University of Massachusetts
Mechanical and Industrial Engineering 607
Fall 2014

Advanced Fluid Dynamics

TTh 11:30-12:45PM Elab 325

This class will cover the fundamentals of fluid mechanics, with a focus on inviscid flow. Upon completion of the class, students will have obtained the following: A sound physical understanding of the fluid mechanics; the ability to use vector calculus to solve problems in fluid mechanics; an understanding of the fundamental kinematics and conservation equations; and the ability to analyze a variety of flows, both compressible and incompressible.

Instructor

Professor Jonathan P. Rothstein
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Office hours: Fridays 2:30-3:30PM
Tuesday 4:00-5:00PM

Web Page http://www.ecs.umass.edu/mie/faculty/rothstein/mie607.htm

Course Texts David C. Wilcox, *Basic Fluid Mechanics,* Fifth Edition, DCW Industries, 2013.

Grading The course grade will be based on the following:

Homework	20%
Two Midterm Exams	20% each
Final Exam	40%

Homework A set of homework problems will be assigned roughly once a week during lectures. You should work through these problems carefully as they are essential for your learning of the material. The problems will be typically collected and graded on Tuesdays.

Note, homeworks will not be graded in extreme detail, however, solutions will be provided on the website. I will look to see that the problem was completed and that the solution is reasonable. Possibly grades will be 0, √-, √, √+, which correspond to "no effort," "minimal effort/completely incorrect," "good effort/mostly correct," and "good effort/correct or very close." The numerical values for each grade are 0, 4, 8, 10.

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Course Syllabus

Topics	**Reading**
Introduction	[Chapter 1]
Overview of Vector Calculus and Tensor Notation	[Chapter 1 + Handouts]
Development of the Governing Equations	[Chapters 4-6 and 12]
Some Exact Solutions to the Newtonian Navier-Stokes Equations	[Chapter 13]
Potential Flow	[Chapter 11]
Boundary Layer Theory	[Chapter 14]
Waves	[Chapter 7]
Compressible Flow	[Chapters 7 and 8]