ME 303 A1: Fluid Mechanics Fall 2017

Lead Instructor:
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Contributing Instructor:
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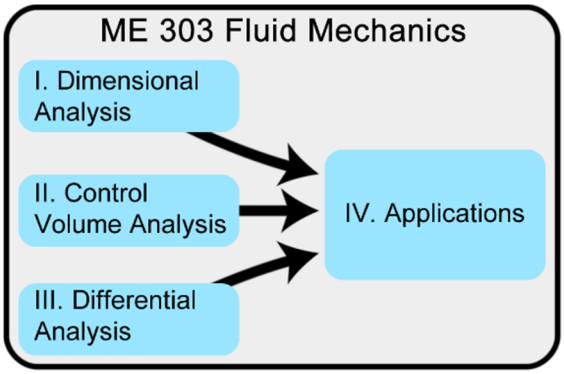
Course schedule:
Lecture: Monday and Wednesday 10:10-11:55 (STH-B19)
Office hours: Tuesdays 12:30 – 1:30 PM (Brown – ENG 305)
for extra hours, please email brownka@bu.edu
Discussions: Review material with GTF / discuss homework
Tue: 11:15am-12:05pm PSY B37
Mon: 2:30-3:20pm PRB 150
Tue: 3:35-4:25pm EPC B05
Labs: ENG 113, time to be scheduled
GTF: Huy Do (xhuydo@bu.edu) Office Hours: Thursdays 3-4PM, ENG 414

Textbook: Fundamentals of Fluid Mechanics by Munson et al., Wiley 8th edition

Course web page: Blackboard

Prerequisites: ENG EK 301 or equivalent.

Course learning objectives:
This course is designed to teach fundamental concepts of fluid dynamics through a broad range of applications. In particular, we will cover:



1) Dimensional analysis: the ability to explore a problem based upon the dimensions of the parameters. While this cannot provide exact answers, it is extremely useful for determining scaling relationships and identifying factors that can be ignored.
2) Control volume analysis: solving constitutive equations and conservation laws in integral form to understand the behavior of fluids.
3) Differential analysis: directly solving governing equations such as the Navier-Stokes equations as a means of understanding fluid behavior.
4) Applications of these problem solving approaches in disciplines including aerospace, mechanical, and biomedical engineering. A critical skill to be acquired is the ability to identify which analysis method is most appropriate for a given problem and justifying assumptions.

Policy on collaboration:
Collaboration is encouraged on homework and labs, however students should turn in their own work in their own words. No collaboration is permitted on exams.

Grading:

Homework (10%):	Problem sets assigned roughly every week
Lab reports (21%):	Three laboratory exercises; must complete to pass the course
Exams (42%):	Three closed-book exams; formula sheet will be provided
Final Exam (21%):	Closed book; formula sheet will be provided.
Participation (6%):	Will be evaluated on overall participation in class and discussion

Homework:
Homework assignments will be announced in class and on the course webpage. Homework can be passed in during class or at the ME front desk.

- Due date and time will be specified on the assignment.
- Late homework will not be accepted.

Lab exercises:
There will be three lab exercises for this course. Sign-up sheets will be posted in advance of the labs. The experiments will be done in groups, but lab reports will be done individually.

- Reports are limited to a **strict 4 page length limit**. *pages beyond 4 will not be graded*
- Fonts must be 11 pt or larger, margins must be 1" or larger
- Students will not receive credit for turning in a laboratory report if they have not physically completed the laboratory exercise.
- Individual laboratory reports are due at 4 PM on to the ME office.
- Email submission is acceptable in cases of emergency; email both Prof. Brown and the GTF.
- Late reports WILL NOT be accepted without prior approval from Prof. Brown.

Exams:
Each exam will take place over an entire class period. Each exam will cover a block of lectures as noted in the schedule. The Final Exam is cumulative.

- Missing an exam due to vacation is not excusable. Arrangements will be made on a case-by-case basis for documented emergencies or University conflicts.
- Students requiring additional time to complete examinations must supply proper documentation from the Office of Disability Services at ***least 3 days in advance*** of an examination to the instructor so suitable arrangements can be made.
- The final exam is Monday December 18th in the Lecture room from 9 AM to 11 AM

Boston University Academic Conduct Code*:* Honesty is a core value of Boston University. Any violations of BU academic honesty and integrity standards ***will be pursued*** through appropriate University channels. This includes, but is not limited to: cheating, plagiarism and misrepresentation. If you have any questions as to what constitutes an honor code violation, please ask. ***Ignorance is not an excuse for cheating***. You may access the BU Academic Conduct Code at:
http://www.bu.edu/academics/policies/academic-conduct-code/

Course Schedule:

The following is an approximate schedule for the course

Date	Topic	Reading
Sept 6	Lecture 1: Overview of Fluid Properties	1
Sept 11	Lecture 2: Pressure	2.1-6
Sept 13	Lecture 3: Dimensional Analysis	7.1-6
Sept 14,15	**Lab 1 – Dimensional Analysis of Pipe Flow (due 9/25)**	
Sept 18	Lecture 4: Dimensional Analysis of Internal Flows	8.4.1
Sept 20	Lecture 5: Dimensional Analysis of External Flows	9.1,3
Sept 25	Lecture 6: Modeling and Similitude	7.0-7
Sept 27	Lecture 7: Introduction to Control Volumes	4.3-4
Oct 2	**Exam 1 on Lectures 1-6**	
Oct 4	Lecture 8: Conservation of Mass	5.1
Oct 10	Lecture 9: Conservation of Energy	5.3
Oct 11	Lecture 10: Problem Solving with the Bernoulli Equation	3.6
Oct 12,13	**Lab 2 – Bernoulli's Equations (due 10/23)**	
Oct 16	Lecture 11: Conservation of momentum	5.2
Oct 18	Lecture 12: Problem Solving with Control Volumes	
Oct 23	Lecture 13: Kinematics I	4.1
Oct 25	**Exam 2 on lectures 7-12**	
Oct 30	Lecture 14: Kinematics II	4.2; 6.1
Nov 1	Lecture 15: Conservation of Mass	6.2
Nov 6	Lecture 16: The Navier-Stokes Equations	6.3,8
Nov 8	Lecture 17: Unidirectional flow	6.9; 8.2
Nov 9,10	**Lab 3 – CFD and Laminar Flow (due 11/20)**	
Nov 13	Lecture 18: Buoyancy and Hydrostatic Forces	2.8-12
Nov 15	**Exam 3 on Lectures 13-17**	
Nov 20	Lecture 19: Inviscid Flows	6.4-5
Nov 27	Lecture 20: Lift and the Magnus Effect	6.6-7; 9.4
Nov 29	Lecture 21: Boundary Layers and D'Alembert's Paradox	9.2
Dec 4	Lecture 22: Turbulence	8.3
Dec 6	Lecture 23: Pipe Networks	8.5
Dec 11	Lecture 24: Review/Special Topics	