

CE 360 FLUID MECHANICS
Tu-Th 1-2:15p in 207S Henderson-South

INSTRUCTOR: Dr. Patrick Reed
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OFFICE HOURS: Dr. Reed's---MONDAYS 8-10am, WEDNESDAYS 8-10am, or by appointment
 Brian Younkin (bdy105@psu.edu) Teaching Assistant Office Hours TBA

REQUIRED TEXT: Young et al., *A Brief Introduction to Fluid Mechanics*, 3rd Edition, John Wiley & Sons, Inc., New York, NY, 2004.

GRADING:

Participation	10%	(5% In-Class Exercises, 5% Notes Binder)
Homework	40%	
Bi-Weekly Quizzes	50%	

Letter grades will be based on the weighted average specified above and assigned as follows:

- A = 94-100%
- A- = 90-93%
- B+ = 87-89%
- B = 84-86%
- B- = 80-83%
- C+ = 76-79%
- C = 70-75%
- D = 60-69%
- F < 60%

I reserve the right to adjust your grades. Your grade will only improve if adjustments are necessary. Feel free to contact me during office hours or by appointment if you have grade-related questions or concerns.

COURSE GOALS:

Enable you to understand and apply the fundamental principles governing incompressible fluids to the design of engineering systems. Fluids surround and affect everything in the physical world, consequently every major project you will be participating in as an engineer requires a sound understanding of the material covered in this course. This course represents a stepping stone in your professional development; it is intended to aid you in developing the skills you will need for systematic decomposition and solution of real-world problems.

ABET EDUCATIONAL OBJECTIVES:

- Gain a solid understanding of the basic principles of mathematics, science, and engineering.
- Be able to apply this understanding to advance your technical competency in Civil Engineering
- Be able to use the techniques, skills, and modern engineering tools learned in this course for practice in Civil Engineering and/or graduate education.

ABET EDUCATIONAL OUTCOMES:

- An ability to apply your knowledge of mathematics, science, and engineering.
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

IN CLASS PARTICIPATION:

Please bring your text, printed notes in a 3-ring binder, a calculator, and scrap paper to each class. You will be participating in the solution and discussion of in-class example problems. You will work in small groups while solving these problems. Each group will hand in their attempt to solve the problem with each member's signature on the paper. Simply attempting the solution will result in full participation credit for the day. These in-class exercises will require that you **complete the assigned readings** prior to the beginning of each class.

Note that participation counts for 10% of your grade. You need to develop organized notes binders, which will be assessed during each lecture period to ensure you have printed the notes in advance of the current lecture and have organized prior lectures in your binder.

ON-LINE CLASS PARTICIPATION:

All course emails and web postings will be made using the ANGEL course management software. You will need to regularly login (<https://cms.psu.edu/frameIndex.htm>) to check course announcements, download in-class example solutions, and access posted homework solutions.

Important: When you 1st login into the system you must configure “My Settings” to forward course emails to your primary email account as follows:

Step 1: Login into system

Step 2: Click “My Settings”

Step 3: Click “System Settings”

Step 4: Type your PSU Email under “Forwarding Address” and set “Forwarding Mode” as shown below:

Forwarding Address

Forwarding Mode

Step 5: Click “Save”. You now should receive all course announcements in your primary email account as well as your ANGEL account.

HOMEWORK:

Homework will be assigned bi-weekly and is due at the **beginning of class** on the Thursday of the subsequent week. Late homework **will not** be accepted. Feel free to work on the assignments in groups of 2 or 3. If you are doing group work, hand in 1 copy with everyone's name.

Each assignment requires:

- Your name(s) on each page of **stapled** solutions
- A legible step-by-step presentation (**in pencil**) of the solutions (**include problem diagrams**)
- Boxed answers presented in proper units

Solutions will be made available after your assignments have been collected.

QUIZZES:

This class has no exams. Quizzes will be given in class on the dates listed below. You will be allowed one-side of a 3 in by 5 in note card as a crib sheet for each quiz. Make up quizzes will not be given. In extreme cases, an quiz grade will be replaced by the average of your grades on the remaining quizzes (proof of illness or emergency will be required).

EXTRA CREDIT:

This course introduces you to the importance of fluids. I will increase your score on each homework assignment by 10% of the total points possible, if you find examples in newspapers, magazines, or the internet of real-world problems where the topics covered in this course play a vital role. Submit a 1-paragraph (<300 words), well written synopsis that provides:

- A summary of the problem (in your own words)
- A brief discussion of how the problem relates to this class (what principles covered in class are important in solving the problem?)
- A reference for where you found the story

Essay Competition: I am encouraging you to develop your writing skills and broaden your perspective on the “beauty” of fluid mechanics. To participate in this competition you must write a 5-page essay that addresses the following topic:

How have advances in our knowledge of fluid mechanics shaped the culture and history of the United States?

