

MASC 503 – Thermodynamics of Materials

Fall, 2018

Lectures

T/Th 12:30 - 1:50 p.m., OHE 100D

Course Description

Thermodynamics of Materials is intended for graduate students in Materials Science and Engineering. The goal of the course is to introduce students to a broad treatment of classical thermodynamics and its applications to equilibrium properties of materials. The course will provide a thermodynamic framework for the treatment of general phenomena in materials science, e.g. chemical reactions, diffusion, and point defects. However, the course will focus on maps of equilibrium states such as phase diagrams. Course topics include the laws of thermodynamics, phase equilibria, phase transformations, and phase diagrams of binary and ternary alloys. The structure of the course primarily follows the text by Dickerson for the laws of thermodynamics and the textbooks by Paul Gordon and by Callister and Rethwisch, for phase diagrams.

Instructor

Prof. Paulo Branicio

Mork Family Department of Chemical Engineering and Materials Science

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Phone: (213) 740-0364

Office hours: Immediately after lectures (T/Th 2pm-3pm)

Office hours with TA's every week (check Blackboard)

Required Readings and Supplementary Materials

Lecture notes will be provided and contain all required content. The books listed below are suggested reference supplementary readings.

Molecular Thermodynamics, Richard Dickerson, Benjamin, Menlo Park, 1969.

Principles of Phase Diagrams in Materials Science, McGraw Hill, New York, 1968.

(These two books are out of print and the instructor will ensure copies are available of the relevant chapters)

Fundamentals of Materials Science and Engineering: An Integrated Approach, 5th edition, William D. Callister and David G. Rethwisch, 2015, ISBN: 9781119234395.

Exams

Exam scores will consist of three midterms and a final. Exams are closed book and closed notes.

Grading

Grading	
Midterm 1	20%
Midterm 2	20%
Midterm 3	20%
Final exam	40%

Course Content

Topic	Reading
First Law of Thermodynamics	Dickerson: Ch 3
Second Law of Thermodynamics	Dickerson: Ch 3, 4
Third Law of Thermodynamics	Dickerson: Ch 4
Thermodynamics Relations	Dickerson: Ch 4
Thermodynamic Reactions	Dickerson: Ch 5
Thermodynamics of Solutions	Dickerson: Ch 6
Phase diagrams of Binary Systems	Gordon: Ch 4, Callister and Rethwisch: Ch 10
Phase diagrams of Ternary Systems	Lecture Notes

Important Dates

Midterm 1: Thursday, September 20th

Midterm 2: Thursday, October 18th

Midterm 3: Tuesday, November 15th

Final exam: Tuesday, December 11th 11:00 a.m. - 1:00 p.m.