

ENGRD 221: ENGINEERING THERMODYNAMICS

Lecture 10: September 25, 2007

Reading Assignments (from Moran & Shapiro, Sixth Edition): Chapter 5.

Topics covered:

- Ordered and disordered processes, entropy as related to the disorder in the system, system randomness, heat transfer as a disordered process and work as an ordered process
- Review of reversible and irreversible processes
- Energy interactions with the local surroundings
- Internally reversible processes
- Externally reversible processes
- Proving irreversibility, examples in the free expansion of a gas & heat transfer (conduction) across a temperature difference
- Reversible isothermal and adiabatic processes
- Isothermal and adiabatic processes for ideal gases
- Another statement of the 2nd law: Entropy is a state function that can be expressed in terms of measurable properties of the system and it is an intrinsic property of the system related with the degree of disorder in the system.
The change of entropy (disorder) of the universe (system & surroundings) is positive and zero only for reversible processes: $dS_{\text{total}} \geq 0$ and $dS_{\text{total}} = 0$ only for reversible processes
- Carnot (reversible) cycle
- The Carnot cycle corollaries
- The Carnot cycle efficiency, coefficient of performance
- Thermodynamic temperature scale
- Revisiting entropy S
- Ideal gas in a reversible process
- Equivalent reversible and irreversible processes
- Equivalent reversible and irreversible cycles
- The Clausius theorem
- Revisiting the 2nd law, mathematical form
- Isentropic processes
- Example of calculation of ΔS for isothermal reversible processes