**ME 303: Fluid Mechanics**
**MW 10 AM-12 PM COM 213**
**Discussion Friday 12-1 PM PHO 205**

**Instructor:** Dr. Tyrone M. Porter
**Office:** ENG 319
**Office Hour:** Fri 10-11 am or by appointment
**Email:** tmp@bu.edu

**Graduate Teaching Fellow:** Steven Scherr
**Office:** PHO 717
**Office Hour:** TBD
**Email:** sscherr@bu.edu

**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, 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:**

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 one week 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 (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 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 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 | Chapter 1 | course introduction, basic fluid properties, viscosity |
| 2 | Chapter 2, sec. 1-7, 11 | viscosity, surface tension, hydrostatic pressure |
| 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 |
| 6 | Chapter 4, sec. 3-4 | Reynolds Transport Theorem |
| 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 | exam solutions | |
| 14 | Chapter 6, sec. 1-2 | conservation of mass, stream function |
| 15 | Chapter 6, sec. 3-4 | inviscid flow equations of motion, velocity potential |
| 16 | Chapter 6, sec. 5 | basic plane potential flows |
| 17 | Chapter 6, sec. 8-9 | viscous flow equations of motion |
| 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 | pipe flow measurements | |
| 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 7, sec. 1-6 | dimensional analysis, Pi terms |
| 26 | Chapter 7, sec. 8 | modeling and similitude |
| 27 | final review | |