PhotonHub Experience Centre

Silicon Photonics: Build your own Thermo-Optic Modulator

Course Provider

ORC (CORNERSTONE)
University of Southampton
UK

Course Overview

Silicon photonics plays a key role in many applications ranging from communications, AI, quantum, sensing, defense, LiDAR and more. The key advantage of silicon photonics is cost. Silicon is inherently cheap, and the infrastructure to fabricate silicon devices already exists in the electronics industry, which can be exploited for low-cost silicon photonics.

This three-day hands-on training course provides industry, particularly those seeking to better understand the challenges of silicon photonics fabrication, with an opportunity to fabricate their own silicon photonics devices in a cleanroom facility.

The course will focus on six technology areas; 1) Deep-UV projection lithography for patterning designed devices into a photosensitive resist layer; 2) Etching of silicon waveguides; 3) Cladding deposition; 4) Metallisation; 5) Flip-chip bonding; and 6) Wafer-scale-testing. Course attendees will learn the details of how silicon photonics devices are fabricated and gain a better understanding of the tolerances involved in the fabrication processes. They will learn technologies that are comparable to volume manufacturing technologies.

Target Audience

It is desirable but not essential that course attendees have a basic understanding of photonics. The course is ideally suited to those planning to develop new silicon photonic products, or those who already operate “fab-less” and want to gain a better understanding of typical fabrication tolerances to enable the improvement of circuit designs.

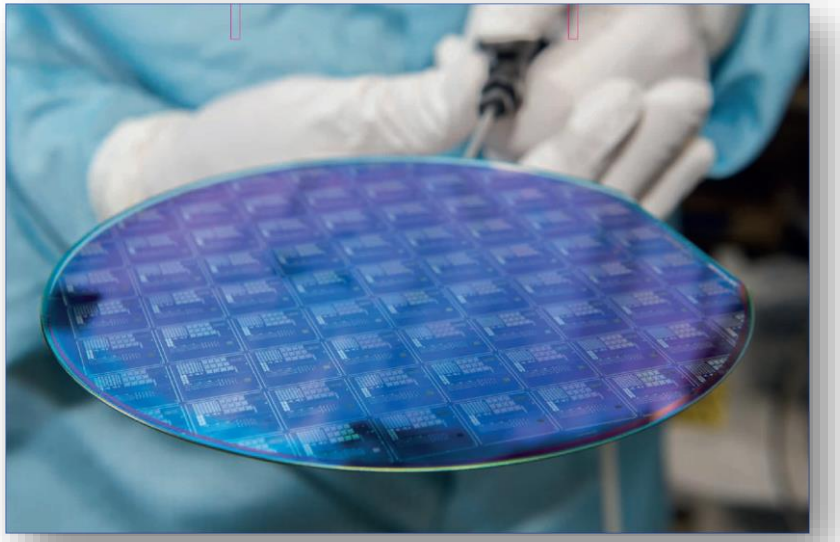
Expected Outcomes

1) Understanding of how silicon photonics devices are fabricated
2) See the key silicon photonics fabrication processes (hands-on activity)
3) Understand the fabrication tolerances involved in fabricating silicon photonics devices (hands-on activity)
4) Take home a real silicon photonics chip that is compatible with PhotonHub packaging courses (https://ecosystem.photonhub.eu/trainings/product/?action=view&id_form=7&id_form_data=6)

Course Schedule

Day & Time	Training Activity
Day 1 (10:00 – 13:00)	Lecture: ORC Orientation, Health & Safety Briefing, Course Introduction & Tutorial
Day 1 (14:00 – 17:00)	Demo 1: Deep-UV projection lithography & Silicon etching (hands-on)
Day 2 (09:00 – 12:00)	Demo 2: Resist stripping, CD-SEM & Cladding deposition (hands-on)
Day 2 (14:00 – 17:00)	Demo 3: Metal sputtering lift-off & flip-chip bonding (hands-on)
Day 3 (09:00 – 12:00)	Demo 4: Wafer-scale-testing & dicing (hands-on)
Day 3 (14:00 – 15:00)	Lecture: Introduction to CORNERSTONE, Q&A & wrap up

