CE 360 FLUID MECHANICS (section 002)

Tuesday, Thursday 1-2:15 pm in 129 Waring

INSTRUCTOR: Dr. Michael Gooseff
OFFICE: 231 P Sackett Building
TELEPHONE: 867-0044
EMAIL: mgooseff@engr.psu.edu
OFFICE HOURS: Dr. Gooseff's: TUESDAYS 10 am-12 pm, THURSDAYS 3-5 pm, or by appointment

TA: Adam Ward (asw178@psu.edu) Office Hours: TUESDAYS 2:30-4 pm, WEDNESDAYS 10 am-12:30 pm, in Sackett Rm. 406 – if the door is locked, knock on it; this room accommodates many CEE graduate students.

REQUIRED TEXT: Young et al., *A Brief Introduction to Fluid Mechanics*, 4th Edition, John Wiley & Sons, Inc., New York, NY, 2007.

GRADING:		
	Participation	10% (In-Class Exercises)
	Homework	35%
	Bi-Weekly Quizzes	55%

Final 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, notes, a calculator, and scrap paper to each class. You will be participating in the solution and discussion of in-class exercise problems. You will work alone or 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.

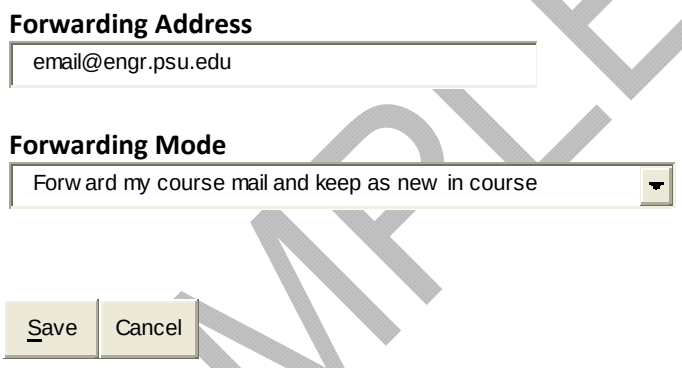
Note that participation counts for 10% of your grade. You are encouraged to keep your notes/materials organized.

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:



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 Friday 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 (on the class ANGEL site) after your assignments have been collected.

QUIZZES:

This class has no mid-term or final exams. Quizzes will be given in class on the dates listed below (every 2 weeks, on Fridays). You will be allowed one-side of a 3"x5" note card as a crib sheet for each quiz. Your grade in this class will not include your worst quiz grade. Make-up quizzes will not be given. In extreme cases, a quiz grade will be replaced by the average of your grades on the remaining quizzes (proof of illness or emergency will be required). For quizzes, you must work in pencil. You are allowed to bring in a calculator (in most cases the simplest of calculators will suffice), but no other cell phones, blackberries or any other electronics will be allowed.

EXTRA CREDIT:

1) *Fluids in the News*: This course introduces you to the importance of fluids, with an emphasis on the physical and engineering aspects of fluid mechanics. You can earn an additional 10% on each of the 7 homework assignments, 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. To earn this credit, you will need to submit a 1-paragraph (<300 words), well written synopsis with your homework assignment that provides:
   - Summary of the issue (in your own words)
   - Brief discussion of how the problem relates to this class (what principles covered in class are important in solving the problem?)
   - Reference for where you found the story
   - You must turn these in prior to or with each homework assignment throughout the semester (i.e., you have a 2 week window to generate each one).

2) *Essay Competition*: You are encouraged 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 human civilization?

   Your essay needs to be researched with citations, well written, and **original**. Furthermore, it 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 points added to their final grade. Any student who submits a high quality essay will receive a minimum of 2 points added to their final grade. The best essays will be published on the web.

Letters of Commitment are due February 3, 2009 (simply email me stating that you will participate).
Essays are due Tuesday, April 7, 2009 by 5pm with no exceptions.

