

MICRO-CREDENTIAL

# PHOTONIC INTEGRATED CIRCUITS FROM THEORY TO PRACTICE AND APPLICATIONS

SEPTEMBER 2026 - JUNE 2027



GHENT  
UNIVERSITY



Flanders Chips Competence Center

# PHOTONIC INTEGRATED CIRCUITS

## FROM THEORY TO PRACTICE AND APPLICATIONS

Driven by the current needs of data centers and artificial intelligence, the field of integrated photonics is growing rapidly, resulting in a shortage of skilled researchers and engineers. This micro-credential is designed to equip lifelong learners with the necessary skills and knowledge to make a difference in this cutting-edge field, from core technologies to diverse applications in telecommunications, data communications, sensors and biomedical technology, and quantum information processing.

Both simulation and modeling of chip design are covered, as well as insight into the necessary materials and fabrication techniques to ultimately characterize and measure a working photonic chip. methods to automate the data visualization process itself.

### CONTENTS

The course encompasses the entire spectrum of PIC development, covering design, fabrication, testing, and characterization. So, next to the theoretical background, the students will actively design their own PIC which will be fabricated and later on in the course tested and characterized. Additionally, it includes special lectures delivered by industry experts, shedding light on major application areas, and includes company visits to get familiar with the ecosystem and allows for networking opportunities.

The course will cover the following aspects:

- ⇒ Introduction : PICs and Silicon Photonics
- ⇒ Quickstart: Photonic Circuit Design + info of the design project
- ⇒ Waveguides and PIC platforms
- ⇒ PIC components: passive and active building blocks
- ⇒ PIC fabrication processes and relation to the CMOS process flow
- ⇒ Heterogeneous integration for silicon photonics
- ⇒ Circuit abstraction? Why?
- ⇒ Ways to describe photonic circuits? Signals, ports, models
- ⇒ Time domain/frequency domain circuit simulation
- ⇒ Circuit Design Flow and Chip Layout
- ⇒ Wavelength Filter Circuits
- ⇒ Component Simulation and Component Simulation Quiz
- ⇒ Programmable Photonics
- ⇒ Co-integration techniques, Co-design and co-simulation considerations
- ⇒ Control loops
- ⇒ Design for Manufacturability
- ⇒ Hands-on characterization labs
- ⇒ Packaging for PICs
- ⇒ Applications
- ⇒ Company visits

### LECTURERS

- **prof. Wim Bogaerts**, Department of Information Technology, Ghent University-imec

- **dr. Mattias Verstuyft**, Department of Information Technology, Ghent University-imec

### FINAL COMPETENCES

- ⇒ Understanding of the working principles of PIC components (active and passive), and how they can be combined into circuits
- ⇒ Understanding the essential modelling and simulation techniques for PICs components and circuits, being able to select the most suitable method for a problem, and applying the techniques (with commercial tools)
- ⇒ Understanding photonic circuit formalisms, how they differ from electronic circuits. Being able to construct photonic circuits, simulate them, and generate a layout that can be fabricated.
- ⇒ Understanding the fundamental concepts of wavelength filters, and the different implementations with their strengths and weaknesses.
- ⇒ An insight into the different technology platforms for PICs, their fabrication processes, and how PICs can serve a diversity of applications.
- ⇒ Having hands-on experience in designing a photonic integrated circuit with tunable elements, the associated fabrication and packaging flow, and being able to characterize the chip using lab equipment and driver electronics.
- ⇒ An insight in the PIC Ecosystem of Ghent, Leuven and Eindhoven (and beyond)
- ⇒ Connecting with stakeholders

### TARGET AUDIENCE

Several high-tech companies and research institutions in Flanders (and abroad) are increasingly seeking professionals with expertise in Photonic Integrated Circuits (PICs), also known as photonic chips. In this micro-credential, professionals will gain a solid foundation in the theory behind PICs, understand the practical aspects of design and fabrication, and explore real-world applications of photonic chips. The course empowers learners to contribute to the next generation of miniaturized, scalable photonic systems, and to play a role in the growing European photonics ecosystem.

This course is also a great fit for business development professionals looking to grasp the value of Photonic Integrated Circuits and capitalize on the dynamic market opportunities emerging in this field.

Participants must have at least a bachelor's degree 'Bachelor of Science in industrial engineering' or 'Bachelor of Science in Engineering'.

### PRACTICAL INFO

⇒ **FEE** 2600€

⇒ **LOCATION** Universiteit Gent, Campus Technologiepark Zwijnaarde

⇒ **TIME** September 2026 – June 2027

More info? Go to ⇒ [WWW.UGAIN.UGENT.BE/PIC2026.HTM](http://WWW.UGAIN.UGENT.BE/PIC2026.HTM)