Materials Thermodynamics
EMA 6316

Class Periods: M, W, F, Period 5 (11:45 AM - 12:35 PM)
Location: NEB 102 and Zoom
Academic Term: Fall 2025

Instructor:
Prof. Richard G. Hennig
rhennig@ufl.edu
352-392-7327
Office Hours: Thursday, 6 - 7 pm, Zoom https://ufl.zoom.us/j/93419474788

Teaching Assistant/Peer Mentor/Supervised Teaching Student:
Please contact through the Canvas website

- Jennifer Ruliffson, j.ruliffson@ufl.edu

Course Description
Thermodynamics of materials systems, surfaces in solids, irreversible processes.

Course Pre-Requisites / Co-Requisites
EMA 4314: Energetics and Kinetics in Materials Science or any equivalent thermodynamics course.

Course Objectives
This course is one of the four key technical courses foundational to the MSE graduate program: Materials Thermodynamics (EMA 6316), Diffusion, Kinetics and Transport in Materials (EMA 6136), Structure and Mechanical Properties of Materials (EMA 6313), and Properties of Functional Materials (EMA 6114). As a core course, this class covers a significant amount of graduate-level material and is designed to challenge you to advance your knowledge and skills. Success will require a considerable investment in preparing for lectures by using textbooks and other sources that you seek out, solving problems, and studying for exams. It is expected that you will have to exhibit significantly more independence, initiative, and ownership of the learning process than what was required for success at the undergraduate level.
This class reviews the four laws of thermodynamics as the fundamental basis for thermal and chemical equilibrium and introduces a statistical mechanical viewpoint for fundamental thermodynamic variables and the relationships between them. The students will apply these principles to understanding phase equilibria, phase diagrams, heterogeneous reactions, solutions, surfaces, and defects. The use of thermodynamics for practical scientific and technical applications will be emphasized in the course.

Required Textbooks and Software
Title: Thermodynamics in Materials Science, 2nd Edition
Author: Robert DeHoff
ISBN: 0-8493-4065-9
Supplementary reading and links to various other resources/websites are provided and updated throughout the semester.

Required Computer
Recommended Computer Specifications: https://it.ufl.edu/get-help/student-computer-recommendations/
HWCOE Computer Requirements: https://www.eng.ufl.edu/students/advising/fall-semester-checklist/computer-requirements/

Course Schedule

Week 1: Course Structure and Syllabus
Week 2: History, Introduction, and Structure of Thermodynamics, Ch. 1,2
Week 3: The Four Laws, Ch. 3
Week 4: Variables and Relations, Ch. 4
Week 5: Equilibrium Conditions, Ch. 5
Week 6: Statistical Mechanics, Ch. 6
Week 7: Statistical Mechanics, Ch. 6
Week 8: Unary Phase Diagrams, Ch. 7
Week 9: Partial Molar Quantities, Ch. 8
Week 10: Partial Molar Quantities, Ch. 8
Week 11: Construction of Phase Diagrams, Ch. 9
Week 12: Thermodynamics of Phase Diagrams, Ch. 10
Week 13: Thermodynamics of Phase Diagrams, Ch. 10
Week 14: Reactions, Ch. 11
Week 15: Reactions, Ch. 11

Important Dates

September 12	Homework 1 Due
September 19	Exam 1 (Canvas)
October 3	Homework 2 Due
October 10	Exam 2 (Canvas)
October 31	Homework 3
November 7	Exam 3 (Canvas)
November 21	Homework 4
December 2	Exam 4 (Canvas)

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (4)	100	15%
Quizzes	variable	15%
Midterm Exams (4)	variable	70%
		100%

Grading Policy

The following is given as an example only.

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

UF General Academic Policies & Resources (Honor Policy, DRC, Academic and Health Resources):
https://go.ufl.edu/syllabuspolicies
Graduate Level Academic Policies and Regulations (Attendance and Grading policy):
https://gradcatalog.ufl.edu/graduate/regulations/

Academic Policies & Resources
To support consistent and accessible communication of university-wide student resources, instructors must include this link to academic policies and campus resources: https://go.ufl.edu/syllabuspolicies. Instructor-specific guidelines for courses must accommodate these policies.

Commitment to a Positive Learning Environment
The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:
• Your academic advisor or Graduate Coordinator
• HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
• Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu