GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2015-2016

Laboratories in Photonics Research (E030721)

Due to Covid 19, the education and evaluation methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

Course size (nominal values; actual values may depend on programme)

Credits 6.0 Study time 180 h Contact hrs 76.0 h

Course offerings and teaching methods in academic year 2020-2021

A (semester 2)	English	Gent	practicum	72.5 h
B (semester 2)	Dutch		practicum	72.5 h

Lecturers in academic year 2020-2021

Le Thomas, Nicolas	TW05	lecturer-in-charge
Bienstman, Peter	TW05	co-lecturer
Meulebroeck, Wendy	VUB	co-lecturer
Ottevaere, Heidi	VUB	co-lecturer

Offered in the following programmes in 2020-2021	crdts	offering
Bridging Programme European Master of Science in Photonics	6	A
Master of Science in Electrical Engineering (main subject Communication and Information Technology)	6	A
Master of Science in Electromechanical Engineering (main subject Control Engineering and Automation)	6	A
Master of Science in Electromechanical Engineering (main subject Electrical Power Engineering)	6	A
Master of Science in Electrical Engineering (main subject Electronic Circuits and Systems)	6	A
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Mechanical Construction)	6	A
Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)	6	A
European Master of Science in Photonics	6	A
Master of Science in Photonics Engineering	6	B

Teaching languages

Dutch, English

Keywords

Photonics, lab work, lasers, interferometry

Position of the course

The aim of this course is to teach the student the basic concepts of research methodology and subsequently to apply those in lab exercises based on knowledge acquired in the courses photonics, microphotonics, lasers and optical materials. The topics of research methodology that will be covered include performing a literature study (scientific papers and patents) and consulting sources, correctly analyzing measurement data and displaying the latter in graphs, orally presenting scientific results and writing them down into a research paper.
Next, these techniques will be illustrated through four research topics to be chosen by the student and related to the ongoing work of the different research groups involved in the photonics master program. In each case the promoter will situate the topic in the broader scope of the research group and subsequently the student will get more familiar with the topic through demonstrations and hands-on training, given by a PhD student working on the topic. In this way the student will gain an overview of the research ongoing in the groups involved in the photonics master program.

Finally, the student will apply the knowledge gained in the first two parts of the course in lab-exercises through which he will acquire the expertise and insight needed to operate laboratory and demonstrator setups. These include the elementary skills, which will allow the student to work with optical elements and optical systems and give him insight in the relevant optics theory. Both free space optical systems (interferometry, characterization of laser beams, 4f processor) and fiber based and integrated optical systems (laserdiodes, waveguides) are studied. The student also comes in contact with typical measurement software such as LabView. The basic experiments will be divided over 6 modules in which the core measurement techniques are covered. The lab exercises illustrate in an integrated manner basic knowledge gained through the courses photonics, lasers, microphotonics and optical materials and require application of the research methods (literature study, reporting) learned in the first part of the course

Contents

Part 1: Research Methodology in Photonics
Introducing research methodology, consulting scientific sources, analyzing and displaying of measurement results in tables and graphs, orally presenting scientific measurement results and writing a research paper.

Part 2: Lab demonstrations
Demonstration of the application of research methods through 4 topics related to the ongoing research of groups involved in the photonics master program. The topic will be introduced by the promotor and illustrated though a practical exercise.

Part 3: Photonics Laboratory
Alignment of a HeNe laser, characterization of different types of sources (lasers, LEDs, white light sources), study the polarization behavior of light, characterization of optical components (mirrors, filters, lenses, prisms, gratings, beam splitters), study of different types of materials and coatings, coupling light into fibers and study fiber characteristics, characterization of waveguides, spatial filtering and building a 4f processor, control different instruments by LabView software, applications of light sources (lasers in interferometry, white light sources in spectroscopy).

Initial competences

course photonics, microphotonics, optical materials and lasers or similar

Final competences

1. Basic measurement techniques for photonic applications.
2. Having insight in diverse optical phenomena.
3. Interpret measurement results.
4. Present scientific results in paper.
5. Build, explain and describe a scientific experiment in group.
6. Use advanced software for conducting lab experiments.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Practicum

Extra information on the teaching methods

Lab sessions; Team work

Learning materials and price

Syllabus (English)

References

Course content-related study coaching

Evaluation methods

end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Oral examination, assignment

Examination methods in case of periodic evaluation during the second examination period

Oral examination, assignment

Examination methods in case of permanent evaluation

Skills test

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible in modified form

Extra information on the examination methods

During examination period: graded oral presentation; graded team work. During semester: graded lab sessions.

Calculation of the examination mark

- Answering to questions which are asked during the lab (20%-individual)
Students are asked to have prepared the exercises before the start of every lab session. This is checked during the duration of the laboratory by interrogating the students. The quality of their responses are part of their final score on this course.
- Attitude in the lab + progress made (20%-individual)
- Content of the laboratory logbook (20%-group)
During the lab students are asked to keep a scientific logbook (one per group) on their practical experiments. They also receive a quotation on the quality of the logbook.
- Oral presentation of scientific work + answers to questions (20%-individual)
At the end of this laboratory course each group of students has to present during 20 minutes their results on one of the practical lab modules. After the presentation the students’ knowledge about the different laboratories is tested on an individual basis and orally.
- Writing a research paper of one of the laboratories (20%-individual)