Course Trainers



Course Director: Prof. Callum Littlejohns

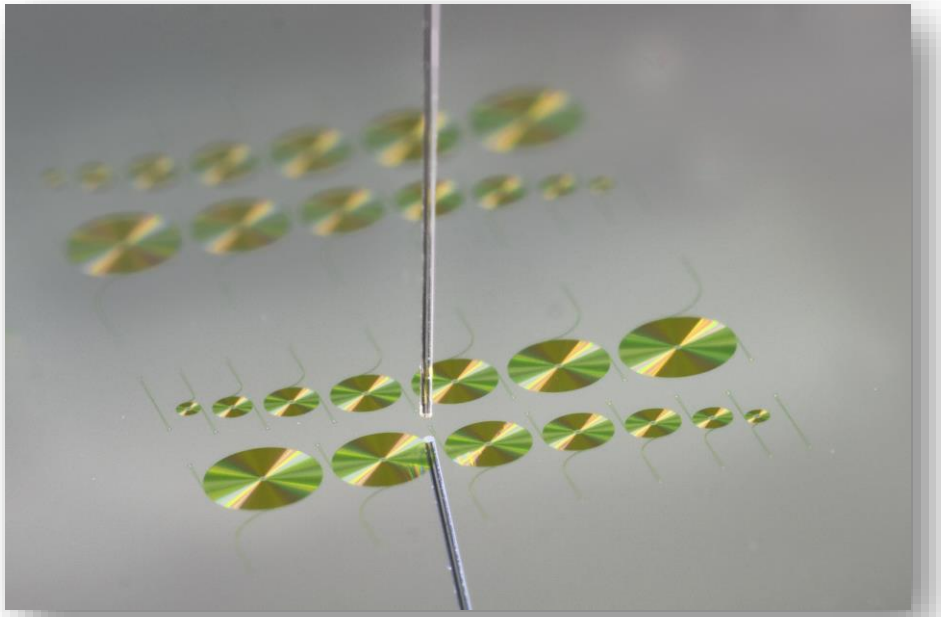
Demo 1: Dr. Xingzhao Yan & Dr. Georgia Mourkioti

Demo 2: Eleni Tsanidou & Dr. Thalia Dominguez Bucio

Demo 3: Dr. Martin Ebert & Dr. Colin Mitchell

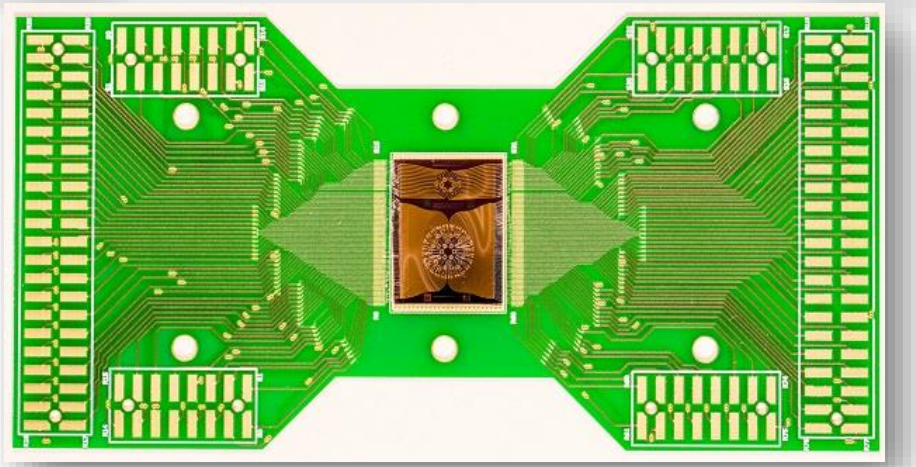
Demo 4: Dr. Emre Kaplan & Hanuushah Vizabaskaran

