PhotonHub Demo Centre

Fundamentals, fabrication and characterisation techniques of guided optical systems

Course Provider

CNR-IFAC Institute of Applied Physics “N. Carrara”,
CNR Florence Research Area,
Italy

Course Overview

This one-day hands-on training course aims to provide industrial partners, as well as students and young researchers, a training about guiding devices, waveguides and fibres, and related fabrication and characterisation technologies.

The course, after a short introduction about the principles of light propagation in the structures object of the course, will focus on the following main topics:

1) Ion-exchange as a technology for the fabrication of planar waveguides in glasses
2) Coupling of light to guiding structures
3) Characterization of slab and channel waveguide structures (optical constants, propagation and coupling losses, near field, optical gain)
4) Fabrication and characterization techniques of optical fibre gratings
5) Physical parameters sensing techniques (Fibre bragg gratings)
6) Biochemical parameters sensing techniques (Long period gratings + microfluidics)

Target Audience

A short introduction to the general topic will be provided, so that attendees will be prepared to understand the activities in which they will be involved. It is therefore desirable but not essential that course attendees have a basic understanding of photonics.

The course is targeted to persons interested in gaining the capability of performing the main characterisations needed to test guiding structures.

Expected Outcomes

1) Acquiring the key principles of light guiding in optical devices and of fibre gratings.
2) Experiencing a key technology for waveguide fabrication (hands-on activity).
3) Gaining the capability of performing the most essential characterizations of planar (slab and channel) waveguides (hands-on activity).
4) Acquiring the key principles of fiber gratings design and production (hands-on activity).
5) See and realize exemplative applications of fiber gratings for sensing (hands-on activity).

Course Schedule

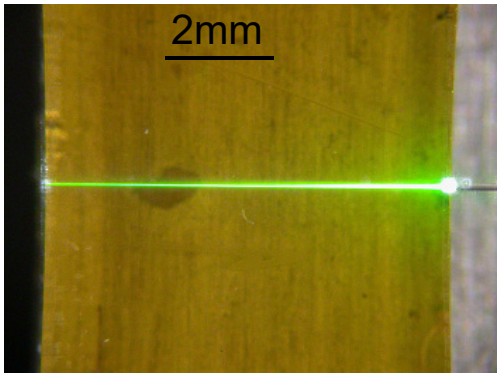
Time	Demo Activity
09:00 – 10:30	IFAC Orientation, Course Introduction & Tutorial
10:30 – 13:00	Demo 1 • Fabrication of optical fibre gratings (hands-on) • Physical parameters sensing (Fibre bragg gratings) (hands-on) • Biochemical parameters sensing (Long period gratings + microfluidics) (hands-on)
14:30 – 17:00	Demo 2: • Fabrication of slab waveguides by ion-exchange (hands-on) • Coupling of light to slab waveguides and measurement of optical constants (hands-on) • Characterization of channel waveguides: losses, near field, gain (hands-on)
17:00 – 17:30	Follow-Up Questions & Close

Course Trainers

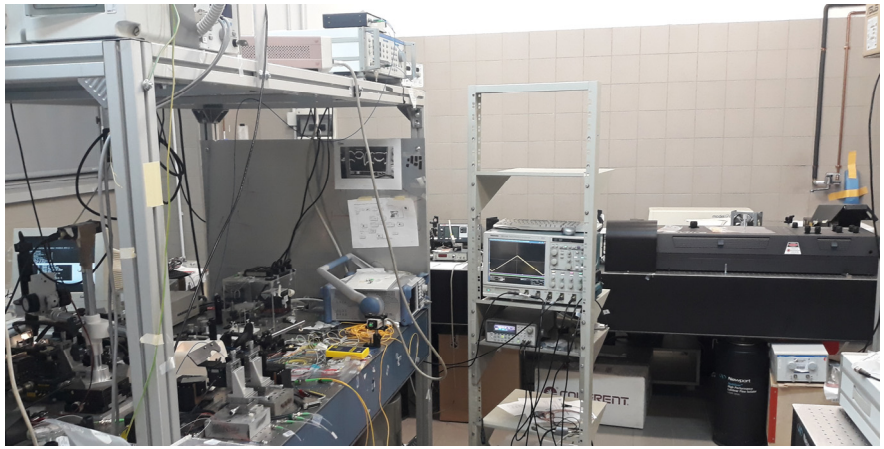
Course Director: Cosimo Trono, Stefano Pelli

Demo activities: Cosimo Trono, Stefano Pelli, Simone Berneschi, Gualtiero Nunzi Conti, Silvia Soria

