

STANFORD UNIVERSITY
Department of Aeronautics and Astronautics
AA 200A Applied Aerodynamics

Instructor: Brian Cantwell, 379 Durand, x 3-4825, cantwell@stanford.edu

Class hours and location: TTh 2:15-3:30, Huang 18

Instructor office hours: TTh 4:00-5:00, open door and by appointment

Required Text: Course Reader, *Applied Aerodynamics* (available on my website <http://web.stanford.edu/~cantwell/>)

Recommended Text: M. Van Dyke, *An Album of Fluid Motion*, Parabolic Press

Reserve Book List

R. T. Jones, *Wing Theory*, Princeton

J. D. Anderson, *Fundamentals of Aerodynamics*, McGraw Hill

K. Karamcheti, *Principles of Ideal-Fluid Aerodynamics*, Wiley

R. Von Mises, *Theory of Flight*, Dover

H. Schlichting and Gersten, *Boundary Layer Theory*, Springer

B. J. Cantwell, *Introduction to Symmetry Analysis*, Cambridge

P. G. Saffman, *Vortex Dynamics*, Cambridge

L. Prandtl and O.G. Tietjens, *Fundamentals of Hydro and Aeromechanics*, Dover

L. Prandtl and O.G. Tietjens, *Applied Hydro and Aeromechanics*, Dover

List of Topics

1. Fundamentals of fluid motion
2. Dimensional analysis
3. The equations of motion in differential and integral form
4. Alternate forms of the equations of motion, rotational and irrotational flow
5. Kinematics of fluid flow, 2-D and 3-D flow separation
6. Viscous flow along a wall, boundary layers, pipe flow, channel flow, intro to symmetry methods
7. Boundary layer integral equation, Thwaites' method, Head's method
8. Elements of incompressible potential flow
9. 2-D Airfoils, generation of circulation, incompressible thin airfoil theory
10. Wings of finite span, induced drag, the Prandtl equation, wake models
11. Compressible thin airfoil theory, transonic wings, the effect of sweep
12. Viscous free shear flows, jets, wakes, vortex rings

Exam Dates: Midterm Exam - Tuesday May 5, 2:15-3:30 PM

Final Exam - Friday June 5, 3:30-6:30 PM

Grading: Homework - 25% ; Midterm - 25% ; Final - 50%

Exam policy - Exams are taken in class during the assigned time. Students are permitted to bring books, notes and tables as well as a graphing calculator to the exams. Laptops are allowed to access course notes. Use of the internet is not allowed. Exams will not be provided at any other time than that indicated above.

Homework policy - The understanding gained through solving problems is absolutely crucial to learning the course subject matter and demonstrating proficiency on the exams. Indeed, most of the homework problems contained in the class notes were exam problems at some time in the past. You are not expected to work on homeworks in total isolation; seek out your peers, the course assistants and the instructor when you need help on the problems. This is a fundamental part of the learning experience. Just be sure that whatever you hand in is your own work. Homeworks that are turned in by 5:00 PM on the date due will be carefully examined, graded and returned. There is a considerable effort required to grade the homeworks. Please be considerate of the Course Assistants and make every effort to turn your homework in on time. Late homeworks will not be graded. They will be assigned up to 3/5 credit depending on effort and returned without examination.