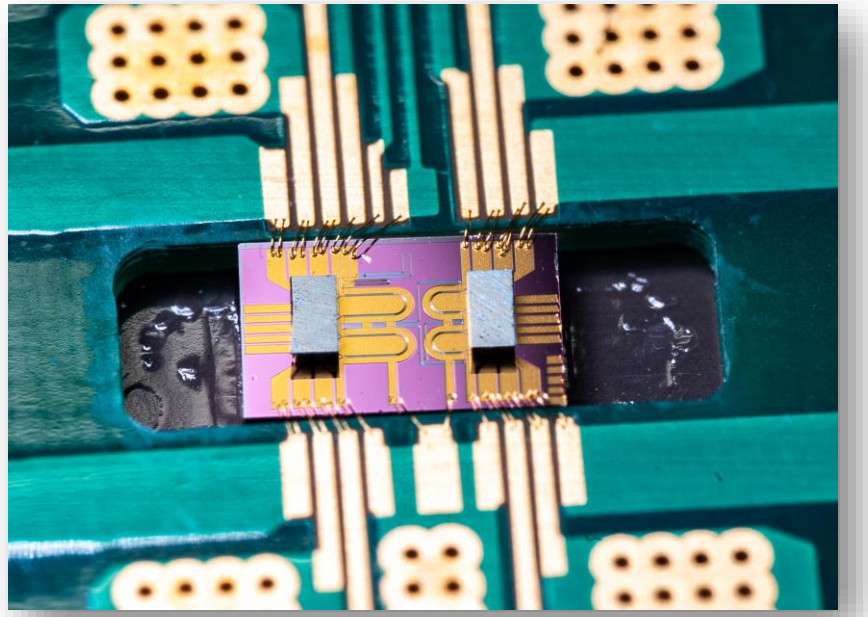
Course Demonstrators



Sensing circuits for bio-medical applications

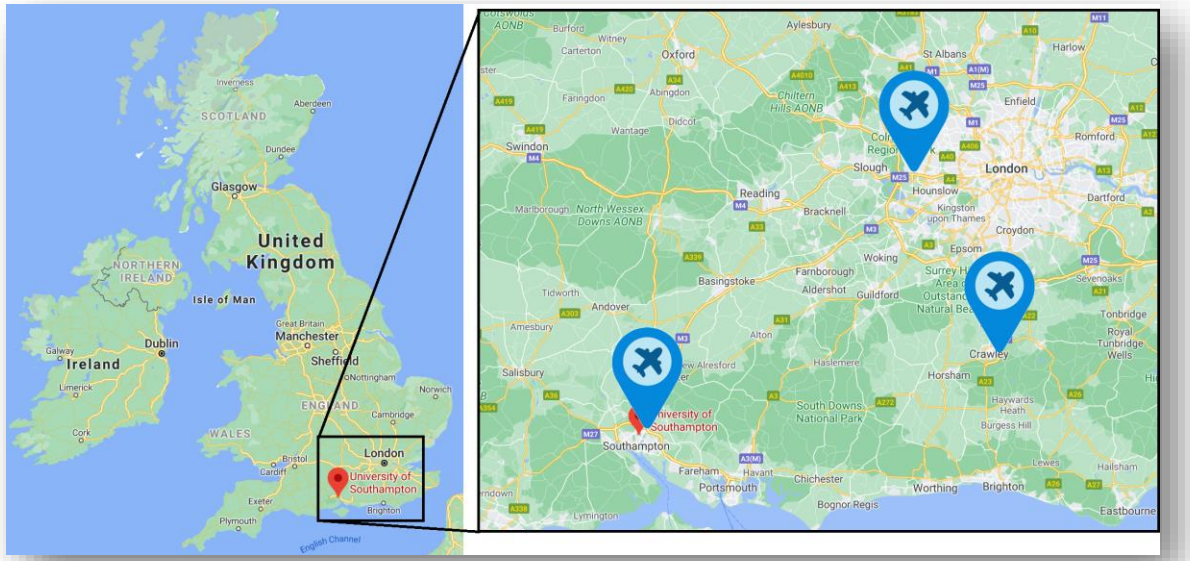
Programmable photonic circuits





Integrated transmitter for high-speed communications systems

Course Location, Schedule & Cost

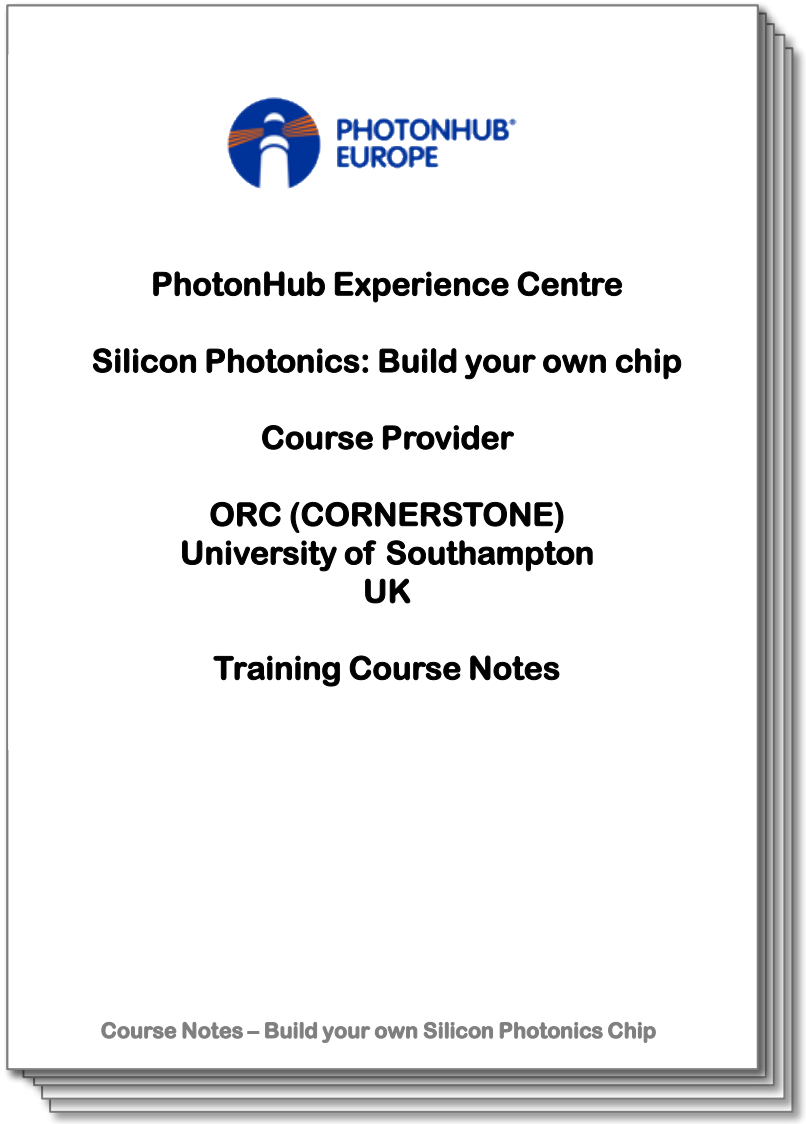


- Course Schedule (see PhotonHub training catalogue)
- Number of people (6 people per course; in Groups of 3)
- Course Cost (2,200 Euros per person, includes catering and project consumables)

Further Information

- cornerstone@soton.ac.uk
- www.cornerstone.sotonfab.co.uk/contact-us
- www.photonhub.eu/euphotonicsacademy

Course Material (technical hand-outs)



Keywords

Silicon photonics, PICs, Integrated Photonics, Manufacturing, Equipment, Lithography, Waveguides, Etching, Communications, LiDAR, Sensing, Rapid Prototyping, Testing

Optional Extras

This course is partnered with Luceda Photonics & Tyndall National Institute to enable a full design + fabrication + packaging cycle to enable you to take home your own fully packaged silicon photonics devices designed by you. Each course is run independently and can operate as a stand-alone course.

Full Training Programme

1) Design your own Silicon Photonics devices using the ORC (CORNERSTONE) process-design-kit (PDK) built into Luceda Photonics' IPKISS software. This introductory course will be independently hosted free-of-charge by Luceda Photonics (not organised by PhotonHub Europe).

   Contact: https://lucedaphotonics.odoo.com/contactus

2) Fabricate your own designs at ORC (CORNERSTONE) – this training course (2500 Euros per group surcharge applies for the procurement of the required mask-set)

3) Package your fabricated designs at Tyndall National Institute