

PhotonHub Experience Centre

Course ...

**Fiber-Optic Sensors for Structural Health
and Biomedical Monitoring**

Course Provider

**Warsaw University of Technology,
Poland**

Course Overview

The proposed 3-day hands-on trainings will address the major topics of manufacturing and practical application of fiber-optic sensors with a specific focus on biomedical and structural health monitoring applications, reflecting the unique competences of the team in these fields.

This 3-day training course includes measuring the basic parameters of fiber optic sensors - mainly focused on Bragg grating (FBG) sensors, showing the possibilities of compensating the influence of temperature, designing of a fiber optic sensor laminated in composite fiber and of a fiber optic sensor printed in a 3D printer (smart materials) and showing the possibilities of integration of the sensor system with PIC dedicated for either a single fiber-optic sensor or multiple sensors.

This unique 'hands-on' training programme provides attendees with access to state-of-the-art facilities, materials and equipment, with dedicated tutorials and mentoring for technical experts.

Target Audience

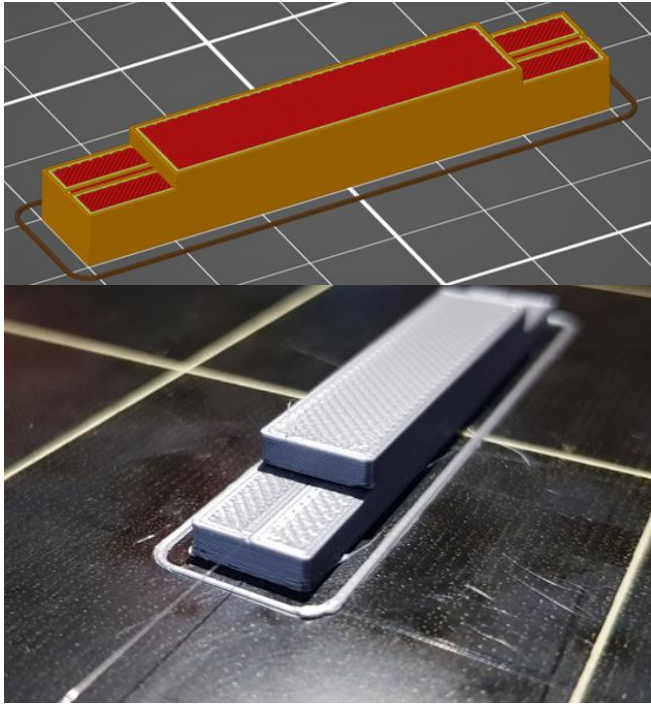
It is desirable but not essential that course attendees have a basic understanding of photonics. The course is designed to support newcomers to the photonic field, planning to develop new products exploiting the potential of fiber-optic sensors.

Expected Outcomes

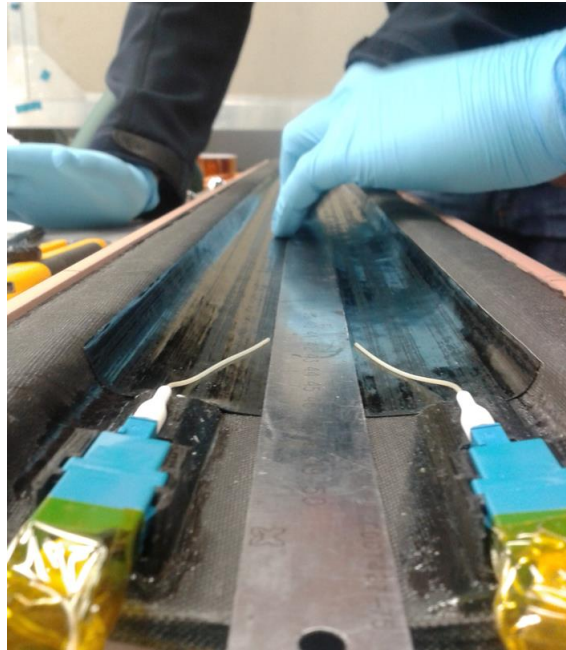
- 1) Understanding of key features of fiber-optic sensors
- 2) Design and construction of a fiber optic sensor (hands-on activity)
- 3) Ability to compensate the effect of temperature on the measured signal
- 4) Understanding the process of integration of the sensor system with PIC

