ME 303: Fluid Mechanics
MW 10 AM-12 PM EPC 205
Discussion A2 Tuesday 9-10 AM PHO 202
Discussion A3 Monday 2-3 PM PRB 148
Discussion A4 Tuesday 4-5 PM EPC 201

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Required Textbook:
Munson, Young, Okiishi, Heubsch. *Fundamentals of Fluid Mechanics*
John Wiley and Sons, Inc., 7th Edition

Student Companion Site:
http://bcs.wiley.com/he-bcs/Books?action=index&itemId=1118116135&bcsId=7240

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 experimental methods to measure fluid properties and characterization of 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 given approximately weekly)
Laboratories: 30%
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.

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 will be made available on Blackboard Learn.

Lecture	Required Reading	Topic
1	1. Introduction (1.1-1.4)	Goals and expectations; Brief history of fluid mechanics; What is a fluid? Density and compressibility
2	2. Fluid Statics (2.1-2.7)	Pressure at a point; Hydrostatic pressure
3	2. Fluid Statics (2.8-2.12)	Hydrostatic pressure on objects; Buoyancy
4	4. Fluid Kinetics (4.1-4.2)	Euler vs Lagrangian picture; Material derivative
5	3. Bernoulli Equation (3.1-3.3)	Derivation of Bernoulli equations
6	3. Bernoulli Equation (3.4-3.8)	Use and limitations of Bernoulli equations
7	4. Fluid Kinetics (4.3-4.4)	Reynolds transport theorem
8	5. Control Volume Analysis (5.1)	Conservation of mass
9	5. Control Volume Analysis (5.2)	Newton's 2nd law; Conservation of momentum
10	5. Control Volume Analysis (5.3)	Conservation of energy
11	5. Control Volume Analysis (5.4)	Irreversible flow; Example problems
12	**Midterm**	
13	1. Introduction (1.5-1.9)	Viscosity; Surface tension
14	7. Dimensional Analysis (7.1-7.6)	Dimensional analysis; Buckingham Pi Theorem
15	6. Differential Analysis (6.1-6.3)	Infinitesimal control volumes; Vorticity; Stream function
16	6. Differential Analysis (6.4-6.7)	Euler equations; Potential flows; Superposition
17	6. Differential Analysis (6.8-6.10)	Navier-Stokes Equations; Reynolds number
18	8. Internal flows (8.1-8.2)	Dimensional analysis of pipe flow Fully developed laminar flow
19	8. Internal flows (8.3)	Fully developed turbulent flow
20	8. Internal flows (8.4)	Major and minor losses in pipe flow
21	9. External flows (9.1)	External flow
22	9. External flows (9.2)	Boundary layers
23	9. External flows (9.3)	Drag
25	9. External flows (9.4)	Lift
26	7. Dimensional Analysis (7.7-7.10)	Modeling and similitude
27	**Final Exam Review**	