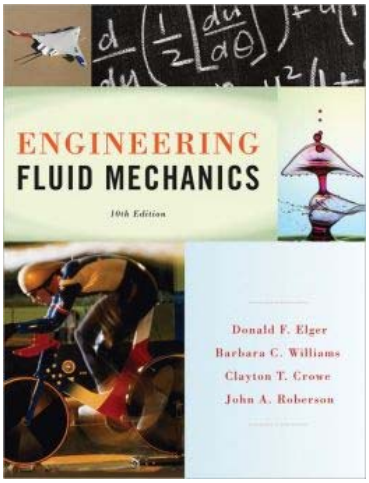
Course Textbook



Elger, D.F., Williams, B.C., Crowe, C.T., Roberson, J.A., Engineering Fluid Mechanics, 10th edition, John Wiley & Sons, Inc., 2013.

In addition to the course textbook, additional handouts will be made available on the course website.

Course Schedule: Lecture: 09:30 am -10:20 am MWF at TLC 222

Course Description and Objectives

To understand the properties and behavior of fluids and the basic principles of fluid mechanics applied to fluids at rest and in motion and to be able to apply these principles to solve simple engineering problems, and also learn about dimensional analysis, modeling and similitude.

Students will:

(1) be familiar with the properties and behavior of liquids and gases, classification of various types of flows, and understand the basic concepts of boundary layer and its importance in fluid mechanics;
(2) be familiar with the hydrostatic equation and its application to engineering problems;
(3) be familiar with the Bernoulli equation and its application to flow measuring devices such as Pitot tube and Venturi meter, and to solve engineering problems;
(4) be familiar with the velocity field, acceleration field, control volume and system representations, and the Reynolds Transport Theorem
(5) understand the four basic principles of fluid mechanics: continuity equation, momentum equation, energy equation and state equations, and their application to engineering problems;

(6) understand dimensional analysis and be able to use non-dimensional parameters in solving fluid flow problems, and do similitude and modeling in fluid mechanics and
(7) be familiar with the laminar and turbulent pipe flows and used Moody chart to compute head loss.
(8) Understand lift and drag force calculations

Prereq.: Engr 210 (Engineering Statics), and **Math 275** (Analytic Geometry and Calculus III).

Course Web Site

Course-related material will be distributed on the course BbLearn website (http://bblearn.uidaho.edu). If you are a registered student in the class, you will automatically receive an invitation to the class website. Check it frequently. Download any items of interest that you find there!

Reading and Homework Assignments

Reading assignments are shown in the syllabus table at the end of this document. Homework assignments will be posted on the course website. Homework assignments are due at the beginning of the class period posted on the course website. Homework not submitted at the beginning of the class period is considered late and will receive a grade of zero.

Course Grading

Your total course percentage will be made up of the following,

Homework	30%
Exam 1	15%
Exam 2	15%
Exam 3	15%
Final Exam	25%

Course grades will be assigned on the following scale: 90-100% = A, 80-89% = B, 70-79% = C, 60-69% = D, <60% = F. The instructor reserves the right to adjust the scale according to overall class performance.

Academic Honesty

As a student enrolled at the University of Idaho, you are bound by the UI Student Code of Conduct. Article II, Section 1 of this code addresses academic honesty. This code states …

> *Cheating on classroom or outside assignments, examinations, or tests is a violation of this code. Plagiarism, falsification of academic records, and the acquisition or use of test materials without faculty authorization are considered forms of academic dishonesty and, as such, are violations of this code. Because academic honesty and integrity are core values at a university, the faculty finds that even one incident of academic dishonesty seriously and critically endangers the essential operation of the university and may merit expulsion.*

Violation of this code will not be tolerated in this course and will be reported immediately to the Office of the Dean of Students for review.

Professionalism

You are training yourself, through formal education, for a career in engineering or a related field. Professional integrity is expected in the workplace, and it is also expected in the classroom. This includes, but is not limited to,

- On-time class attendance. In your professional career, you will no-doubt be involved in many things requiring your on-time attendance (meetings, conferences, etc.). Entering a meeting, presentation, or a class lecture late is a distraction for everyone. It can completely derail the proceedings. Distractions like this can cause those who are trying to focus to lose their concentration.
- Attention during class. It is my sincere hope that you never will have to deal with people talking, whispering, laughing, eating, internet-surfing, or doing other distracting things while you are giving a presentation. For the presenter, this is not a pleasant experience at all. It causes one to lose his/her train of thought very quickly. Activity that distracts the presenter also distracts those in the room who *want* to hear the material in more ways than one. Causing a presenter to stumble because of distractions degrades the quality of the presentation. Distracting activity directly affects those around you who are interested in the subject material and *want* to hear the presentation.