Course Equipment & Infrastructure

Designing



Manufacturing



Testing



Course Schedule

Day & Time	Training Activity
Day 1 (09:00 – 12:00)	Lecture on Photon HUB (30min) + intro Lab1 (2h)+2x15min (lectures)
Day 1 (13:00 – 16:00)	Characterizing Fiber Bragg Gratings (hands-on)
Day 2 (09:00 – 12:00)	Design and construction of a fiber optic sensor printed in a 3D printer (hands-on)
Day 2 (13:00 – 16:00)	Design and construction of a fiber optic sensor laminated in composite fiber (hands-on)
Day 3 (09:00 – 12:00)	Fiber optic connection methods (hands-on)
Day 3 (13:00 – 16:00)	Signal analysis methods (hands-on)

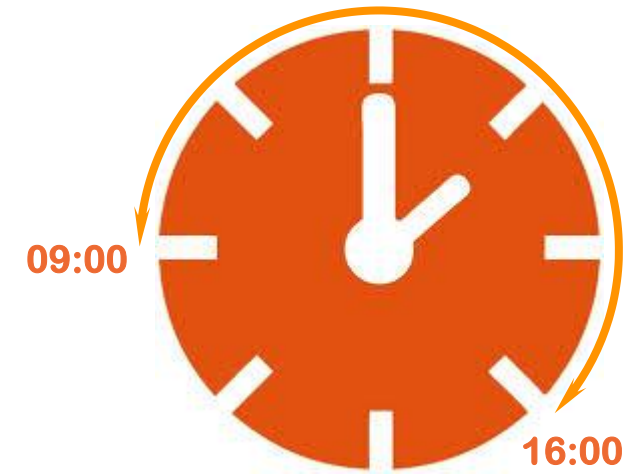
Course Details (Day 1)

Day 1a. Lecture on Photon HUB (30min) + intro Lab1 (2h)+2x15min (lectures)

Location: WUT Conference Room

Details: basics of fiber optics, fiber optic sensors, applications

Training Duration: 3 Hours



Day 1b. Characterizing Fiber Bragg Gratings (hands-on)

Equipment Used: Optical Spectrum Analyser

Details: a) Fundamental properties of FBG measurement (central wavelength, FWHM, transmission coefficient, reflection coefficient)

Training Duration: 3 Hours

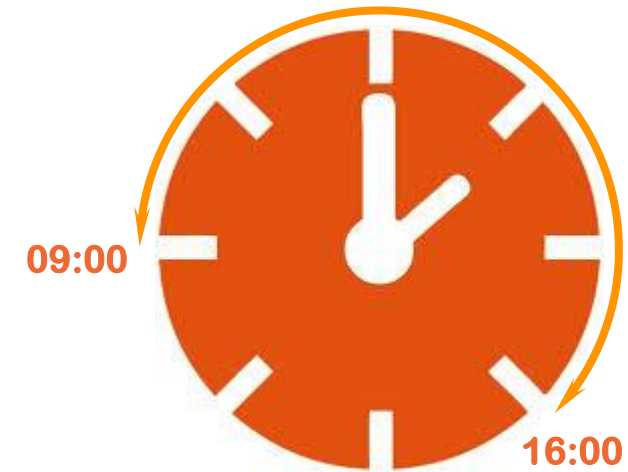
Course Details (Day 2)

Day 2a. Design and construction of a fiber optic sensor printed in a 3D printer (**hands-on**)

Equipment Used: Prusa 3D printer

Details: sensor design, 3D printing design, fiber optic sensor tests

Training Duration: 3 Hours



Day 2b. Design and construction of a fiber optic sensor laminated in composite fiber (**hands-on**)

Equipment Used: Three-point bending system

Details: sensor design, fiber optic sensor lamination, securing the optical fiber during the lamination process

Duration: 3 Hours



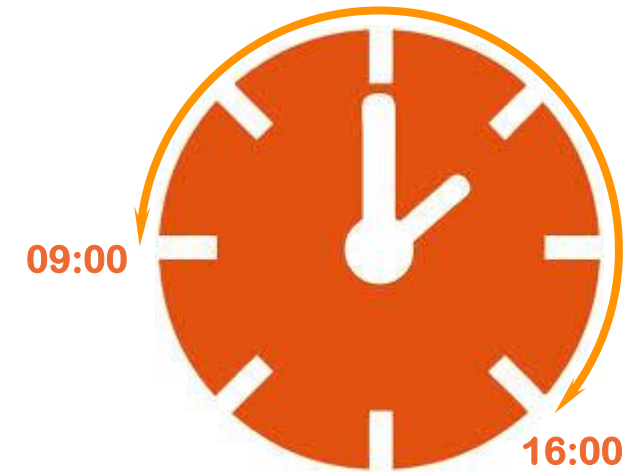
Course Details (Day 3)

