PhotonHub Experience Centre

Course XX
InP PIC Concepts

Course Provider

Eindhoven University of Technology (TU/e)
The Netherlands

Course Overview

The indium phosphide (InP) photonic integration technologies offer an access to a comprehensive set of active and passive functions allowing to create application specific photonic system-on-chip (SoC) for a wide range of applications. Realization of photonic SoC requires familiarity with PIC-based product creation chain. Decisions and choices made in early-stage planning and at the design phase are critical to successful prototypes and/or manufacturability of the product at scale.

This 3-day long course provides trainees with the fundamentals and understanding of creating InP PIC based products. On the completion adepts will be able to quantitatively assess their concepts and make informed decisions on upskilling and outsourcing. These will enable development of custom and scalable PIC based solutions with reduced design-in windows for new products.

This unique ‘hands-on’ experience gives the attendees an access to the state-of-the-art fabrication and characterization facilities at TU/e. Dedicated training materials, access to remote experiments, tutorials and mentoring by world-class technical experts will be provided.

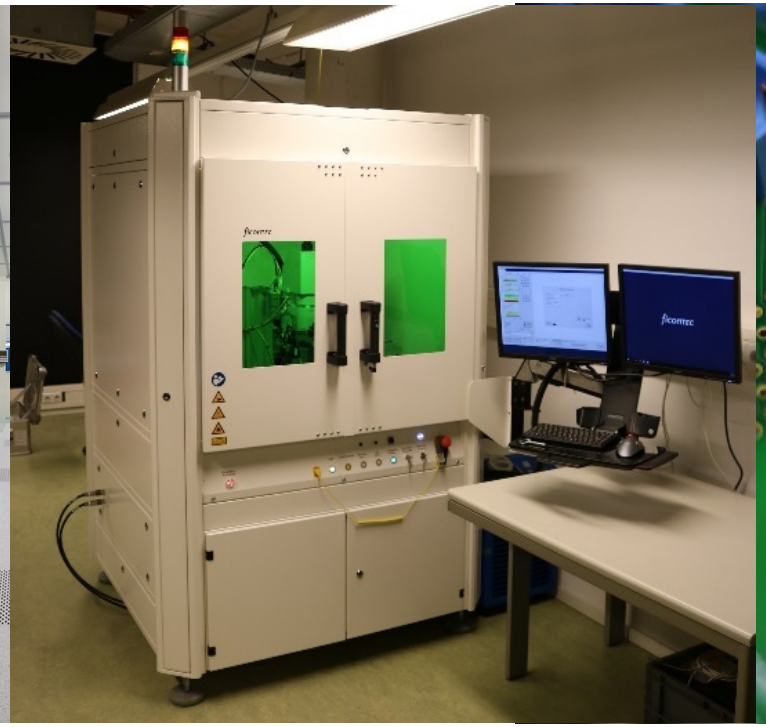
Target Audience

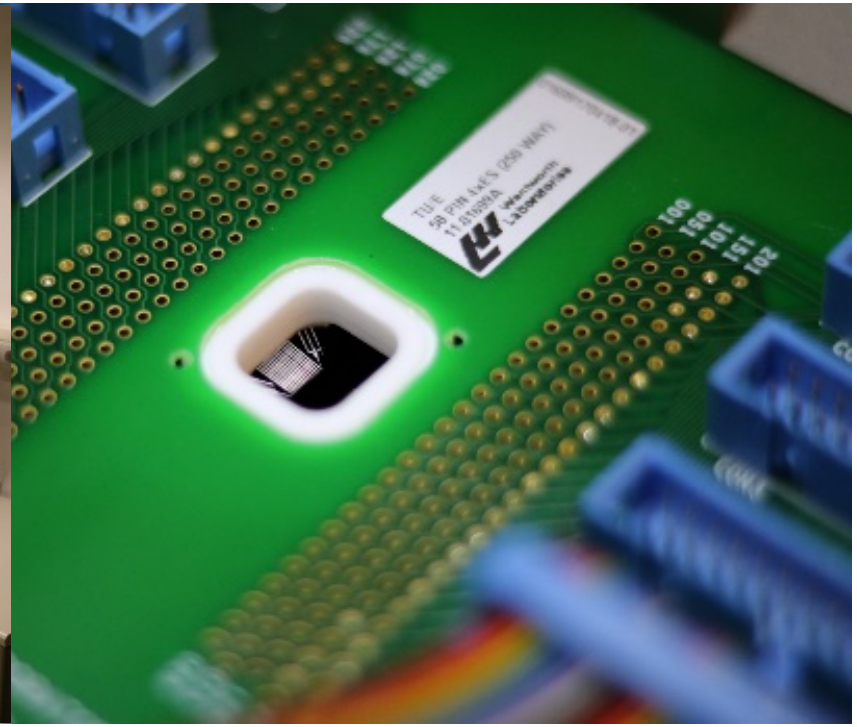
The course is tailored for innovators who have not worked with InP PIC technology. Basic understanding of photonics is an advantage but not required.