  Respecting the individual presenting the information and respecting your peers that surround you in the room by refraining from distracting activity is truly professional in every sense of the word.
- Cell phones. This falls under the previous category, but it warrants a separate bullet. Hearing a cell phone ring during a presentation is a huge distraction for everyone. Sending and receiving text messages or surfing the internet is distracting you from the material being presented. I respectfully request that you **turn your cell phone off** during the class period.
- Courtesy and respect. These represent the pinnacle of professional integrity. Exhibiting courtesy and respect to others is absolutely essential for effective communication.

Lec	Date	Day	Topic	Reading
	12-Jan	M		
1	14-Jan	W	Definition fluid; continuum hypothesis; dimensions; grid method	1.1-1.9
2	16-Jan	F	Fluid properties; viscosity, shear stress and rate of strain	2.1-2.7
	19-Jan	M	MARTINE LUTHER KING DAY - UI CLOSED	
3	21-Jan	W	Bulk Modulus; vapor pressure/cavitation; surface tension	2.8-2.11
4	23-Jan	F	Pressure definition; pressure variation with elevation in liquids	3.1-3.2
5	26-Jan	M	Pressure variation in atmosphere and pressure measurement	3.2-3.3
6	28-Jan	W	Hydrostatic forces on plane surfaces	3.4
7	30-Jan	F	Hydrostatic forces curved surfaces	3.5
8	2-Feb	M	Buoyancy; hydrometer	3.6
9	4-Feb	W	Stability; Streamlines, pathlines, and streak lines	3.7, 4.1
10	6-Feb	F	Fluid kinematics (velocity and acceleration)	4.2-4.4
11	9-Feb	M	Euler's Equation and pressure in a fluid with Rigid Body Motion	4.5
12	11-Feb	W	Review of Exam 1	
13	13-Feb	F	Exam 1	
	16-Feb	M	PRESIDENTS' DAY – UI CLOSED	
14	18-Feb	W	Static/dynamic/total pressure, Bernoulli equation	4.6-4.7
15	20-Feb	F	Rotation and vorticity	4.8
16	23-Feb	M	The Bernoulli Equation in irrotational flow; Separation	4.9-4.10
17	25-Feb	W	Rate of flow; Control volume and Reynolds transport theorem	5.1-5.2
18	27-Feb	F	Continuity equation; cavitation	5.3-5.5
19	2-Mar	M	Differential continuity equation.; Derivation of momentum Eqn.	6.1
20	4-Mar	W	Momentum Equation (interpretation)	6.2
21	6-Mar	F	Momentum Equation (applications)	6.3-6.4
22	9-Mar	M	Review	HW14-21
23	11-Mar	W	Navier-Stokes Equation with exact solutions	6.7
24	13-Mar	F	Energy, work, and power; derivation of energy equation	7.1-7.3
	16-Mar	M	Spring recess	
	18-Mar	W	Spring recess	
	20-Mar	F	Spring recess	
25	23-Mar	M	Energy equation (pipe flow) and power equation	7.4-7.5
26	25-Mar	W	Transitions and Hydraulic and Energy Grade Lines	7.6-7.7
27	27-Mar	F	Hydraulic and Energy Grade Lines (Cont'd) and examples	7.8
28	30-Mar	M	Review of Exam 2	
29	1-Apr	W	Exam 2	
30	3-Apr	F	Dimensional analysis; Buckingham Pi theorem; step-by-step method	8.1-8.3
31	6-Apr	M	The exponent method	8.3
32	8-Apr	W	Important Pi groups; Similitude	8.4-8.6
33	10-Apr	F	Model-Prototype Performance; high Re effect; free-surface model	8.7-8.9
34	13-Apr	M	Surface resistance and boundary layer description	9.1-9.2
35	15-Apr	W	Laminar boundary layer and transition	9.3-9.4
36	17-Apr	F	Turbulent boundary layer	9.5-9.7
37	20-Apr	M	Flow in Conduits; Classification; pipe sizes	10.1-10.2
38	22-Apr	W	Head loss, stress, and laminar pipe flow	10.3-10.5
39	24-Apr	F	Turbulent pipe flow and Moody Diagram	10.6-10.7
40	27-Apr	M	Combined head loss and Nonround Conduits	10.8-10.9
41	29-Apr	W	Review of Exam 3	
42	1-May	F	Exam 3	
43	4-May	M	Lift and drag forces, drag of axisymmetric and 3D bodies	11.1-11.3
44	6-May	W	Terminal velocity and drag reduction; Lift and drag for airfoils	11.4-11.6; 11.8-11.10
45	8-May	F	Review of Final Exam	
	12-May	Tue	**FINAL EXAM (10:00 AM to 12:00 PM)**	