Master in

Silicon Photonics

Ghent University

What do we offer ?

Highly specialized education

State of the art research infrastructure

Education by world-class researchers

- 6 ERC Starting Grants
- 1 ERC Consolidator Grant
- 2 ERC Advanced Grants
- 7 ERC Proof-of-Concept Grants
- 4 EIC Pathfinder Grants
- 2 EIC Transition Grants
- 100+ H2020 / Horizon Europe projects in past 4 years

European Research Council
Established by the European Commission

Vibrant city life

Strong network in Academia and Research

Associated with

imec

About Ghent

“Smack in the middle of Brussels, Bruges and Antwerp, Ghent distils their greatest attributes into one engaging and enchanting city.”

About UGent

Ghent University, founded in 1817, is one of the top 100 universities worldwide and located in the Dutch language area, with more than 44,000 students and 15,000 staff members.

Our 11 faculties are divided into 86 departments and offer high-quality and research-supported training courses in most scientific disciplines.

Ghent University	# World
Academic Ranking of World Universities (Shanghai Ranking) 2024	**90**
U.S. News Best Global Universities Ranking 2024	**109**
Times Higher Education (THE) World Universities Ranking 2025	**112**
QS World University Ranking 2025	**169**
QS Sustainability Ranking 2024	**24**
Best Engineering Universities in Europe (EngiRank) 2024	**12**

Watch

FACULTY OF ENGINEERING AND ARCHITECTURE

°1835

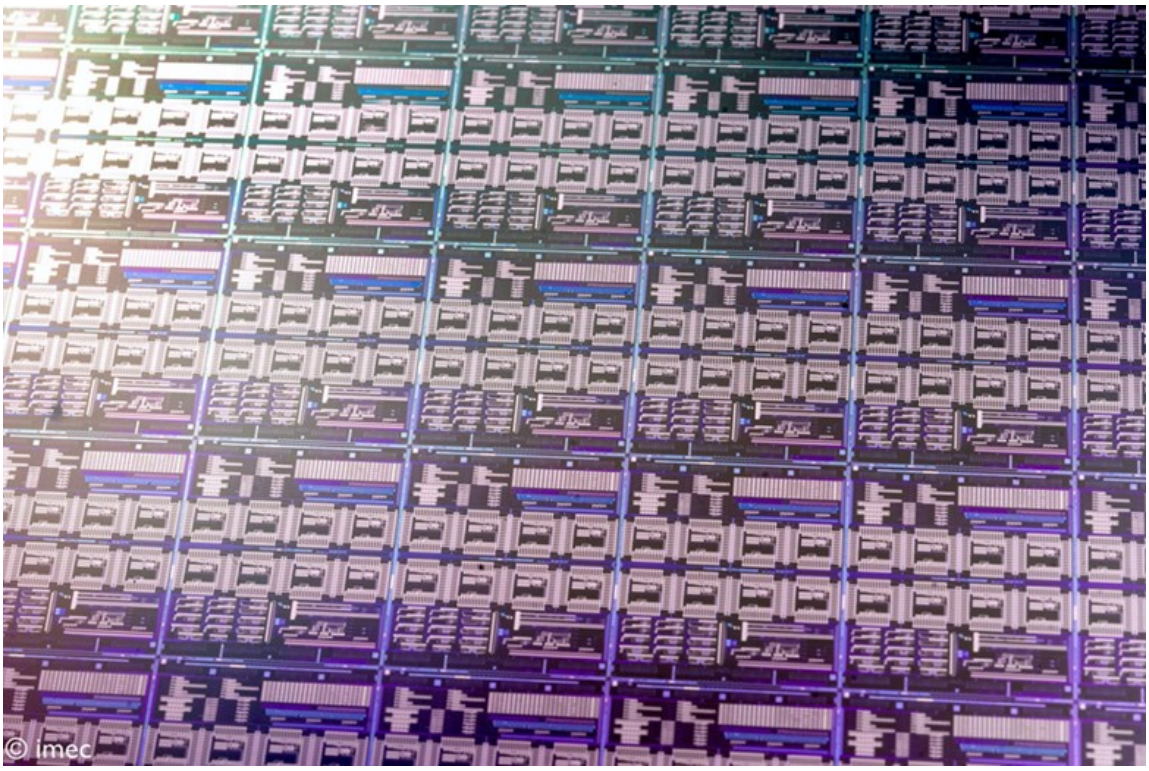
- 10 departments
- About 65 research teams
- About 390 FTE Professors
- Over 130 Doctoral Degrees per year
- Over 700 International publications per year
- Total student population (BSc + MSc): 4900