Expected Outcomes

1) Fundamentals of integrated photonics product creation flow and supply chain.
2) Design strategy for test, production and manufacturability (DfX)
3) Handling of photonic ICs
4) Electronic-Photonic test and measurement orientation
5) Understanding of how to quantitatively assess own concepts
6) Ability to make informed decisions on upskilling and outsourcing

Course Equipment & Infrastructure





Course Schedule

Day & Time	Training Activity
Day 1 (09:00 – 12:00)	TUE Orientation, Course Introduction & Tutorials (lectures)
Day 1 (14:00 – 17:00)	Fabrication of InP photonic integrated circuits (hands-on)
Day 2 (09:00 – 12:00)	Handling of photonic ICs (hands-on)
Day 2 (14:00 – 17:00)	Optical characterization (hands-on / remote set-up)
Day 3 (09:00 – 12:00)	Electronic-photonic test automation (hands-on / remote set-up)
Day 3 (14:00 – 17:00)	Design a photonic system-on-chip (SoC) (hands-on)

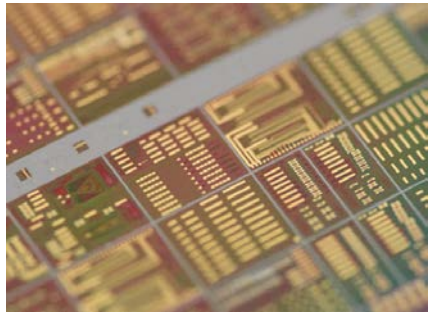
Course Details (Day 1)

Day 1a. TU/e & PhotonHub Course Introduction. PIC Product creation flow tutorials (lectures)

Location: Conference room at TU/e campus

Details: Lectures on InP PIC fabrication, Design for test, production and manufacturability.

Training Duration: 3 Hours



Day 1b. Cleanroom visit (hands-on)

Equipment, tool-set, processes: epitaxy, deposition, lithography, wet and dry etching, metallization and breaking

Location: NanoLab@TU/e

Details: Trainees will learn how photonic integrated circuit chips are fabricated

Training Duration: 3 Hours

Course Details (Day 2)

09:00

17:00

Day 2a. Handling and probing of photonic ICs (hands-on)

Equipment Used: die carrier (Gelpak), release tools, tweezers, InP PIC samples, dc probes, lensed fiber and positioners, laser diode, optical power meter

Location: Optical characterization labs at TU/e e.g. OLA1/OLA1

Details: Trainees will learn how handle probe electrically and optically photonic chips

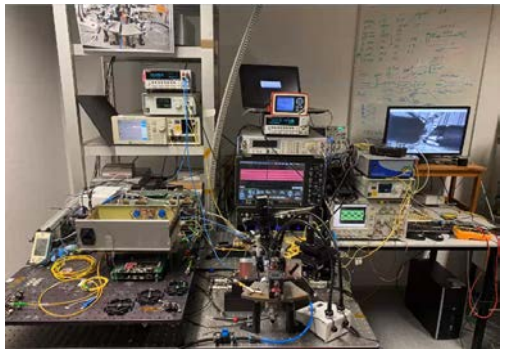
Training Duration: 3 Hours

Day 2b. Characterization of Photonic Integrated Circuit (hands-on)

Equipment Used: Multichannel source meter, optical spectrum analyzer, test rig with a predefined DUT

Details: Measurements of a real DUT e.g. LIV characteristics of laser diode, VI and dark current of photodiode, modal gain od SOA

Duration: 3 Hours



Course Details (Day 3)

09:00

17:00

Day 3a. Test automation of PICs (hands-on)

Equipment and tools: Automated and semi-automated die testers, a DUT InP PIC with DOEs, electronic-photonic test kit

Details: Testing of multiple DUTs with parameter variations (DOE) and collection of data in standardized file format.

Training Duration: 3 Hours

Day 3b. Design an application specific photonic SoC (hands-on)

Equipment Used: PC, Python ADE, WebBased interface

Details: Designing a custom photonic system on chip with experts e.g. widely tunable swept laser system for gas sensing.

