

MSE-477

**Nanomaterials**

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Cursus	Sem.	Type
Chimiste	MA1, MA3	Opt.
Materials Science and Engineering	MA1, MA3	Opt.

Language of teaching	English
Credits	3
Session	Winter
Semester	Fall
Exam	During the semester
Workload	90h
Weeks	14
<b>Hours</b>	<b>3 weekly</b>
Courses	2 weekly
Exercises	1 weekly
<b>Number of positions</b>	

**Summary**

This course is an introduction to the concepts and associated relevant physics and materials science principles of what makes inorganic nanomaterials outperform their bulk counterparts. It covers their synthesis and characterization as well as the physical and chemical properties at the nanoscale.

**Content**

1. Emergence, definitions, challenges
2. Synthesis & characterization
3. Nano - thermodynamic/thermal/mechanical properties
4. Nanoelectronics, nanooptics, and nanomagnetism
6. Nano for energy and nano for environment
7. Nanomedicine, nanotoxicology, and safety issues in nano

**Keywords**

nanomaterials, nanoscale

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

Introduction to Materials Science

**Recommended courses**

Crystallography  
Inorganic chemistry

**Learning Outcomes**

- Contextualise physical properties of nanomaterials
- Choose synthesis and characterization method
- Choose the nanomaterial for a specific application

**Teaching methods**

Ex cathedra, videos, clickers

**Assessment methods**

Grouped project with presentation and written report and Final exam

## Resources

### Bibliography

1. Fundamentals of Nanotechnology, G.L. Hornyak, J.J. Moore, H.F. Tobbals & J. Dutta, CRC press, 2009
2. Nanostructures and Nanomaterials –Synthesis, Properties and Applications, C. Guozhong & W. Ying, World Scientific Publishing, 2nd edition, 2011

### Ressources en bibliothèque

- [Nanostructures and Nanomaterials - Synthesis, Properties and Applications / Guozhong](#)
- [Fundamentals of Nanotechnology / Hornyak](#)

### Moodle Link

- <https://go.epfl.ch/MSE-477>