Watch

About Silicon Photonics

Silicon photonics is a technology that uses silicon-based materials to manipulate and transmit light signals. It allows the creation of **photonic circuits on a silicon chip**, integrating optical and electronic components. This technology is compatible with complementary metal-oxide-semiconductor (**CMOS**) processes, which are widely used in electronics manufacturing.

Silicon Photonics offers a wide range of potential applications, including optical **computing**, optical **interconnects**, and **data center** communication systems where light is used to transmit data instead of electricity, allowing for **much faster and more efficient** data transfer.



It can also be used in **sensing** and **healthcare** applications to create **compact, low-cost** optical sensors that are capable of detecting minute changes in the environment.

Furthermore, it is also being explored for its potential to enable **quantum computing**, which relies on the manipulation of photons as information carriers.

Silicon photonics is rapidly growing, evolving and maturing field that has the potential to revolutionize various industries, particularly in the area of information technology.

MSc Silicon Photonics

New Advanced MSc starting in '25-'26

Taking into account the full ecosystem, the international renowned expertise of the Photonics Research Group (PRG) in photonics integration, materials at the Liquid Crystals and Photonics group (LCP), packaging at the Centre for Microsystems Technology (CMST), Electronic-optical integration at IDLab Design, spinoffs, … and being associated to IMEC (Interuniversity MicroElectronics Centre, a world-leading research and innovation hub in nanoelectronics and digital technologies),

Ghent University is the best place in the world to study "Silicon Photonics".

A unique, one-of-a-kind Master in Europe, focusing on Silicon Photonics and Photonic Integration.

Entry Requirements

- Master's degree in Applied Physics / Physics / Engineering Physics, Electrical Engineering, Micro-electronics, Telecommunications, Optical Engineering / Photonics / Optoelectronics, Nano-technology / Nano-sciences, Biomedical Engineering, Material Sciences, Computer Science or related disciplines
- B2 English language proficiency

Tuition Fee

- 3809 Euro / year (for 60 ECTS)

(fixed enrolment fee of € 299 / year + € 58,5 per credit)

Program Details

- studiekiezer.ugent.be

Program Structure

Mandatory Courses	ECTS	Sem
	30	
Photonics Integrated Circuits: from Concept to Application	8	1 + 2
Theory of Photonics Integrated Circuit Devices	6	1
Integrated Lasers	4	1
Materials for Photonics Integrated Circuits	4	1
Electronics for Photonics Integrated Circuits	4	1
Processing and Packaging Technologies for Photonic Integration	4	2
Electives: Advanced Photonics Courses	**ECTS**	**Sem**
	12	
Quantum Optics	4	1
Optical Communication and Information Processing	4	1
Non-linear Optics	4	1
Integrated Photonic (Bio)Sensing	4	2
Micro- and Nanophotonic Semiconductor Devices	4	2
Technological Processes for Photonics and Electronics: Laboratory	4	1 + 2
Master Thesis	**ECTS**	**Sem**
	18	
Master Thesis	18	1 + 2

Professional Development

- **Guest lectures** by industrial partners (Ligentec, Luceda, Sentea, HPE, imec, Indigo ...)
- **Company visit** to imec & the PhotonDelta ecosystem
- **ePIXfab** training activities
- **Photonics Society Ghent** activities

Total	60	

Working Students

The program can be followed in a full-time mode (1 year, 60 ECTS) but to address working students, the program can also be followed in **part-time modes**. This can vary between spreading the program over the course of 2 to 4 years.

