

MAE 2315 - Fluid Dynamics

Spring 2010

Mo/We/Fr 9:00AM - 9:50AM Room: WH 402

This is based on the most recent information available. If you have special concerns about course information, you are advised to contact the instructor.

Instructor:	Dr. Luca Maddalena
Office Location:	315 E Woolf Hall
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Course Prerequisites:

Math 2326, MAE2323, MAE3360 (concurrent).

Required Readings/Materials:

Text: Fluid Mechanics, 6th edition, by Frank M. White.

Course Description:

Fluid properties; Dimensional analysis; Conservation equations in integral and differential form; potential flow theory, airfoil and finite wing theory; viscous flow.

Course Learning Goals and Objectives:

Basic concepts of fluid mechanics and low speed aerodynamics.

Attendance and Drop Policy:

Attendance is required.

Tentative Lecture/Topic Schedule (course content):

Introduction

- Basic concepts
- Dimensions and Units
- Fluid Properties-thermodynamic, viscosity
- Velocity field/streamlines

Fluid Statics

- Hydrostatic forces
- Center of pressure
- Resultant forces and moments
- Buoyancy and stability

Integral Relations for a Control Volume

- Conservation laws
- Reynolds transport theorem
- Conservation of mass
- Conservation of momentum
- Conservation of Energy
- Bernoulli's equation

Differential Relations for Fluid Flow

- Material derivative
- Conservation of Mass, Momentum, Energy in differential form
- Navier-Stokes Equations
- Stream/potential functions
- Vorticity and circulation
- Fundamental Planar potential flows (non-lifting)
- Fundamental Solutions for Incompressible viscous flows

Dimensional Analysis

- Buckingham Pi Theorem
- Non-dimensional coefficients for aerodynamics
- Modeling and Similitude

Viscous Flow

- Reynolds number regimes
- Introduction to Turbulence
- The boundary Layer concept

Potential Flows

- Planar potential flows (lifting and non-lifting)
- Kutta-Joukowski Theorem
- Airfoil characteristics and nomenclature
- Kutta condition
- Thin airfoil theory
- Flow over finite wings: downwash and induced drag
- Lifting Line theory

Specific Course Requirements

Examinations:

2 mid-term exams + final exam.

Final Examination:

Final Exam Comprehensive.

Other Graded Assignments:

One homework set per week. Must be neat with staple pages. Late homeworks penalized by 10% per day. All homeworks that are obviously copied will receive a score of zero. One final project.

Missed Exams, Quizzes and Makeup Work:

No makeup exams unless arrangements are made in advance. No extra credit assignments will be given.

Grading Format Weighting / Point Value of Assignments and Examinations:

Homework: 10%, Project: 10%; 2 mid-term exams: 25% each, final exam: 30%

(Grading Scheme: A: 90-100%; B: 80-89%; C: 70-79%; D: 60-69%; F: <60%)

Other Information:

One final project based on a selected topic will be graded. Students will demonstrate the ability to analyze and solve aerodynamics problems of engineering interest. Further information will be provided in class.

Americans With Disabilities Act:

The University of Texas at Arlington is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 93112 -- The Rehabilitation Act of 1973 as amended. With the passage of new federal legislation entitled Americans With Disabilities Act - (ADA), pursuant to section 504 of The Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens.

As a faculty member, I am required by law to provide "reasonable accommodation" to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests with informing faculty at the beginning of the semester and in providing authorized documentation through designated administrative channels.

Academic Dishonesty:

It is the philosophy of The University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University.

"Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts." (Regents' Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22)

Student Support Services Available:

The University of Texas at Arlington supports a variety of student success programs to help you connect with the University and achieve academic success. These programs include learning assistance, developmental education, advising and mentoring, admission and transition, and federally funded programs. Students requiring assistance academically, personally, or socially should contact the Office of Student Success Programs at 817-272-6107 for more information and appropriate referrals.

For assistance with your library needs in this course, please consult the appropriate [subject librarian](#).
