ROMA TRE UNIVERSITÀ DEGLI STUDI Ingegneria

ROMA THMO 203: Thermodynamics

Instructor
TBA

Credits
4 credit-hour, or 60 contact hours

Textbook

- Van Wylen, G., Sonntag, R., Borgnakke, C., *Fundamentals of Classical Thermodynamics*, 4th Ed., Wiley and Son, 1994.
- Reader and notes provided by professor

Objective

For students to develop an understanding of the first and second laws of thermodynamics, particularly when applied to open and closed steady-state systems and to real physical processes. To learn how to evaluate thermodynamic properties using equations, and thermodynamic data, in both tabular and in chart form. To appreciate the role of thermodynamics in engineering and society.

Topics

- Basic Concepts: Properties of matter. Work, heat, stored energy forms (internal energy, kinetic energy, potential energy), enthalpy. Formulation of the first law as it applies to steady-state non-flow and flow processes. State functions and path functions. Mechanical efficiency of devices. Heat capacity and specific heat. The Gibbs Phase Rule. Reversibility. Energy balances for steady state processes (open and closed systems). Use of steam tables and other thermodynamic tables.
- Ideal gas law: Ideal gas behavior. Reversible ideal gases non-flow processes; isometric, isobaric, isothermal, adiabatic and isenthalpic processes. Flow processes involving ideal gases.
- P-V-T behavior of pure substances. Equations of state for non-ideal gases.
- Heat & Enthalpy: Heat capacities of gases, liquids and solids. Latent heat effects for pure substances. Enthalpy calculations for systems with both sensible heat and latent heat effects.
- The Second Law of Thermodynamics. The concept of entropy: entropy as a state function; entropy changes for reversible processes; entropy changes in a reversible cycle. Second law limitations and real processes. Irreversibility and entropy changes for real processes

- Heat engine: the Carnot cycle. Thermal efficiency of processes versus the mechanical efficiency of devices
- Vapor Cycles: The Basic Rankine Cycle (Steam Power Plant), the Vapor Compression Cycle (Refrigeration) and air-standard power cycles.
- The ideal Gas-Turbine cycle: The Otto cycle. The Diesel cycle.
- Isentropic efficiencies of turbines, nozzles, compressors, and pumps

Assessment

20% class participation
30% mid-term exam
50% final exam