Syllabus for
ME 5317, Spring 2007

The course begins by reviewing the equations of motion for viscous fluids. Energy equation that governs the heat flux across a fluid layer is introduced. A discussion of forced and free convection solutions is an integral part of this course.

Course Outline

1. Review of fluid mechanics
   - continuity equation
   - momentum equation
2. Derivation of energy equation.
3. Boundary layer equations.
4. Flow over flat plate
   - similarity solutions
   - Blasius equation
   - natural convection
5. High-speed flow over a flat plate.
6. Momentum and energy integral equations
   - flow over a flat plate
   - flow in the presence of a pressure gradient
   - flow in porous media
7. Condensation and flow over a vertical plate.
8. Internal flow
   - flow in circular ducts
   - flow in noncircular ducts
   - Flow through porous passages
9. Turbulent flow
   - Reynolds stresses
   - Boussinesq approximation
   - von Karman turbulence model
   - universal velocity profile
   - Deisler model

Exams: 1 Mid-semester (50%) and 1 final (50%)

Textbook: None, see the Web page of this course for class notes.

References:

1. *Convective Heat Transfer* by L. C. Burmeister, Wiley
2. *Convective Heat and Mass Transfer* by W. W. Kays and M. E. Crawford, McGraw-Hill
3. *Boundary Layer Theory* by H. Schlichting, McGraw-Hill
4. *Analysis of Heat and Mass Transfer* by E. R. G. Eckert and R. M. Drake, McGraw-Hill