ACADEMIC INTEGRITY

The College of Engineering' statement on academic integrity is available at http://www.engr.psu.edu/CurrentStudents/acadinteg.aspx. Please review this information as it provides details on what constitutes a violation of academic integrity, how violations are dealt with, and penalties for violations.

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

Lec. #	*Week/Date*	*Topic*	*Reading*	*Assignments*
1	1T – Jan. 13	Course Introduction	None	
2	1R – Jan. 15	Dimensions, Physical Properties	1.1-1.5	
3	2T – Jan. 20	Viscosity, Surface Tension	1.8-1.9	
4	2R – Jan. 22	Fluid Statics – Hydrostatic Distribution	2.1-2.4	Homework #1 due
5	3T – Jan. 27	Fluid Statics – Manometry	2.6-2.7	
6	3R – Jan. 29	Fluid Statics – Forces on plane surfaces	2.8-2.9	Quiz #1 (Lect. 1-5)
7	4T – Feb. 3	Fluid Statics – Layered fluids, pressure prisms ***ALSO – Deadline for Essay Commitment***	2.8-2.9	
8	4R – Feb. 5	Fluid Statics – Forces on curved surfaces	2.10	Homework #2 due
9	5T – Feb. 10	Fluid Statics – Buoyancy, stability, rigid body motion	2.11-2.12	
10	5R – Feb. 12	*Review of Hydrostatics*	Ch. 2	Quiz #2 (Lect. 6-9)
11	6T – Feb. 17	Fluids in Motion – Newton's 2nd law, acceleration along/normal to streamlines, Bernoulli Equation I	3.1-3.6	
12	6R – Feb. 19	Fluids in Motion – Bernoulli Equation II	3.6	Homework #3 due
13	7T – Feb. 24	Fluids in Motion – Energy & Hydraulic Grade Lines	3.7-3.8	
14	7R – Feb. 26	Fluids in Motion – Energy Equation	5.3	Quiz #3 (Lect. 10-13)
15	8T – Mar. 3	Review of Bernoulli & Energy Equations	Ch. 3, 5.3	
16	8R – Mar. 5	Fluid Kinematics – Velocity, Acceleration, and Control Volume Representation	4.1-4.3	Homework #4 due
Mar. 9-13, no lectures – Spring Break – Enjoy…				
17	9T – Mar. 17	Fluid Kinematics – Conservation of Mass	4.3, 5.1	
18	9R – Mar. 19	Fluid Kinematics – Linear Momentum	5.2	Quiz #4 (Lect. 14-17)
19	10T – Mar. 24	Fluid Kinematics – Angular Momentum	5.3	
20	10R – Mar. 26	Review of Fluids in Motion and Kinematics	Ch. 4, 5	Homework #5 due
21	11T – Mar. 31	Dimensional Analysis – Buckingham Pi Theorem	7.1-7.3	
22	11R – Apr. 2	Dimensional Analysis – Modeling, Similitude (guest lecture by A Ward)	7.4-7.9	Quiz #5 (Lect. 18-21)
23	12T – Apr. 7	Viscous Flow, Boundary Layers ***Essays Due***	9.1-9.2	
24	12R – Apr. 9	Viscous flow in pipes ***ALSO Late Drop Deadline is Apr. 10***	8.1	Homework #6 due
25	13T – Apr. 14	Laminar and Turbulent Flow in Pipes	8.2-8.3	
26	13R – Apr. 16	Turbulent Flow in Pipes, Moody Diagram	8.3-8.4	Quiz #6 (Lect. 22-35)
27	14T – Apr. 21	Pipe flow losses, multi-flow pipe systems, pump flow rate measurement	8.5-8.6	
28	14R – Apr. 23	Open Channel Flow – characteristics, surface waves	10.1-10.2	Homework #7 due
29	15T – Apr. 28	Open Channel Flow – specific energy	10.3	
30	15R – Apr. 30	Winning essays to be read by authors…		Quiz #7 (Lect. 26-29)