

Fall 2021

ME/MS 505 Materials Thermodynamics

The laws of thermodynamics; general formulation and applications to mechanical, chemical and electrochemical systems; statistical thermodynamics, including ensembles, gases, crystal lattices, and phase transitions; thermodynamics of solutions, phase diagrams, chemical systems and chemical reactions;

Lectures	Lecture Topic	
1	Introduction (First Law)	Chapter 1
2	First Law (Continued)	Chapter 2
3	Second Law, Statistics of Entropy I	Chapters 3
4	Statistics of Entropy II	Chapter 4
5	Auxiliary Thermodynamic Functions Chemical Potential, Maxwell's Relations	Chapters 5
6	Heat Capacity, Enthalpy, Entropy and 3 rd Law I	Chapter 6
7	Heat Capacity, Enthalpy, Entropy and 3 rd Law II	Chapter 6
8	One Component Phase Diagrams I	Chapter 7
9	One Component Phase Diagrams II	Chapter 7
10	Treatment of Gas Mixtures I	Chapter 8
11	Treatment of Gas Mixtures II	Chapter 8 and Notes
12	Treatment of Condensed Systems I	Chapter 9
13	Treatment of Condensed Systems II	Chapter 9 and Notes
14	Binary Phase Diagrams I	Chapter 10
15	Multi-component Phase Diagrams II	Chapter 10 and Notes
16	Gas Reactions	Chapter 11
17	Gas-Condensed Phase Reactions	Chapter 12
18	Multi-component reaction equilibria I	Chapter 13
19	Multi-component reaction equilibria II	Chapter 13
20	Binary Phase Diagrams (Composition- Temperature-Pressure Space)	Chapter 14
21	Electrochemistry	Chapter 15

Required Text: Introduction to the Thermodynamics of Materials by David R. Gaskell, Prentice Hall (5th edition).

Reference Texts:

1. C.H.P. Lupis, Chemical Thermodynamics of Materials, Prentice-Hall, Englewood Cliffs, NJ.
2. D. Tabor, Gases, liquids, and solids and other states of matter, Cambridge University Press Syndicate, Cambridge
3. David Chandler, Introduction to Modern Statistical Mechanics, Oxford University Press, Oxford, New York.