Below, some model trajectories are presented:

(these are example trajectories which can deviate from student to student)

1 ECTS ≈ 25-30 hours (incl. lectures, lab work, project work, assignments, examinations)
12-13 lecturing weeks / semester + 4 weeks examination period

Y 1 - Sem 1	Y 1 - Sem 2	Y 2 - Sem 1	Y 2 - Sem 2
Mandatory Courses			**30 ECTS**
Photonics Integrated Circuits: from Concept to Application (8 ECTS)		Integrated Lasers (4 ECTS)	
Theory of Photonic Integrated Circuit Devices (6 ECTS)	Processing and Packaging Technologies for Photonic Integration (4 ECTS)	Materials for Photonic Integrated Circuits (4 ECTS)	
Electronics for Photonic Integrated Circuits (4 ECTS)			
Elective Courses (3 to choose from list)			**12 ECTS**
Semester 1 courses: Optical Communication and Information Processing (4 ECTS) | Non-linear Optics (4 ECTS) | Quantum Optics (4 ECTS)			
Semester 2 courses: Integrated Photonic (Bio)Sensing (4 ECTS) | Micro- and Nanophotonic Semiconductor Devices (4 ECTS)			
Semester 1+2 course: Technological Processes for Photonics and Electronics: Laboratory (4 ECTS)			
Master Thesis			**18 ECTS**
Preparatory work for the Master Thesis (≈3 ECTS)			Master Thesis (≈15 ECTS)

≈ 30 ECTS /year
≈ 15 ECTS /semester

≈ 375-450 hours /semester
Between 22-26 hours /week

The Master Thesis can be completed entirely at a UGent Research Lab, at a company or R&D center, or in a hybrid mode.

3-YEAR TRACK

Y 1 - Sem 1	Y 1 - Sem 2	Y 2 - Sem 1	Y 2 - Sem 2	Y 3 - Sem 1	Y 3 - Sem 2
Mandatory Courses					**30 ECTS**
Photonics Integrated Circuits: from Concept to Application (8 ECTS)		Integrated Lasers (4 ECTS)	Processing and Packaging (4 ECTS)	Materials for PICs (4 ECTS)	
Theory of PIC Devices (6 ECTS)		Electronics for PICs (4 ECTS)			
Elective Courses (3 to choose from list)					**12 ECTS**
Sem 1 courses: Optical Communication and Information Processing (4 ECTS) | Non-linear Optics (4 ECTS) | Quantum Optics (4 ECTS)					
Sem 2 courses: Integrated Photonic (Bio)Sensing (4 ECTS) | Micro- and Nanophotonic Semiconductor Devices (4 ECTS)					
Sem 1+2 course: Technological Processes for Photonics and Electronics: Laboratory (4 ECTS)					
Master Thesis					**18 ECTS**
Preparatory work for the Master Thesis (≈8 ECTS)					Master Thesis (≈10 ECTS)

≈ 20 ECTS /year
≈ 10 ECTS /semester

≈ 250-300 hours /semester
Between 15-18 hours /week

4-YEAR TRACK

Y 1 - Sem 1	Y 1 - Sem 2	Y 2 - Sem 1	Y 2 - Sem 2	Y 3 - Sem 1	Y 3 - Sem 2	Y 4 - Sem 1	Y 4 - Sem 2
Mandatory Courses							**30 ECTS**
Photonics Integrated Circuits: from Concept to Application (8 ECTS)		Theory of PIC Devices (6 ECTS)		Materials for PICs (4 ECTS)	Processing and Packaging (4 ECTS)		
Electronics for PICs (4 ECTS)		Integrated Lasers (4 ECTS)					
Elective Courses (3 to choose from list)							**12 ECTS**
Sem 1 courses: Optical Communication and Information Processing (4 ECTS) | Non-linear Optics (4 ECTS) | Quantum Optics (4 ECTS)							
Sem 2 courses: Integrated Photonic (Bio)Sensing (4 ECTS) | Micro- and Nanophotonic Semiconductor Devices (4 ECTS)							
Sem 1+2 course: Technological Processes for Photonics and Electronics: Laboratory (4 ECTS)							
Master Thesis							**18 ECTS**
Preparatory work for the Master Thesis (≈3 ECTS)						Master Thesis (≈15 ECTS)	