Day 3a. Fiber optic connection methods (hands-on)

Equipment Used: Reflectometer

Details: measurement of attenuation using the insertion method with an optical spectrum analyzer and the reflectometric method, fiber's bending losses, fiber cleaning

Training Duration: 3 Hours

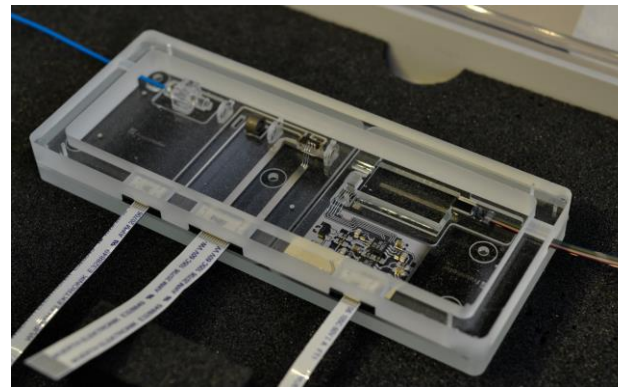


Day 3b. Signal analysis methods (hands-on)

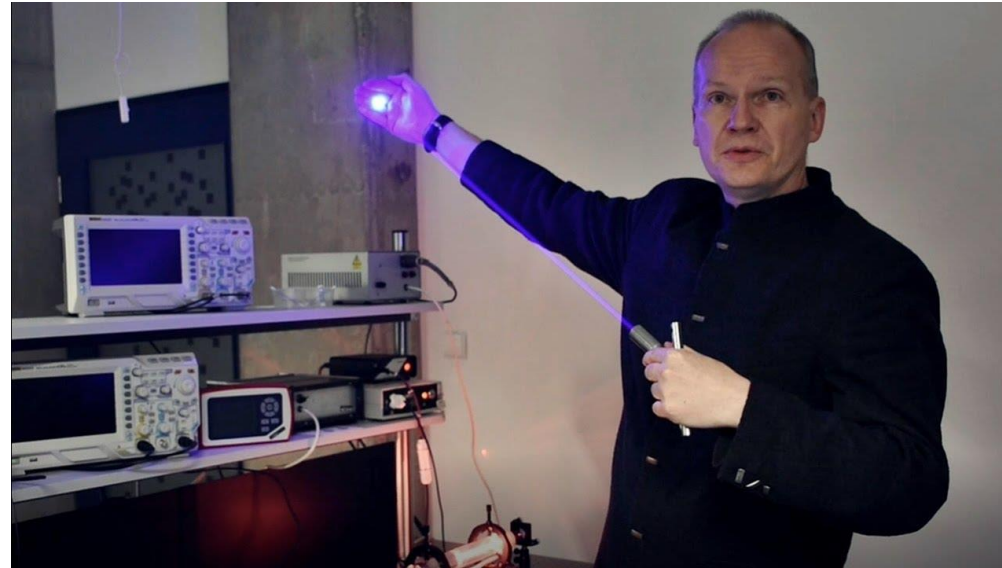
Equipment Used: Optical spectrum analyser

Details: possibilities of integration of the sensor system with PIC dedicated for either a single fiber-optic sensor or multiple sensors

Training Duration: 3 Hours



Course Trainers



Course Directors: Piotr Lesiak, Ryszard Piramidowicz
Course Manager: Marta Kajkowska

Demo 1: Alicja Anuszkiewicz

Demo 2: Piotr Sobotka

Demo 3: Krzysztof Anders

Course Material (technical hand-outs)



PhotonHub Demo Centre

Course 11
**Fiber-Optic Sensors for Structural Health
and Biomedical Monitoring**

Course Provider

Warsaw University of Technology

Course Location, Schedule & Cost



- Course Schedule (all around the year – exact dates to be confirmed)
- Number of people (Groups of 4/8 people per course)
- Course Cost (250 Euros per person, includes catering and project consumables)

Further Information

- piotr.lesiak@pw.edu.pl
- www.photonhub.eu/euphotonicsacademy

Keywords

Optical fibers, fiber-optic sensors, optical sensor networks, structural health monitoring, smart materials, FBG, distributed sensing, OFDR, OBR, OTDR, specialty fiber splicing,

Relevant Technology & Application Domain

Technology: Glass and Polymer Specialty Optical Fibers and Fiber Optic Devices

Application: Relevant to all application domains