The essays need to be researched with citations, well written, and **VERY** original (i.e., they should be informative and fun to read). The essays must be of very high quality to be considered in the competition. Students with top rated essays will receive 5-percentage points added to their final grade. Any student who submits a high quality essay will receive a minimum of 3-percentage points added to their final grade. I will publish the best essays on the web (you can see examples at the following website <http://www.engr.psu.edu/ce/Divisions/Hydro/Reed/CE360.htm>).

Letters of Commitment are due February 1, 2005 (simply email me stating that you will participate). Essays are due Friday, April 6, 2007 by 5pm with no exceptions.

ACADEMIC INTEGRITY

The University's statement on academic integrity, from which the following statement is drawn, is available at <http://www.psu.edu/dept/oue/aappm/G-9.html>

Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the University's Code of Conduct states that all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts. All students are expected to act with civility, personal integrity; respect other students' dignity, rights and property; and help create and maintain an environment in which all can succeed through the fruits of their own efforts. An environment of academic integrity is requisite to respect for self and others and a civil community. Academic integrity includes a commitment to not engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty include cheating or copying, plagiarizing, submitting another persons' work as one's own, using Internet sources without citation, fabricating field data or citations, "ghosting" (taking or having another student take an exam), stealing examinations, tampering with the academic work of another student, facilitating other students' acts of academic dishonesty, etc. Students charged with a breach of academic integrity will receive due process and, if the charge is found valid, academic sanctions may range, depending on the severity of the offense, from F for the assignment to F for the course.

COURSE SCHEDULE (subject to change, if topics require more lecture time)

WEEK/DATE	TOPIC	LEC	READING	QUIZ/HW
1 / Jan. 16	Course Introduction	0	None	
1 / Jan. 18	Dimensions, Physical Properties	1	1.1-1.5	
2 / Jan. 23	Viscosity, Surface Tension	2	1.6-1.9	
2 / Jan. 25	Fluid statics: hydrostatic distribution	3	2.1-2.4	Homework 1 Due
3 / Jan. 30	Fluid statics: manometry	4	2.6-2.7	
3 / Feb. 1	Fluid statics: forces on plane surfaces	5	2.8-2.9	Quiz 1 (LECS 1-4)
4 / Feb. 6	Fluid statics: layered fluids, pressurized prisms	6	2.8-2.9	
4 / Feb. 8	Fluid statics: forces on curved surfaces	7	2.10	Homework 2 Due
5 / Feb. 13	Fluid statics: buoyancy, stability	8	2.10-2.12	
5 / Feb. 15	Review of Fluid Statics		Ch 2	Quiz 2 (LECS 5-8)
6 / Feb. 20	Bernoulli Equation	9	3.1-3.6	
6 / Feb. 22	Bernoulli Equation Applications	10	3.6	Homework 3 Due
7 / Feb. 27	Hydraulic Grade Line	11	3.7-3.8	
7 / Mar. 1	Energy Equation	12	5.3	Quiz 3 (LECS 9-12)
8 / Mar. 6	Review of Bernoulli-Energy Eqn		Ch 3, 5.3	
8 / Mar. 8	Fluid kinematics: flow classifications, total derivatives	13	4.1-4.3	Homework 4 Due
9 / Mar. 13	NO CLASS ☹ Spring Break			
9 / Mar. 15	NO CLASS ☹ Spring Break			
10 / Mar. 20	Fluid kinematics: total derivatives, conservation of mass	14	4.3, 5.1	
10 / Mar. 22	Linear momentum	15	5.2	Quiz 4 (LECS 13-16)
11 / Mar. 27	Angular momentum	16	5.3	
11 / Mar. 29	Review of Kinematics & Momentum		Ch 4, Ch 5	Homework 5 Due
12 / April 3	Dimensional Analysis, Buckingham Pi Theorem	17	7.1-7.3	
12 / April 5	Dimensional Analysis modeling and similitude	18	7.4-7.9	Quiz 5 (LECS 17-20)
13 / April 10	Viscous flow, boundary layers	19	9.1-9.2	
13 / April 12	Boundary layers, characteristics of pipe flow (Late Drop Deadline)	20	9.2,8.1	Homework 6 Due
14 / April 17	Laminar and Turbulent pipe flow	21	8.2-8.3	
14 / April 19	Turbulent pipe flow, Moody chart	22	8.3-8.4	Quiz 6 (LECS 21-24)
15 / April 24	Losses, non-circular conduits, multi-pipe systems	23	8.4-8.6	
15 / April 26	Froude classification, specific energy, Chezy and Manning Equations	24	10.1-10.4	Homework 7 Due
16 / May 1	Hydraulic jump/ Profile classifications	25	10.6	
16 / May 3	No Lecture/Winning Essays			Quiz 7 (LECS 25-29)