≈ 15 ECTS /year
≈ 8 ECTS /semester

≈ 190-225 hours /semester
Between 11-13 hours /week

PHOTONICS RESEARCH @UGENT

PHOTONICS RESEARCH GROUP

LCP

CMST

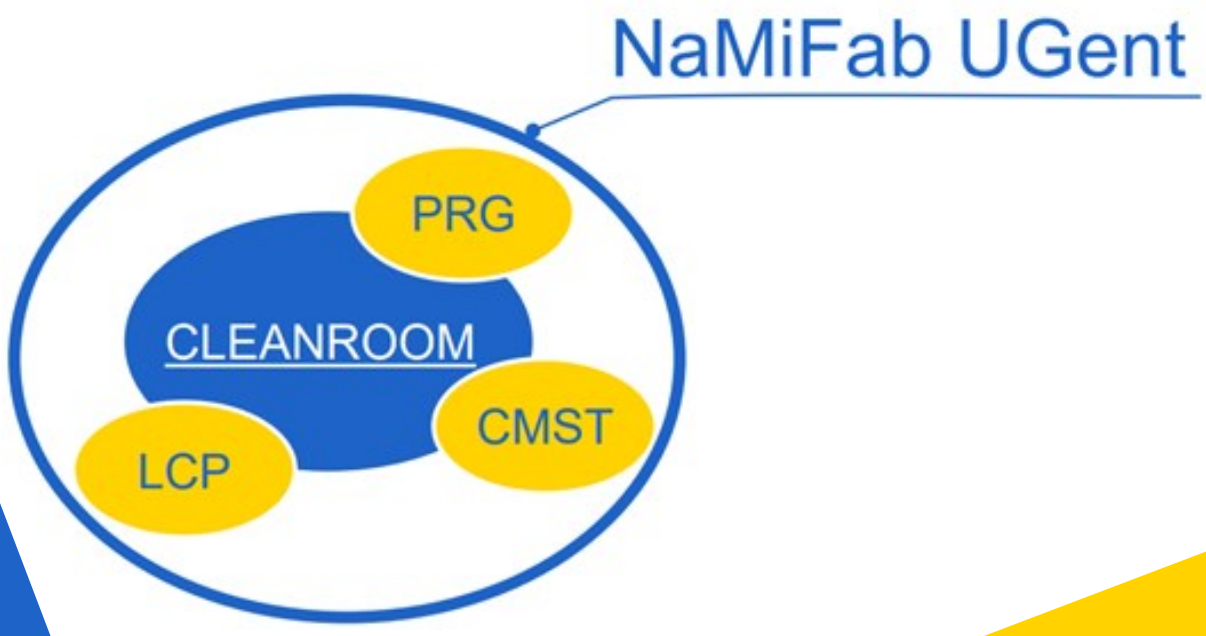
IDLab
INTERNET & DATA LAB

4 research groups, 25+ professors, 175+ researchers

Associated with imec

Supported by a UGent Core Facility:

NAMIFAB - CORE FACILITY FOR NANO- AND MICROFABRICATION



Tech Lane Ghent Science Park

Located at Tech Lane Ghent, a vibrant ecosystem of international R&D centers, university labs, the UGent cleanroom and more than 90 knowledge intensive start-ups.

