

ENGRD 221: ENGINEERING THERMODYNAMICS

Lecture 7: September 13, 2007

Reading Assignments (from Moran & Shapiro, Sixth Edition): Sections 4.6 – 4.11. Note that the examples given in this chapter are the most essential part of the presentation. We will continue on lecture 8 with a review of lectures 6 and 7 and proceed with examples for the analysis of transient systems (section 4.12).

Topics covered:

- Review of lumped and continuum (integral) formulations of mass balance for open systems
- Review of conservation of energy (1st thermodynamics law) for lumped open systems
- Control surface in a general flow, convected energy, flow work, heat transfer at the control surface, heat flux vector
- The integral energy balance, enthalpy formulation, comparison with the lumped formulation
- Applications of energy and mass conservation in the analysis and design of energy system components
 - Nozzles and diffusers, assumptions for analysis, example problem
 - Throttling devices, porous plug throttling device, principles of operation, state diagram, example problem
 - Compressors and pumps, turbine type compressors, rotary type compressors, assumptions, example problem
 - Turbines, assumptions, example problem
 - Heat exchangers, review of various types of heat exchangers, heat exchanger with fluids mixed, heat exchanger with unmixed fluids, cross and counter flow heat exchanger, parallel flow heat exchanger, tube heat exchangers, example problem