Computational Fluid Dynamics (AE/ME 339)

Fall 2005

T/Th. 12:30-1:45, Room, 208 ME Building

August 23, 2005

Instructor: K. M. Isaac

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Text: Computational Fluid Dynamics, John D. Anderson, Jr., McGraw-Hill
ISBN 0-07-001685-2

References: Computational Fluid Mechanics and Heat Transfer, Tannehill, Anderson and Pletcher.

Required Reading: Will be announced in each class. This should be completed before coming to the next class

Grading: Homework, projects, quizzes: 31%, tests: 23% each, final: 23%

Attendance: Required. Please let me know in advance if you have to miss class. Those who miss class without acceptable reason will be dropped.

Homework: Due on the announced dates, at the beginning of class. No late homework please. Not all homework will be graded. Should be neatly done and stapled together. Projects and homework involving computer programs should be organized according to good technical writing practice. Avoid raw printout of computer output. Group graphs logically and avoid printing them one per page. In any case, **do not exceed 10 pages**. Learn how to use a good plotting program such as TecPlot.

Office hours: MW: 1:30-2:30 (any changes will be announced. Make sure to check your email messages daily). Also by appointment. You may also use email and/or phone for assistance.

Test dates: Thursday, September 29; Thursday, November 10.

Final exam: 4:00-6:00, Monday, December 12.

Grading: **Undergraudate students**: A: 90% and above, B: 80-89%, C: 70-79%, D: 60-69%, F: Below 60%
Graduate students: A: 90% and above, B: 80-89%, C: 70-79%, F: Below 70%

AE/ME 339 Syllabus

Review of numerical methods for ordinary differential equations; engineering examples
Introduction to partial differential equations, classification
Basic finite difference forms for derivatives
Truncation error and round-off error
Explicit and implicit methods
Stability of numerical methods
Crank-Nicolson method, ADI method
Treatment of boundary conditions
Linear PDE examples from heat conduction
Navier-Stokes equations
Numerical solution of the flow over a heated wall
Representative methods of solution of Navier-Stokes equations
Relaxation techniques
Pressure correction method
Burgers equation
MacCormack's method
Beam and Warming method
Solution of the shock tube problem
Potential flow over a cylinder
Flow in a de-Laval nozzle
Grid generation