Tech Lane Ghent

The Ghent Silicon Photonics Ecosystem

R&D Center in Ghent / Belgium

imec

Hewlett Packard Labs

LIGENTEC

Spin-off Companies

Caliopa silicon photonics

indigo

SENTEA

LUCEDA PHOTONICS

meep

axithra

Career Opportunities

- **50 %** **industry**

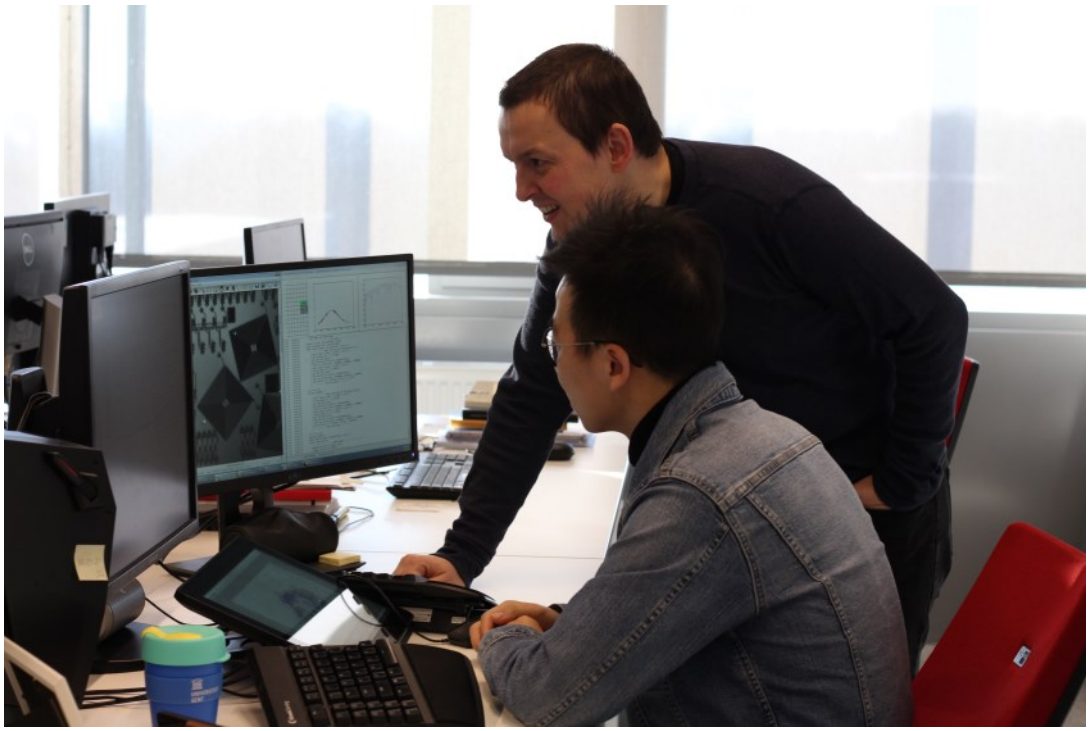
  R&D

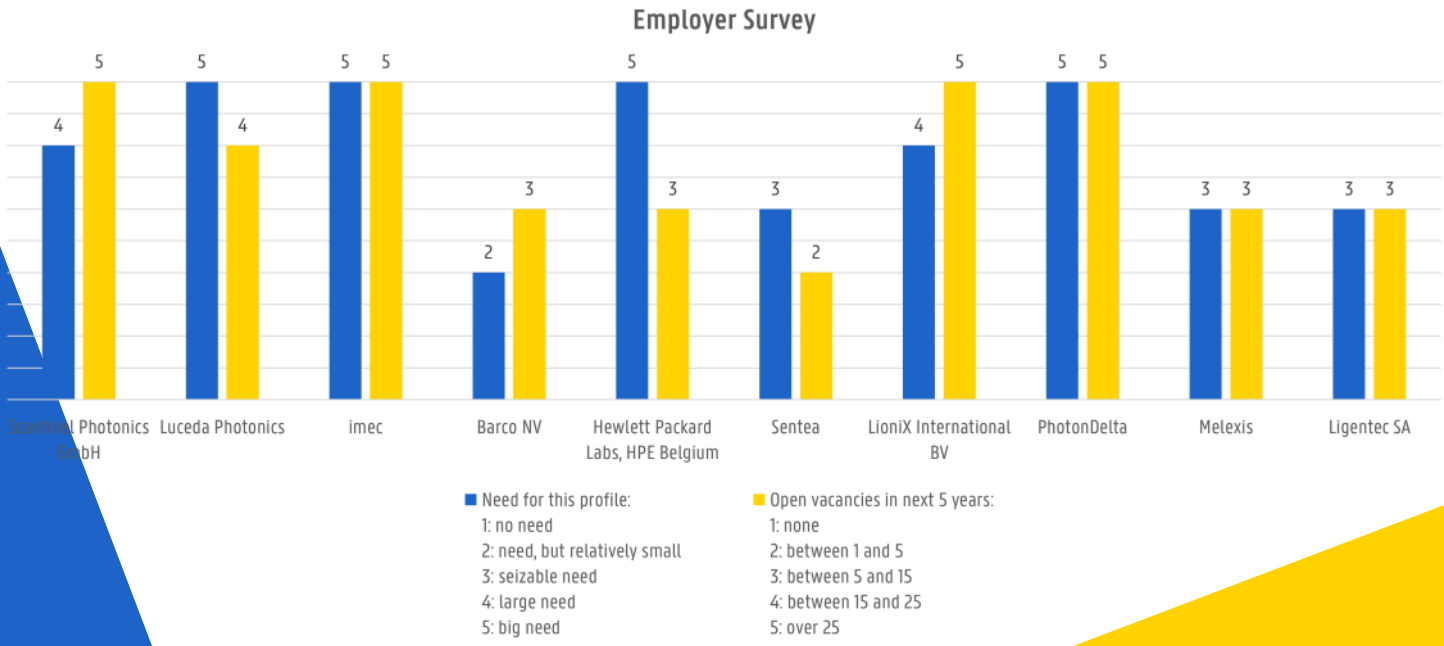
  project management

  consultancy

  sales/business support

- **50 %** **PhD**





BOOMING IN EU AND WORLDWIDE

Integrated (silicon) photonics is an important part of the European Chips Act, which is a policy that seeks to promote the development of innovative semi-conductor technologies in Europe. The Act encourages the use of advanced chip technologies, **such as integrated photonics**, to improve the competitiveness of European companies.

It also focuses on supporting research and development in the field of integrated photonics to ensure that Europe remains at the forefront of the industry. By encouraging the use of integrated photonics, the European Chips Act helps to create jobs and boost the economy.

Excerpt from the Whitepaper on Integrated Photonics by Photonics21, a European Technology Platform in Public Private Partnership with the European Commission :

Europe has the potential to become a major player in the worldwide market of Integrated Photonics. The expert group has identified the following research, innovation and industrialization priorities for further strengthening Europe's position:

1. **Establish R&D ecosystems for joint development of electronic components and systems and photonics,** since photonics, electronics and related system design need to be interconnected in order to build industrially attractive solutions at an acceptable price point.
2. **Cost-efficient possibilities for prototyping including seamless access to services for SMEs.** There are EU based pure play PIC foundries with volume capability but the task of bringing the ecosystem to the required manufacturing readiness level across a range of technologies is far from complete.
3. **Ensure linking up of entire value chain:** This includes the all aspects like materials, design systems, front-end wafer fabrication, back-end test, assembly and packaging.
