# ME 303: Fluid Mechanics MW 2-4 PM KCB 106

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### **Required Textbook/Course website:**

Munson, Young, Okiishi, Heubsch. *Fundamentals of Fluid Mechanics*, John Wiley and Sons, Inc., custom edition (available at bookstore or rental from Amazon)

#### **Student Companion Site:**

http://bcs.wiley.com/he-bcs/Books?action=index&itemId=0470262842&bcsId=4532

### Supplemental Textbook

Cenegal, Cimbala. Fluid Mechanics: Fundamentals and Applications, McGraw Hill, 2<sup>nd</sup> ed.

### **Course Learning Objectives:**

- Develop the ability to describe a fluid qualitatively and quantitatively
- Develop the ability to analyze a fluid under static and kinetic conditions
- Develop insight into how fluids flow close to and far from boundaries
- Gain an appreciation for the value of using experimental methods to measure fluid properties and characterizing fluid flow/behavior through dimensional analysis and lab-based experiments
- Gain experience in writing technical reports on lab-based experiments
- Gain insight into the application of fluid mechanics to practical problems in a variety of disciplines, including aerospace, mechanical, and biomedical engineering

#### Grading:

Comprehension:	20%
•	You will be quizzed each discussion period on assigned reading and lecture
	material. You may use your notes only for this quiz.
•	You will be quizzed on analytical techniques <b>one week</b> after chapter problems
	are assigned. Generally, the relevant equations for the quiz will be provided.
Laboratories:	30% (2 lab reports)
	10% deduction for not making own measurements
	15% deduction each day lab report is submitted late
Exams:	25% per exam (Midterm and Final)
Note: Grading is done	on a standard scale (i.e. A: 90-100; B: 79-89, etc.).

#### Assignments:

Problems will be assigned and solutions made available on Blackboard Learn. Problems will not be graded; however, you should complete the problems in order to acquire a thorough understanding of the

concepts and analytic techniques covered in class and to practice organizing your solutions. The problems and lectures will serve as the basis for quizzes to be given the week after the problems are assigned.

## Schedule of lab sessions

The GTF will work with you to schedule your labs. Expect to work in groups of 4-5 students. Students that do not honor their scheduled lab time will receive a 10-point deduction on their final lab grade. Lab manuals and example lab reports will be made available on Blackboard Learn.

Lecture	Required Reading	Торіс
1	Chapter 1	course introduction, basic fluid properties
2	Chapter 2, sec. 1-7, 11	hydrostatic pressure, manometry
3	Chapter 2, sec. 1-7, 11	manometry, buoyancy
4	Chapter 3, sec. 1-7	Bernoulli equation
5	Chapter 3, sec. 1-7	Bernoulli equation, stagnation point
6	Chapter 4, sec. 3-4	Reynolds Transport Theorem, conservation of mass
7	Chapter 5, sec. 1-2	conservation of mass, linear momentum equation (1st lab)
8	Chapter 5, sec. 1-2	linear momentum equation
9	Chapter 5, sec. 3	energy equation
10	Chapter 4, sec. 1-2	material derivative, velocity and acceleration fields
11	Chapter 4, sec. 1-2	velocity and acceleration fields, midterm review
12	Midterm exam	
13	Chapter 1 sec. 6	viscosity
14	Chapter 6, sec. 1-3	continuity equation, stream function
15	Chapter 6, sec. 3-4	inviscid flow equations of motion (Euler's EQs), velocity potential
16	Chapter 6, sec. 5	basic plane potential flows
17	Chapter 6, sec. 8-9	viscous flow equations of motion (Navier-Stokes EQs)
18	Chapter 8, sec. 1-2	fully developed laminar flow
19	Chapter 8, sec. 3	fully developed turbulent flow (2nd lab)
20	Chapter 8, sec. 4	major & minor losses in pipe flow
21	Chapter 8	analyzing pipe flow
22	Chapter 9, sec. 1-2	boundary layer for flat plate
23	Chapter 9, sec. 2	boundary layer for blunt object
24	Chapter 9, sec. 3-4	drag, lift
25	Chapter 9	analyzing external flow
26	Chapter 7, sec. 1-6	dimensional analysis, Pi terms
27	Chapter 7, sec. 8	modeling and similitude
28	final review	