

## MSE 204: Thermodynamics for Materials Science (3 credits) | Course Details

This course establishes the basic concepts of chemical thermodynamics for materials science. After an understanding of the fundamental principles, the concepts will be applied to the study of phase transformations and the development of phase diagrams of mixtures. The goal of the course is to comprehend the auxiliary functions of chemical thermodynamics and to apply them in the case of the phase equilibria in materials. The Student Learning Outcomes include analysis of a thermodynamic problem, computing changes in entropy, enthalpy, and Gibbs free energy, and interpretation of the chemical potential, and construction and understanding of a phase diagram.

**Instructor** Vaso Tileli

**Teaching Assistants** Guoyuan Liu, Simone Sigagna, and Claire Paetsch

**Time/Place** Mondays 10.15-12.00 at INM 202– two hour lecture

Mondays 12.15-13.00 at INM 202 – one hour exercise session

**Pre-requisites** Introduction to Materials Science and Engineering

### Textbook

Lecture slides (on moodle)

### Reference Books

- The Bases of Chemical Thermodynamics, M. Graetzel & P. Infelta, Universal Publishers, 2000. | (two volumes in English, one volume in French)
- Thermodynamics for Materials Science, R. DeHoff, CRC Press, 2006.
- The Principles of Chemical Equilibrium, K. Denbigh, Cambridge University Press, 1981

## Instructional Methods

The course includes participation in lectures, peer discussion, exercises, and a final exam. All communication will be added on [moodle](#).

## Assessment

**Final Exam (100% of the total grade)**

The final exam will be on Monday December 15<sup>th</sup> between 10.15-13.15 (3 hours), which will be the final day of class. The exam is open book/notes but no access to electronic devices.

## Class Schedule

This is a tentative schedule starting on Monday 08.09 with the Introduction to Thermodynamics – Adjustments will be made as needed during the semester.

08.09	Week 1	L0. Introduction   L1. The Laws
15.09	Week 2	L1. Thermodynamic Laws & Their Meaning (Cont'd)
22.09	Week 3	No Class
29.09	Week 4	L2. Auxiliary Functions & Their Meaning
06.10	Week 5	L3. Molar Quantities
13.10	Week 6	L4. Partial Molar Quantities (Cont'd)
20.10	Week 7	No Class
27.10	Week 8	L5. Thermodynamics of Gases
03.11	Week 9	L6. Introduction to Phases
10.11	Week 10	L7. Single Component Phase Diagrams
17.11	Week 11	L8. Multicomponent Phase Diagrams
24.11	Week 12	L9. Metastability of Phases
01.12	Week 13	L10. Reacting Systems
08.12	Week 14	L11. Summary Revision
15.12	Week 15	FINAL EXAM