ME 303 B1: Fluid Mechanics
TTH 12-2 pm GCB 209

Instructor: Dr. Tyrone M. Porter
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Graduate Teaching Fellows:
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Required Textbook/Coursewebsite:
Munson, Young, Okiishi, Heubsch. *Fundamentals of Fluid Mechanics*, John Wiley and Sons, Inc., custom edition (available at bookstore)

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, 2nd 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:

Quizzes:	20% (quizzes give Thursday after problems are assigned)
Laboratories:	30% (2 lab reports)
	10% deduction for not attending scheduled lab time for making 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 (think high school)…no curve is utilized!

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 more thorough understanding of the concepts 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 and I will work with you to schedule your labs. Lab manuals and example lab reports will be made available on Blackboard Learn.

Lecture	Required Reading	Topic
1	Fluid Properties	density, ideal gas law, vapor pressure, surface tension
2	Fluid Properties	compressibility, speed of sound, viscosity
3	Fluid Properties, Statics	viscosity, Pressure at a point; pressure field; manometry
4	Fluid Statics	Manometry, Hydrostatic force on planar surface
5	Fluid Statics, Dynamics	Hydrostatic force, Bernoulli equation
6	Fluid Dynamics	Bernoulli Equation & Limitations
7	Control Volume (CV) Analysis	Reynolds Transport Theorem (RTT)
8	CV Analysis	RTT, Conservation of mass
9	CV Analysis	Linear Momentum
	Lab #1 (tent. Oct. 7)	
10	CV Analysis	Linear Momentum; Energy Equation
11	CV Analysis	Energy Equation
12	Midterm Rev, Dimensional Analysis	Buckingham Pi Theorem
	Midterm Exam	
13	Modeling & Similitude	Inspection Method, modeling & similitude
14	Modeling & Similitude	Inspection method, modeling & similitude
15	Internal Flow	Fully developed laminar flow
16	Internal Flow	Fully developed turbulent flow (2nd lab)
17	Internal Flow	Major & minor losses in pipe flow
	Lab #2 (tent. Nov. 11)	
18	Differential Analysis	stream function; velocity potential; material derivative
19	Differential Analysis	Euler's Equations of Motion
20	Differential Analysis	Navier-Stokes Equations of Motion
21	Differential Analysis	Analytical solutions to Navier-Stokes
21	External Flow: Sec. 1-2	External flow, boundary layer
22	External Flow Sec. 2-3	boundary layer, Drag
23	External Flow: Sec. 3-4	Drag, lift
24	Final Exam Period	Lift
25	Final Exam Review	Review

Lab report #1 due Oct. 17, can resubmit corrected report for re-grading
Lab report #2 due Nov. 24, no resubmission