PHYS-407

Frontiers in nanosciences

Pivetta Marina

Cursus	Sem.	Type
Ing.-phys	MA1, MA3	Opt.
Physicien	MA1, MA3	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Oral
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

The course covers relevant experimental and theoretical concepts in nanoscale science, from fundamental aspects like quantum tunneling and quantum size effects, to hot topics like quantum transport and nanoscale magnetism.

Content

Review of electronic properties: from atoms to bulk
Confinement of electronic states
Imaging and manipulation at the atomic scale
Making the nanostructures: top-down and bottom-up approaches
Advances in field-effect transistors (FETs): solid state devices (SSD), 2D-FETs
Quantum transport in 1D, and in 0D (single-electron FET)
Magnetism at the nanoscale: magnetic data storage (HDD), introduction to spintronics

Learning Prerequisites

Recommended courses

Solid state physics

Learning Outcomes

- Explain the differences between nanoscopic and macroscopic scale
- Analyze the results of a scientific experiment
- Design a scientific experiment

Transversal skills

- Summarize an article or a technical report.
- Access and evaluate appropriate sources of information.
- Use a work methodology appropriate to the task.

Teaching methods

Ex cathedra with exercises in class

Assessment methods

oral exam (100%)

Supervision

Office hours	No
Assistant.e.s	No
Forum	No

Resources

Bibliography

For each subject, relevant bibliography will be indicated on the slides, available on Moodle

Notes/Handbook

Lecture slides will be available on Moodle

Websites

- http://moodle.epfl.ch/course/view.php?id=7781

Moodle Link

- https://go.epfl.ch/PHYS-407