PHYS-405 **Experimental methods in physics**

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

Language of teaching	English
Credits	3
Session	Winter
Semester	Fall
Exam	Oral
Workload	90h
Weeks	14
Hours	**3 weekly**
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

The course's objectivs are: Learning several advenced methods in experimental physics, and critical reading of experimental papers.

Content

- **Noise and interference:** Their origins, their influence on experimental results, methods for noise and interference reduction
- **Scanning probe microscopy (SPM):** Principles of operation of the scanning tunneling microscope and atomic force microscope, Advanced scanning microscopy techniques, applications
- **Optical spectroscopys:** The elements of a modern spectroscopy system; different methods of spectral dispersion and their advantages, optical detectors. Related methods: raman spectroscopy, cathodoluminescence.
- **Electron microscopy:** Transmission and scanning microscopes, their principles of operation, observation tecniques, uses ...
- **Structural characterization:** RX, electron diffraction, ...

Keywords

Noise, Scanning probe microscopy, optical spectroscopy, transmission electron microscopy, scanning electron microscopy, electron diffraction, X-ray diffraction

Learning Prerequisites

Recommended courses

Basis courses in physics

Important concepts to start the course

fundamentals of optics, electromagnetics, atomic and solid-state physics

Learning Outcomes

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

- Integrate the notions of critical reading of articles
- Assess / Evaluate scientific articles, their quality and defaults
- Interpret knowledge of several specific experimental methods

Transversal skills

- Communicate effectively, being understood, including across different languages and cultures.
- Give feedback (critique) in an appropriate fashion.
- Demonstrate the capacity for critical thinking
- Access and evaluate appropriate sources of information.
- Make an oral presentation.
- Summarize an article or a technical report.

Teaching methods

- Ex cathedra lectures on specific experimental techniques
- Students' presentations of scientific articles

Expected student activities

Participation in class is encouraged.
Students are expected to give a short presentation of a scientific article.

Assessment methods

oral exam (100%)

Supervision

Others	Moodle

Resources

Notes/Handbook

All is put on the Moodle site

Moodle Link

- https://moodle.epfl.ch/course/view.php?id=15458