Syllabus
MAE561/471 Computational Fluid Dynamics - Fall 2013
Tuesday/Thursday 1:30-2:45 PM GWC535

Instructor: Huei-Ping Huang, ERC 359, Email: hp.huang@asu.edu
Office Hours: Tuesday/Thursday 3:00-5:00, or by appointment
Course website: http://www.public.asu.edu/~hhuang38/MAE561.html

Course Outline

Part I  Overview
  ● Overview of equations in fluid dynamics & applications (instructor's note)
  ● Review of basic partial differential equations (PDEs) (1.2–1.7, 1.10, 1.11)
  ● Review of numerical differentiation & related concepts (2.2, 2.4–2.6)

Part II  Numerical solutions of prototypical PDEs
  ● One-dimensional linear advection/diffusion/wave equations
    ○ Construction of finite difference schemes: advection equation (6.2, 6.4, 6.5)
    ○ Construction of finite difference schemes: diffusion equation (3.2–3.5)
    ○ Numerical convergence (instructor's note)
    ○ Numerical stability (4.3, instructor's note)
    ○ Boundary conditions (instructor's note)
  ● One-dimensional Nonlinear PDE
    ○ Numerical treatment of nonlinear terms (6.6)
    ○ Conservation law (instructor's note)
  ● Elliptic PDE (5.1–5.4)
  ● Higher-dimensional PDEs
    ○ Grid arrangement and grid generation (3.7, 3.13, 8.7, 9.1–9.5)
    ○ Boundary conditions (instructor's note)

Part III  Numerical solutions of Navier-Stokes equations
  ● Overview of 3-D N-S equations (instructor's note)
  ● Boundary conditions (instructor's note, 8.6, 8.9)
  ● Simplified versions of N-S equations (1-D idealized, etc.) (instructor's note, 7.5)
  ● Numerical models of 2-D incompressible flow (8.1–8.12: topic for final project)
  ● CFD solvers (Lab work using ANSYS-Fluent - Computer lab at GWC 481)

Grade: Nominally 65% homework, 35% final project.
Attendance is important. The lectures will only loosely follow the textbook.

Useful links
ASU policy on academic integrity: https://provost.asu.edu/academicintegrity
Campus safety and security: https://provost.asu.edu/University-Safety-Security
Grade and grading policies: https://students.asu.edu/grades
Counseling and consultation: https://students.asu.edu/counseling
SEMTE advising: http://engineering.asu.edu/semte/Advising.html
ASU common software/applications portal: https://apps.asu.edu (login required)
MATLAB searchable online documentation: http://www.mathworks.com/help/techdoc/?s_iid=ML2012_bb_doc
MATLAB online examples: http://www.mathworks.com/products/matlab/examples.html