CHAPTER 6: EXTERNAL FORCED CONVECTION

CHAPTER OUTLINE

1. Flat plate in parallel flow
   a. Pressure considerations
   b. Similarity solution for velocity BL
   c. Numerical solution and velocity BL characteristics (handout 6.1)
   d. Similarity solution for thermal BL
   e. Numerical solution and thermal BL characteristics (handout 6.2)
   f. Summary of cases (handout 6.3)
   g. Calculation examples (handout 6.4, handout 6.5)

2. Cylinder in cross flow
   a. BL structure and convection heat transfer (handout 6.6)
   b. Example (handout 6.7)

3. Flow over a sphere
   a. Whitaker correlation
   b. Ranz and Marshall correlation

4. Flow across banks of tubes
   a. Description
   b. Heat transfer analysis (handout 6.8)
   c. Example (handout 6.9)

CHAPTER OBJECTIVES

- Develop an intuitive understanding of friction drag and pressure drag, and evaluate the average drag and convection coefficients in external flow
- Evaluate the heat transfer associated with flow over a flat plate for both laminar and turbulent flow
- Calculate the average heat transfer coefficient for cylinders and spheres in cross flow
- Determine the pressure drop and the average heat transfer coefficient associated with flow across a tube bank