MICRO-424

Optics laboratories II

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

Language of teaching	English
Credits	3
Withdrawal	Unauthorized
Session	Winter
Semester	Fall
Exam	During the semester
Workload	90h
Weeks	14
Hours	**3 weekly**
Practical work	3 weekly
Number of positions	

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

4 experiments on optics

Keywords

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

Learning Prerequisites

Required courses

MICRO-420: Advanced optics
MICRO-421: Imaging optics
MICRO-422: Lasers and optics of nanostructures
MICRO-522: Integrated optics
MICRO-523: Optical radiation detection methods
MICRO-321 Optical engineering I
MICRO-321 Optical engineering II

MICRO-424: Optics laboratories I

Recommended courses

Bachelor in

- Microengineering, or
- Electrical and electronic engineering, or
- Physics.

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)

Resources

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
- Integrated optics: theory and technology / Hunsperger
- An introduction to error analysis: the study of uncertainties in physical measurements / Taylor,
- Fundamentals of optical waveguides / Okamoto

Notes/Handbook

Handout of course slides and documentation of individual experiments