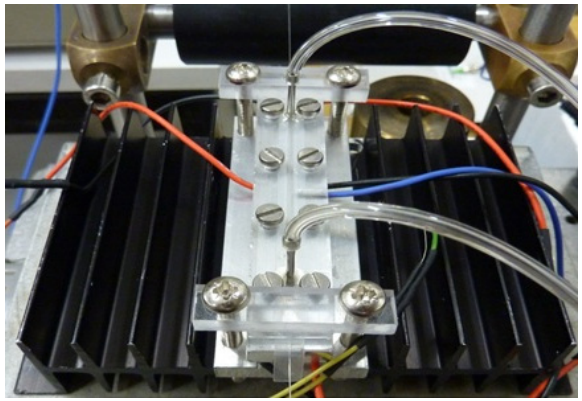
Course Demonstrators



Channel waveguide

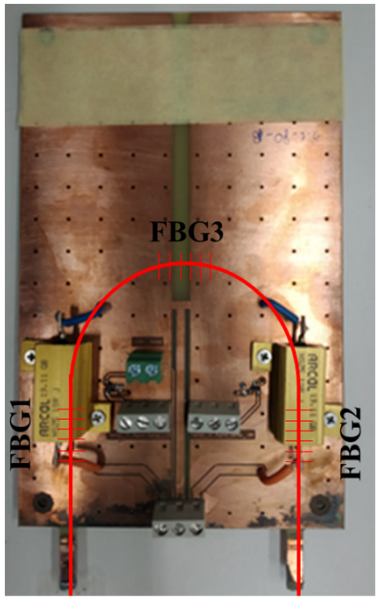


Characterisation laboratory



Microfluidic thermostated flow-cell for biosensing applications of long period gratings

Fiber bragg gratings embedded in a PCB electronic board for temperature and stress measurements



Course Location, Schedule & Cost

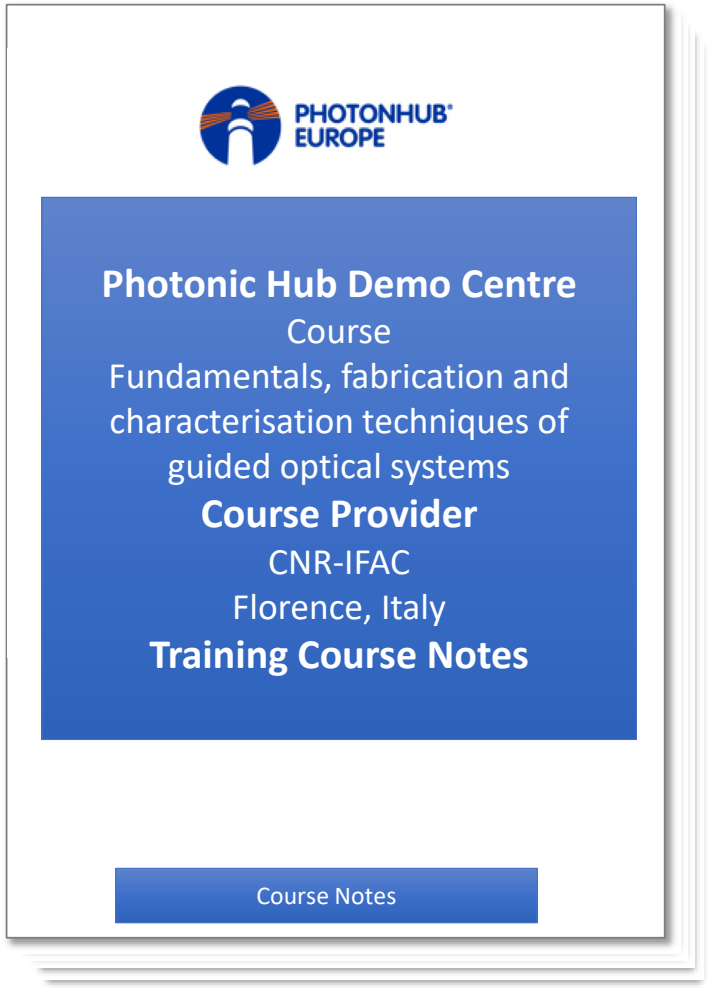
- Course Schedule: 20/01/2026.
- Number of people: Groups of 4 people, 2 parallel groups max, 8 people total max.
- Course Cost: 200 Euros per person: the fee includes coffee breaks and lunch, hand-out notes, consumables / safety devices for hands-on activities.

Further Information

- s.pelli@ifac.cnr.it
- c.trono@ifac.cnr.it
- http://www.ifac.cnr.it/

- www.photonhub.eu/euphotonicsacademy

Course Material (technical hand-outs)



Keywords

Photonic Devices, Fabrication, Characterisation, Optical waveguides, Optical fibres, Fibre gratings, Ion-exchange, Light coupling, Optical amplification

Relevant Technology & Application Domain

Technology: Planar waveguides and fibre structures, ion-exchange

Application: Telecom, Sensing, Light generation, Light amplification