Training Duration: 3 Hours

Course Trainers

Course Director: Dr. Sylwester Latkowski

Course Manager: S.Latkowski@tue.nl

Introduction: Prof. Kevin Williams

PIC product creation tutorials: Dr. Yuqing Jiao, Dr. Sylwester Latkowski

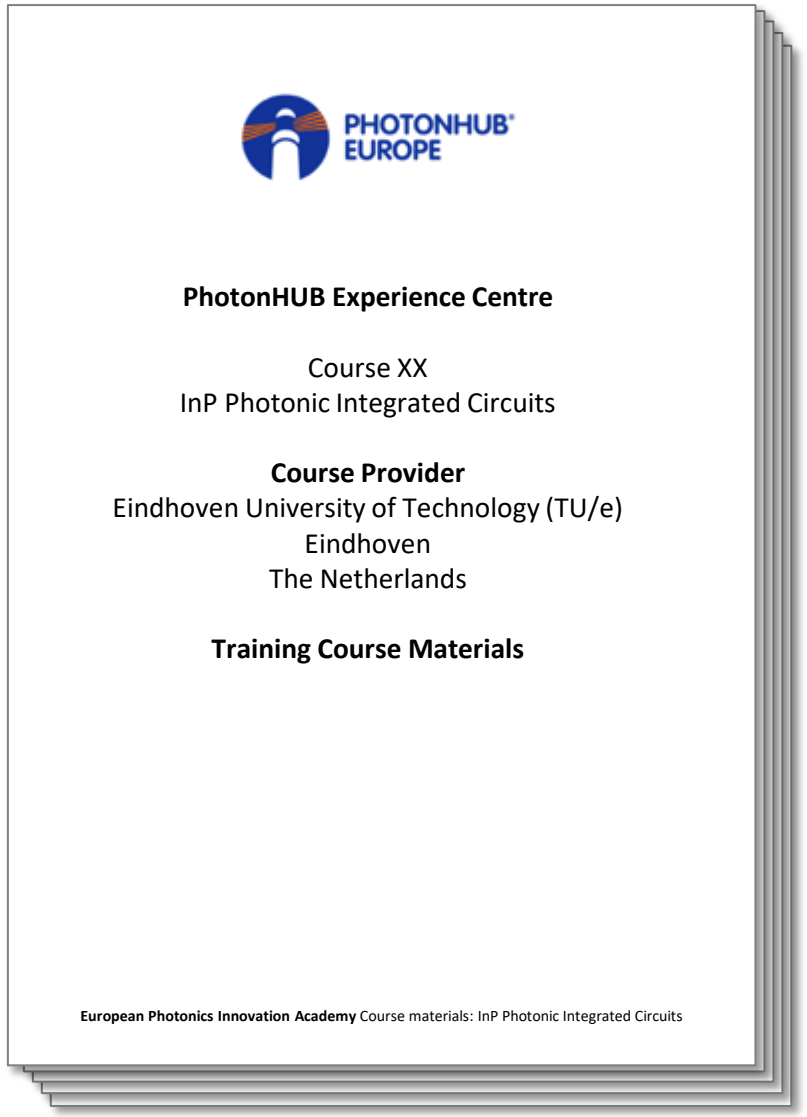
Cleanroom visit: Dr. Jeroen Bolk

Handling and probing of photonic: Dr. Dzimitry Pustakhood, Michail Chatzimichailidis

Characterization and test lab experiments:Dr. Dzimitry Pustakhood, Michail Chatzimichailidis

Design a custom photonic SoC: Dr. Xaveer Leijtens, Dr. Sylwester Latkowski

Course Material (technical hand-outs)



Course Location, Schedule & Cost

- Location: Eindhoven University of Technology (TU/e) Campus, Eindhoven
- Course Schedule: 2 times per year (January, July)
- Number of people: 10 (Groups up to 10 people per course)
- Course Price (1000 Euros per person, includes catering and course materials and consumables)

Further Information

- S.Latkowski@tue.nl
- www.jeppix.eu/contact-us
- www.photonhub.eu/euphotonicsacademy

Keywords

Photonic Integrated Circuits, PIC, Indium Phosphide, InP, Integrated Photonics,
Electronic-Photonic Testing, Design Rules, Design for product (DfX), Design for Test,
Design for Packaging, Fabrication, Manufacturing, Pilot Line, Ecosystem, Equipment, Automation
Application Specific Photonic Integrated Circuit, ASPIC, Photonic SoC
Communications, Biomedical, Sensors, Agri-Food

Relevant Technology & Application Domain

Technology: InP

Application: Relevant to all application domains