MASTER OF SCIENCE IN SILICON PHOTONICS

60 ECTS CREDITS - LANGUAGE: ENGLISH

WHAT

First developed about 20 years ago, silicon photonics, the generic term for photonics on a chip, takes advantage of the huge technological investments made by the microelectronics industry to develop complementary metal-oxide-semiconductor (CMOS) technology. In the same way CMOS technology uses integrated circuits (IC) to process the electronic signals, silicon photonics uses photonic integrated circuits (PICs) consisting of various photonic building blocks such as waveguides, splitters, modulators, optical amplifiers, laser sources, detectors, ... Silicon photonics is fast becoming a key technology in our connected society, as evidenced by the explosion in the number of start-ups and high-tech multinationals using this technology. Integrated photonic chips are essential in all our communication networks and form the basis of the internet. They are also finding increasing applications in healthcare and in various sensors. Recent research focuses on using photonic chips in quantum computers and accelerators for AI.
The primary motivation for this advanced education program is to address the shortage of highly qualified engineers in the integrated photonics field, both in academia and industry. Given that developing new photonic chips requires a broad spectrum of scientific and technical skills, the program is open to students from diverse fields in science and engineering. The goal is not only to train purely 'academically theoretical' system thinkers but also to focus on hands-on design and realisation of application-oriented photonic integrated circuits, a core competence in this programme. Specifically, each student will have the opportunity to actively participate in creating a photonic chip, from design to fabrication and characterisation.

STRUCTURE

The Master of Science in Silicon Photonics is a one-year advanced master programme of 60 ECTS which is fully taught in English. In the first semester, the curriculum places a significant emphasis on establishing a foundational understanding of working principles, fundamental optical effects, and expert knowledge in materials and technologies.
This focus is comprehensively addressed through the following courses:

- Materials for Photonic Integrated Circuits (PICs)
- Theory of PIC Devices
- Processing and Packaging Technologies for Photonic Integration
- Integrated Lasers

Recognizing the inherent connection of Photonic Integrated Circuits (PICs) with electronic devices, the crucial aspect of electro-optical integration is covered in the "Electronics for Photonics" course, aligning with the program competencies.
Within the elective courses, students can delve deeper into specific areas, with a dual focus on application domains and technology-oriented aspects:
Application Areas:

- Integrated Photonic (Bio)Sensing
- Optical Communication and Information Processing
- Quantum Optics
- Non-linear Optics

Technology-Oriented Courses:

- Technological Processes for Photonics and Electronics: Laboratory
- Micro- and Nanophotonic Semiconductor Devices

From the program's outset until the conclusion of the academic year, a flagship course, "Photonics Integrated Circuits: from Concept to Application", runs consistently. This course encompasses the entire spectrum of PIC development, covering design, fabrication, testing, and characterization. Additionally, it includes special lectures delivered by industry experts, shedding light on major application areas.

Master's Dissertation

The Master's dissertation is an original piece of work on a specific topic in silicon photonics. In general, it consists of a literature review combined with practical work in the form of simulation, modelling, fabrication and/or measurements of photonic integrated circuits. The completion of the Master's dissertation is a requirement to obtain the degree of Master of Science in Silicon Photonics.

LABOUR MARKET

The aim of this advanced Master's programme is to deliver engineers and scientists with solid basic knowledge in the field of silicon photonics, and with the skills to apply this knowledge to the design, realisation and the management of photonic integrated circuits for a broad range of application domains.
The sectors where silicon photonics plays or will play a key role are the telecom and datacom industry, the automotive industry, healthcare, agribusiness and food industry, computing and quantum information, and display technology.

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FACULTY OF ENGINEERING AND ARCHITECTURE

2025-26

TOELATINGSVOORWAARDEN VOOR HOUDERS VAN EEN VLAAMS DIPLOMA

1 **Rechtstreeks:**
- Master of Computer Science Engineering
- Master of Electrical Engineering
- Master of Electromechanical Engineering
- Master of Engineering Physics
- Master of Nanoscience, Nanotechnology and Nanoengineering
- Master of Photonics Engineering
- Master of Physics

2 **Na onderzoek van de bekwaamheid van de student om de opleiding te volgen:**
- Een diploma van een masteropleiding aansluitend op een bacheloropleiding
- Een diploma van een masteropleiding die volgt op een andere masteropleiding

LANGUAGE REQUIREMENTS

Language requirements	Dutch: no language requirements English: CEFR level B2

PRACTICAL INFORMATION

Study programme
studiekiezer.ugent.be/master-of-science-in-integrated-silicon-photonics-en/programma

Information sessions
Graduation Fair
afstudeerbeurs.gent/en/students/further-studies

Enrolling institution
Information on enrolment at Ghent University.

Application Deadline (for International degree students)
For students who **need a visa**: before 1st of April
For students who **do not need a visa**: before 1st of June
Read more

Tuition fee
More information is to be found on: www.ugent.be/tuitionfee

Contact
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Contact (for international degree students)
international.ea@ugent.be