HALMSTAD UNIVERSITY
Phone +46 35 16 71 00 - www.hh.se
School of Information Technology

Optoelectronics 7.5 credits

Optoelektronik 7.5 hp

Second cycle
Main field: Electronics, Second cycle, has second-cycle course/s as entry requirements (A1F)
Syllabus is adopted by the Research and Education Board (2024-03-20) and is valid for students admitted for the autumn semester 2024.

Placement in the Academic System

The course is included in the Master's Programme in Electronics Design, 60 credits. The course is also offered as a free-standing course.

Prerequisites and Conditions of Admission

Semiconductor devices 7.5 credits and Applied electromagnetism 7.5 credits. English 6. Exemption of the requirement in Swedish is granted.

Course Objectives

The goal of the course is that the student should gain advanced knowledge regarding semiconductor techniques, optical processes and optical components used in different systems to generate, modulate and detect light.

Following successful completion of the course the student should:

Knowledge and understanding

- describe basic electromagnetic interaction with matter, especially between semiconductor materials and light
- outline the basic construction and working mechanisms of important optical components
- outline the basics of optical communication
- be aware of the different ethical considerations in research to allow for responsible conduct of research

Skills and ability

- design a simple optical system with different components, such as light sources, detectors and wave guides/fibers.
- calculate various important values and factors for optoelectronic components
- use experimental techniques, such as photoluminescence, transmission and photocurrent measurements for basic characterization of optoelectronic components and wave guides.
- utilize optoelectronic components in electronic circuits and devices (e.g. as a sensor in an IoT device)
- identify ethical considerations with ones own research and the research of others and act responsibly to avoid ethical issues

Judgement and approach

- discuss and question the ethical aspects of electronics research and development
- gain an overview of the limitations of the models presented in the course literature. Especially which, engineering perspectives have to be taken into account to avoid quantum mechanical and relativistic effects
- show a scientific approach regarding issues on environmental or health from the interaction between electromagnetic fields and living organisms

Primary Contents

Semiconductors for optoelectronics, optical properties and processes, light emitting diodes, semiconductor lasers, photodetectors, modulators, switches, integrated optoelectronics/photonics, optical fibers. Organic optical components. Photonic bandgap materials and wave guides. Research ethics.

Teaching Formats

Teaching comprises lectures, exercises, home work and laboratory assignments.

Teaching is in English.

Examination

The overall grades of Fail, 3, 4 or 5 will be awarded for the course.
The examination consists of a written exam, laboratory report and online course in research ethics. All examination is carried out individually.

Name of the test		Grading
Written Examination	5 credits	U/3/4/5
Laboratory Sessions	1,5 credits	U/G
Online Research Ethics Course	1 credits	U/G

If there are special reasons, the examiner may make exceptions from the specified examination format and allow a student to be examined in another way. Special reasons can e.g. be a decision on learning support.

For elite sports students according to Riktlinjer för kombinationen studier och elitidrott vid Högskolan i Halmstad, DNR: L 2018/177, the examiner has the right to decide on an adapted examination component or let the student complete the examination in an alternative way.

Course Evaluation

Course evaluation is part of the course. This evaluation should offer guidance in the future development and planning of the course. Course evaluations should be documented and made available to the students.

Course Literature and Other Study Resources

Kasap, S. O. *Optoelectronics & Photonics: Principles & Practices*. (2nd edition) Pearson Education, 2013.

Journal articles available through the University library.

Laboratory instructions on the course website.