MSE 440
Spring 2018

Overview Chap. 1

Chap 1
Thermodynamic Origin of Phase Diagrams

- **Introduction**
  - Why study phase transformations in materials?
  - States of matter
  - Phase of matter
  - Equilibrium
  - Stable, metastable and unstable equilibria
- **Gibbs free energy and phase diagrams of single component systems**
  - From specific heat to enthalpy, entropy and Gibbs free energy
  - Free energy vs. temperature curves
  - Melting point, Latent heat melting, entropy of melting
  - Undercooling
  - Free energy vs. pressure curves
  - Clausius-Clapeyron relation
  - Pressure-Temperature curves (phase diagram)
- **Gibbs free energy and phase diagrams of binary systems**
  - Thermodynamics of mixing two “solids”
  - Free energy vs. composition diagrams
  - From “temperature vs. composition” diagrams to “free energy vs. composition” curves
- **Gibbs phase rule**
  - Chemical potential
  - Derivation of the Gibbs phase rule
  - Application