Ch 6 Convection: Introduction
Ch 7 External Forced Convection
Ch 8 Internal Forced Convection

Concepts:
- Velocity (or Hydrodynamic) Boundary Layer
- Thermal Boundary Layer
- Newton’s Law of Cooling
- Local vs. Average Convection Coefficients
  - effect of geometry on coefficients
- Laminar vs. Turbulent Flow (esp for flat plates and cylinders)
- Dimensionless Parameters: most important: Nusselt # and Prandtl #
- Correlations for Nu- depend on many factors:
  - External vs. Internal Flow
  - Geometry (flat plate, cylinder, sphere, tube bank, etc.)
  - Reynolds Number
  - Pr (liquid metals)
  - Laminar/Turbulent/Mixed Flow Correlations (External Flow)
  - Inside/Outside of Fully Developed (thermal) Flow ($x_{FD,t}$) (Internal Flow)
    - (Entry Length)

Choice of Different Temperatures for Measuring Fluid Properties
- Film Temperature
- Surface Temperature
- Bulk Fluid Temperature
- Mean Fluid Temperature (for internal flow or tube banks)

Choice of driving forces for heat transfer equation (Newton’s law of cooling)
- $T_s - T_{\text{inf}}$
- $T_s - T_{\text{mean}}$
- LMTD

Iterative Problems (when do these happen?)

Connection between Heat Transfer and Pressure Drop (tube banks and internal flow)

What options do you have to improve convective heat transfer in a process?

Internal Energy ($U$) Change for Fluids (tube banks and internal flow)

Bookmark Tables at the end of Chapter 7 & 8!

Recall Earlier Concepts: Thermal Resistances! Fourier’s Law!