## MAE 3302 Aerodynamics of Incompressible Flow Fall 2001

M W F 8:00-8:50AM Woolf Hall 210

## **Professor Thomas S. Lund**

Office:	316C Woolf Hall
Hours:	10:00-13:00 Tu, Th
	Other times by appointment
e-mail:	${ m lund}@{ m uta.edu}$
Phone:	(817) 272-7053

Course Web Site: http://www-woolf.uta.edu/mae3302

Teaching Assistant:

Mr. Abhijit Tilak Office: 315F Woolf Hall Hours: Tu, Th 13:00-16:00

**Required Text:** Anderson, J. D., *Fundamentals of Aerodynamics*, Third Edition, McGraw-Hill, 2001. (Earlier editions 1984,1991).

Optional Supplemental Text: Kuethe, A. M. and Chow, C.-Y. Foundations of Aerodynamics, Fifth edition, Wiley, 1998.

## Prerequisites

MAE 2314, MAE 3360.

## Purpose of the course

To provide and introduction to aerodynamic theory applied to low-speed flows. Special attention will be given to applications concerning the prediction of aerodynamic characteristics of wings and bodies. Important topics to be covered are conservation laws for inviscid, incompressible fluids, potential flow theory, two-dimensional airfoil theory, the effects of camber, thickness, and angle of attack, three-dimensional wing theory, induced drag, the effects of twist, taper, and washout, aerodynamic influence of wing-tail combinations.

## **Course Outline**

1. Introduction to Aerodynamics

Historical perspective, classification of flow regimes, aerodynamic forces and moments, dimensional analysis and similarity, aerodynamic coefficients.

2. Review of Fundamentals of Fluid Mechanics

Vectors and vector fields, control volume analysis, conservation laws, pathlines and streamlines, fluid rotation and rate of strain, stream function, velocity potential.

Exam I

3. Inviscid, incompressible flow

Bernoulli's equation, measurement of airspeed, potential flow theory, Laplace's equation, elementary solutions; source, vortex, and doublet, flow over a cylinder, Kutta-Joukowski theorem, the generation of lift.

4. Two-dimensional, incompressible airfoil theory

Airfoil characteristics and classifications, vortex sheet, Kutta condition, thin airfoil theory, the effects of thickness and camber, effects of flaps and slats.

Exam II

5. Three-dimensional, incompressible airfoil theory

The finite wing, downwash and induced drag, vortex filaments and the Bio-Savart law, lifting line theory, the effects of taper, twist, and washout, lifting surface theory.

Final Exam

## **Course Mechanics**

Homework:	Given every Wednesday					
	Due the following Wednesday					
	No late homework accepted without prior approval You may work together but write the solution in your own words.					
	All homeworks that are obviously transcribed will receive a score of zero. Homework assignments will frequently require the use of a computer.					
Computer Project:	In addition to the homework assignments, a term computer project will be assigned.					
	An optional computer project will also be made available. It is to be done in addition to those required and can be used to raise your final course grade a maximum of one half of a letter grade. You may use any computer system that is convenient for you. The only restrictions are that you must be able to write a program (in any language), run it, obtain a printout, and preferably two- dimensional graphs and contour plots. An option will be available to use existing software instead of writing your own programs. Less than full credit will be given in this case. <b>The term project is due on Monday, 3 December</b>					
Exams:	2 Mid-term Exams					
	Final exam					
	Tentative dates for the Mid-term exams are:					
	1. Monday, 1 October					
	2. Monday, 5 November					
	The final exam is Friday, 14 December, 8:00-10:30					
	Homework $20\%$					
Grades:	Computer Project 20%					
	Exam I 15%					
	Exam II 15%					
	Final Exam $\frac{30\%}{5000}$					
	100%					

# Assignment Calendar

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#### 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, here 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. If you require an accommodation based on disability, I would like to meet with you in the privacy of my office during the first week of the semester to make sure that you are properly accommodated.

#### 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 suspensions 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)