

MSE-204

**Thermodynamics for materials science**

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Cursus	Sem.	Type
Materials Science and Engineering	BA3	Obl.

Contact language	English
Credits	4
Session	Winter
Semester	Fall
Exam	During the semester
Workload	120h
Weeks	14
<b>Hours</b>	<b>4 weekly</b>
Lecture	3 weekly
Exercises	1 weekly
<b>Number of positions</b>	

**Summary**

This course establishes the basic concepts of thermodynamics and defines the main state functions. The concepts are then applied to the study of phase diagrams of various systems.

**Content**

1. Thermodynamic system and the laws of thermodynamics. Work and Heat. Reversibility.
2. Auxiliary functions and their relationships. Chemical potential.
3. Treatment of mixtures. Molar and partial molar variables.
4. Thermodynamics of gases. Ideal and real solutions
5. Introduction to phases
6. Single component phase diagrams.
7. Binary phase diagrams.
8. Metastability of phases.
9. Reacting systems.

**Learning Prerequisites****Required courses**

Introduction to Materials Science and Engineering

**Recommended courses**

Various courses of the Materials science and engineering section

**Learning Outcomes**

By the end of the course, the student must be able to:

- Analyze a thermodynamics problem
- Compute the changes in entropy, enthalpy and Gibbs free energy
- Construct a phase diagram
- Interpret the chemical potential

**Teaching methods**

Ex cathedra, videos, et exercises

**Resources**

### **Ressources en bibliothèque**

- [The bases of chemical thermodynamics - Vol.1 / Grätzel](#)
- [Principles of Chemical Equilibrium: With Applications in Chemistry and Chemical Engineering / Denbigh](#)
- [Thermodynamics for Materials Science / DeHoff](#)
- [The bases of chemical thermodynamics - Vol.2 / Grätzel](#)

### **Moodle Link**

- <https://go.epfl.ch/MSE-204>