

ADVANCED THERMODYNAMICS OF MATERIALS - CME 572

Spring 2019

Instructor:	Sara Kadkhodaei	Time:	W 5:00 pm – 7:30 pm
Email:	sarakad@uic.edu	Place:	Lecture Center Building A, A005

Course Pages: UIC Blackboard

Office Hours: W 4:00 pm – 5:00 pm before class, W 7:30 pm – 8:00 pm after class, or post your questions in the forum provided for this purpose on Blackboard.

Textbook: The textbook is reserved at Richard J. Daley Library for a 2 hour use inside the library. *Call number: TA 403.6 D44 2006*

- Robert DeHoff, *Thermodynamics in Materials Science, 2nd ed.*, Taylor & Francis Group, 2006

References: This is a list of various interesting and useful books that will be touched during the course.

- Chang L. Tien and John H. Lienhard, *Statistical Thermodynamics*, Hemisphere Publishing Corporation, 1979
- David R. Gaskell, *Introduction to the Thermodynamics of Materials, 4th ed.*, Taylor & Francis Group, 2003
- Zi-Kui Liu, *Computational Thermodynamics of Materials*, Cambridge University Press, 2016

Prerequisites: No official one. An undergraduate-level understanding of thermodynamic and statistics is assumed.

Grading Policy: Problem sets (30%), Midterm exam (30%), Final exam (30%), Project (10%).

Homework Policy: Every week or two, due Wednesday beginning of class. 20%/day late penalty up to 2 days. Problem set solutions are posted first Friday after due data on Blackboard. Worst problem set grade dropped from average.

Important Dates:

Midterm exam March 6, 2019
Final exam May 1, 2019
Project Deadline May 8, 2019

Class Policy:

- Regular attendance is essential and expected.

Academic Honesty: Lack of knowledge of the academic honesty policy is not a reasonable explanation for a violation.

Course Outline:

1. Foundations

- (a) Laws of thermodynamics
- (b) Thermodynamic variables and their relationships
- (c) Conditions for equilibrium

2. Statistical thermodynamics

- (a) Review of statistics
- (b) Partition function
- (c) Ensembles
- (d) Specific heat in solids

3. Thermodynamics of materials

- (a) Unary heterogeneous systems
- (b) Multicomponent, homogeneous, non-Reacting systems
- (c) Multiphase equilibrium

4. Advanced topics

- (a) First-principles formulation of thermodynamics
- (b) CALPHAD modeling of thermodynamics