LUND UNIVERSITY

LTH
FACULTY OF ENGINEERING

Programme Syllabus

Master's Programme in Photonics

- Programme code: TAFOT
- Scope: 120 credits
- Cycle: Second
- Approved by: Programme Board F/Pi
- Validity: 2024/2025
- Date of approval: 15 February 2024

1 Aim and outcomes

1.1 Aim

The internationally oriented master's education aims at developing the students' knowledge, abilities and assessments in the field of photonics that deals with generating, amplifying, manipulating and utilizing light for different applications. Photonics technology is essential in many areas of society, e.g. information and communication, lighting, production, security, space technology, defence, life science and medicine. The programme covers four main areas in photonics: optics and lasers (generation and manipulation of coherent and incoherent light), communication (in the visible, infrared and microwave spectral ranges), diagnostics/interaction (spectroscopy, imaging, quantum optics and bio-photonics) as well as component technology (opto-electronics, LEDs and solar cells). The programme provides deep knowledge of optics and laser technology, practical experience in optical design, work experience in state-of-the-art optics- and laser laboratories and deep understanding of several key applications, such as optical communication or bio-photonics.

1.2 Outcomes for a Degree of Master of Science (120 credits)

(Higher Education Ordinance 1993:100)

Knowledge and understanding

For a Degree of Master of Science (120 credits) the student shall

- demonstrate knowledge and understanding in the main field of study, including both broad knowledge of the field and a considerable degree of specialised knowledge in certain areas of the field as well as insight into current research and development work, and
- demonstrate specialised methodological knowledge in the main field of study.

Competence and skills

For a Degree of Master of Science (120 credits) the student shall

- demonstrate the ability to critically and systematically integrate knowledge and analyse, assess and deal with complex phenomena, issues and situations even with limited information,
- demonstrate the ability to identify and formulate issues critically, autonomously and creatively as well as to plan and, using appropriate methods, undertake advanced tasks within predetermined time frames and so contribute to the formation of knowledge as well as the ability to evaluate this work,
- demonstrate the ability in speech and writing both nationally and internationally to report clearly and discuss his or her conclusions and the knowledge and arguments on which they are based in dialogue with different audiences, and
- demonstrate the skills required for participation in research and development work or autonomous employment in some other qualified capacity.

Judgement and approach

For a Degree of Master of Science (120 credits) the student shall

- demonstrate the ability to make assessments in the main field of study informed by relevant disciplinary, social and ethical issues and also to demonstrate awareness of ethical aspects of research and development work,
- demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used, and
- demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.

1.3 Specific outcomes for a Degree of Master of Science (120 credits) in Photonics

To obtain a Degree of Master of Science (120 credits) in Photonics the student shall present the knowledge and skills that are required for independently working with research- and development tasks or other photonics related qualified work in academic or industrial environments.

Knowledge and understanding

For a Degree of Master of Science (120 credits) in Photonics students shall

- demonstrate broad experience in and understanding of optics and lasers as well as their applications,
- demonstrate deeper knowledge of principles, methods, possibilities and limitations of optical technology,
- demonstrate wide-spread knowledge of various applications within the field of photonics, e.g. related to telecommunication, health and patient care as well as environment, and
- detailed knowledge in and understanding of photonics with the ability to develop own ideas in a scientific or industrial context.

Competence and skills

For a Degree of Master of Science (120 credits) in Photonics students shall

- analyse and critically evaluate different technical solutions in the field of photonics,
- demonstrate the competence to independently perform a research- or development project in the field of photonics,
- demonstrate the competence to apply her/his knowledge and problem-solving skills in new or unfamiliar situations that are in the widest sense (e.g. multi-disciplinary) related to photonics,
- demonstrate the skill to critically judge her/his knowledge, acquire new and put into relation to earlier knowledge,
- demonstrate the skill to work efficiently as part of a group towards a common goal,
- demonstrate the skill to critically and systematically integrate knowledge in the field of photonics, including the ability to analyse, evaluate and handle complex phenomena, questions and situations even on the basis of limited information, and
- demonstrate the skill to successfully perform a research- or development project in a limited time frame.

Judgement and approach

For a Degree of Master of Science (120 credits) in Photonics students shall

- demonstrate the skill for teamwork and collaboration in groups of different compositions,
- demonstrate the competence to identify the need for additional knowledge and continuously develop and expand her/his competence and skills in the field of photonics, and
- demonstrate insight into scientific possibilities and limitations and their societal meaning and humanities' responsibility of how these are applied.

1.4 Further studies

On completion of the second-cycle degree, students have basic eligibility for third-cycle studies.

2 Programme structure

The master programme is composed of mandatory courses corresponding to 30 credits, elective mandatory course corresponding to 7,5 credits, elective courses corresponding to 52.5 credits and a master's thesis corresponding to 30 credits. The mandatory course package starts with a basic course (Optics and Optical Design). Three additional courses (Lasers, Optoelectronics and Optical Communication and Advanced Optics and Lasers) provide deeper knowledge and understanding in the field of photonics. Elective courses are chosen within three areas of photonics: communication, diagnostics/interaction as well as component technology.

2.1 Courses

The courses included in the programme are indicated in the timetable. Students are entitled to accreditation of 7.5 credits of courses in Swedish (organised by Lund University for exchange students).

3 Specific admission requirements

A Bachelor's degree in science or engineering. Completed courses of at least 40 credits/ECTS in physics and 30 credits/ECTS in mathematics, covering quantum mechanics, electromagnetism, basics in optics, multi-dimensional calculus, linear algebra and Fourier analysis. English 6.

4 Degree

4.1 Degree requirements

For a Degree of Master of Science (120 credits) students must successfully complete courses comprising 120 credits, including a degree project worth 30 credits. 90 credits must be second-cycle credits, including the degree project.

4.2 Degree and degree certificate

When students have completed all the degree requirements, they are entitled to apply for a certificate for a Degree of Master of Science (120 credits). Main Field of Study: Photonics.