MICRO-428 **Metrology**

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Cursus	Sem.	Type
Computational and Quantitative Biology		Opt.
Microengineering minor	E	Opt.
Microtechnics	MA2, MA4	Opt.
Minor in Imaging	E	Opt.
Minor in Quantum Science and Engineering	E	Opt.
Quantum Science and Engineering	MA2, MA4	Opt.
Space Technologies minor	E	Opt.

Language of teaching	English
Credits	3
Session	Summer
Semester	Spring
Exam	Written
Workload	90h
Weeks	14
Hours	**3 weekly**
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

The course deals with the concept of measuring in different domains, particularly in the electrical, optical, and microscale domains. The course will end with a perspective on quantum measurements, which could trigger the ultimate revolution in metrology.

Content

The course deals with the concept of measuring in different domains, particularly in the electrical, optical, and microscale domains. The concept of precision, accuracy, and resolution will be introduced early in the course with an embedded course on statistics, which provides the basics required to understand how proper measurements ought to be performed. Subsequently, the course will introduce electrical, optical, and mechanical metrology techniques dealing with intrinsic and extrinsic limitations of the measurement. The course will end with a perspective on quantum measurements, which could trigger the ultimate revolution in metrology. Homework will be used as a means to practice the concepts learnt in class.

Syllabus

- Classical metrology
- Basic statistics
- Electrical metrology
- Optical microscopy
- Optical imaging
- AFM
- SEM
- Quantum metrology

Keywords

Accuracy, precision, resolution, reproducibility, reliability, fidelity of the measurement

Learning Prerequisites

Required courses

Basic mathematics/physics

Recommended courses

Design of experiments

Learning Outcomes

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

- Develop measurement setups that yield reproducible results
- Analyze the accuracy and precision of a measurement for a certain resolution
- Interpret the quality of data from measurements

Transversal skills

- Demonstrate the capacity for critical thinking

Teaching methods

Ex cathedra, exercises and homeworks. Q&A during lectures.

Expected student activities

In-class presence and active participation strongly encouraged.

Assessment methods

Self-assessment (ungraded homework, exercise session); final exam during exam sessions.

Supervision

Office hours	Yes
Assistant.e.s	Yes

Resources

Notes/Handbook

On Moodle: handouts of current year.

Moodle Link

- https://go.epfl.ch/MICRO-428

Prerequisite for

MICRO-429 Metrology Practicals