

MICRO-424 **Optics laboratories (autumn)**

Pu Ye

Cursus	Sem.	Type
Microtechnics	MA1, MA3	Opt.
Photonics minor	H	Opt.

Language of teaching	English
Credits	3
Withdrawal Session	Unauthorized Winter
Semester	Fall
Exam	During the semester
Workload	90h
Weeks	14
<b>Hours</b>	<b>3 weekly</b>
TP	3 weekly

**Number of positions**

**It is not allowed to withdraw from this subject after the registration deadline.**

**Summary**

This laboratory work allows students to deepen their understanding of optical instruments, optoelectronic devices and diagnostic methods. Students will be introduced in state of the art optical instruments and measurement principles.

**Content****Keywords**

Optical instruments, optical measurement techniques, Diode laser, He-Ne laser, Fourier optics, waveguide and fiber optics, error analysis

**Learning Prerequisites****Required courses****Bachelor in**

- Microengineering, or
- Electrical and electronic engineering, or
- Physics.
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**Recommended courses**

MICRO-321 Optical engineering I  
MICRO-321 Optical engineering II

MICRO-424: Optics laboratories I

**Important concepts to start the course**

Basics of optics, programming with MATLAB or similar, matrix calculations, Fourier transformation, electromagnetic waves, refraction and reflection, polarization, basics of geometrical optics, semiconductor physics, laser physics, error analysis

## Learning Outcomes

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

- Apply principles of laser security
- Perform data analysis using excel and Matlab
- Assess / Evaluate the reliability of a measurements
- Perform an optical measurement
- Interpret measurement results
- Estimate measurement errors

## Transversal skills

- Manage priorities.
- Communicate effectively, being understood, including across different languages and cultures.
- Use both general and domain specific IT resources and tools
- Continue to work through difficulties or initial failure to find optimal solutions.
- Demonstrate the capacity for critical thinking
- Take feedback (critique) and respond in an appropriate manner.

## Teaching methods

- Practical laboratory work in group (2 persons)
- 4 Experiments (2 afternoons)

## Expected student activities

Individual activity

- Participation at all experiments
- Execution of practical work
- Keep a Laboratory note book

Group activity

- Scientific/technical report writing per experiment

## Assessment methods

Discussion of basic concepts during instruction (individual)

Evaluation of experimental work (individual)

Evaluation of written report (group)

Evaluation of laboratory notebook (individual)

## Supervision

Office hours	No
Assistants	Yes
Forum	No

## Resources

### Virtual desktop infrastructure (VDI)

Yes

## Bibliography

Fundamentals of optical waveguides / Katsunari Okamoto, 2006

Fundamentals of photonics / B.E.A. Saleh, M. C. Teich, 2007

Integrated optics: theory and technology, vol. 33 / Hunsperger, 2009

An introduction to error analysis: the study of uncertainties in physical measurements, J. R. Taylor, University Science Books, 2nd ed., 1997

### **Ressources en bibliothèque**

- [Fundamentals of photonics / Saleh](#)
- [Fundamentals of optical waveguides / Okamoto](#)
- [An introduction to error analysis: the study of uncertainties in physical measurements / Taylor](#),
- [Integrated optics: theory and technology / Hunsperger](#)

### **Notes/Handbook**

Handout of course slides and documentation of individual experiments

### **Moodle Link**

- <https://go.epfl.ch/MICRO-424>