4. **Education activities** to have enough skilled persons for the photonics industry

Top 10 companies with the highest market value

1	Microsoft	3.002 miljard dollar
2	Apple	2.815 miljard dollar
3	Saudi Aramco	2.059 miljard dollar
4	Nvidia	1.793 miljard dollar
5	Amazon	1.760 miljard dollar
6	Alphabet (Google)	1.753 miljard dollar
7	Meta Platforms (Facebook)	1.206 miljard dollar
8	Berkshire Hathaway	880 miljard dollar
9	Eli Lilly	742 miljard dollar
10	TSMC	657 miljard dollar

vrt nws

Investing in silicon photonics

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What Is 'Silicon Photonics'? Why Intel, TSMC, NVIDIA, Apple Are Investing

2023-09-13 | Semiconductors / Telecommunications

Optics & Photonics News
https://www.optica-opn.org › home · Vertaal deze pagina

Photonic Inc. Unveils Microsoft Partnership

18 nov 2023 — ... **Microsoft** will gain access to **Photonic's silicon**-based quantum technology for **Microsoft's** Azure cloud platform. Separately, **Photonic** ...

Student Life

Photonics Society Ghent

- *SPIE Ghent chapter*
- *Optica Ghent chapter*
- *IEEE Photonics Benelux Ghent Chapter*

Each semester a **Light Night** is organized whereby a guest lecturer is invited (from industry or academics), workshops are organized, students engage in a quiz, game-night or cultural activities ...

During the annual **Photonics Event** companies come to present themselves to the students and researchers. Last year imec, Luceda Photonics, Commscope, Huawei and Trinean organized a hands-on workshop whereby students could interact with the companies.

Students have the opportunity to attend **conferences** or participate in **summer schools** or **workshops**. Such as SPIE Photonics Europe (conference), the IEEE Photonics Benelux Annual Symposium, ePIXfab Training Activities...

Application

1st Step

Online application @

ugent.be/prospect/en/administration/application

DEADLINES: before April 1 (for non-EU Students)
before June 1 (for EU students)
before September 30 (for Belgian students only)

2nd Step

interview with a UGent professor

Contact

www.siliconphotonics.eu

SiliconPhotonics@UGent.be

Chair of the Program Board:

Prof. Nicolas Le Thomas
(Nicolas.lethomas@ugent.be)

GHENT UNIVERSITY