PhotonHub Demo Centre

Course 01
Optical gas sensors for industrial applications

Course Provider

National Council of Research of Italy
Institute for Photonics and Nanotechnology
Padua, Italy

Course Overview

Photonics plays an important role in many gas sensing applications; a first example is a new generation of contactless non-intrusive laser-based gas sensors to improve quality and safety of food and pharma products by inspecting the packages and the content. What is new in this technology is the possibility to measure the gas content using laser spectroscopy within transparent or diffusive materials with a new method of inspection and its adaptation to measure closed containers of different shape. This technology is based on gas sensing through laser spectroscopy. Another example are gas sensors based on Raman effect, which are able to simultaneously detect the different components in a gas mixture; this concept is being applied to natural gas / biogas industry and life sciences instrumentation.

This one-day hands-on training course provides industry, especially those developing new products or addressing an application need, with a detailed overview of important photonic-based gas sensor devices and how they are applied in food, pharma, natural gas and analytical instrumentation environments.

The course will focus on a general overview of gas sensing by laser absorption and Raman spectroscopy techniques and two technology demonstrators; 1) Non-destructive measurement of containers for food and pharma; 2) Multigas analyzer for natural gas quality control. Course attendees will learn how these sensors devices are designed, fabricated and tested. They will also learn how early-stage prototypes can be scaled to volume manufacturing.

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 testing methods based on innovative, non invasive gas sensors and compact, contactless multi gas analyzers with the ability to resolve the composition of gas mixtures containing several components.

Expected Outcomes

1) Understanding of key features of photonic design for gas sensor applications
2) Find out the correct sensing technique for a specific gas analysis problem
3) See and evaluate working gas sensor devices (hands-on activity)
4) Understand the photonic product design process and manufacturing system

Course Schedule

Time	Demo Activity
09:30 – 10:00	**IFN Orientation, Course Introduction & Tutorial**
10:30 – 12:00	Demo 1: Principles of laser spectroscopy and general overview on photonic gas sensing technologies
14:00 – 15:30	Demo 2: Gas sensors based of Tunable Diode Laser Absorption Spectroscopy Hands-on and manufacturing industry testimonials in food and pharma field
15:30 – 17:00	Demo 3: Gas sensors based RAMAN spectroscopy Hands-on and industrial testimonials
17:00 – 17:30	**Follow-Up Questions & Close**

Course Trainers

Course Director: Dr. Luca Poletto

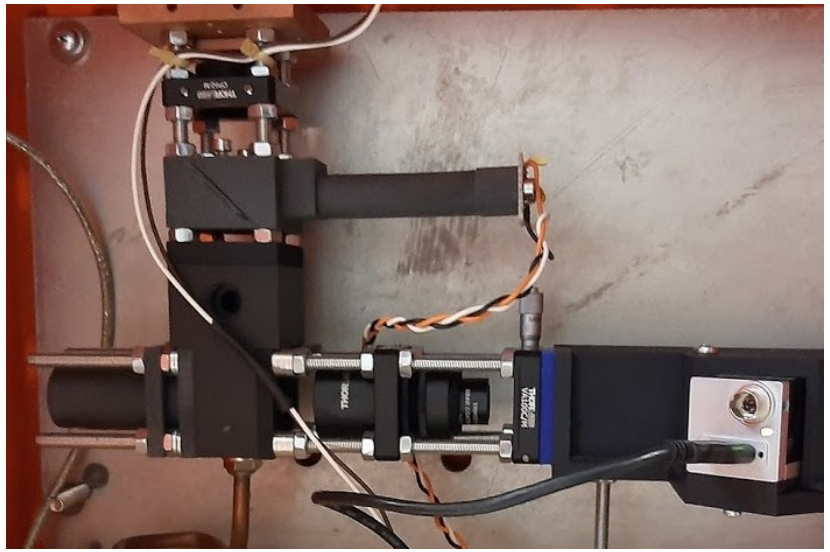
Course Manager: Sandra Perazin

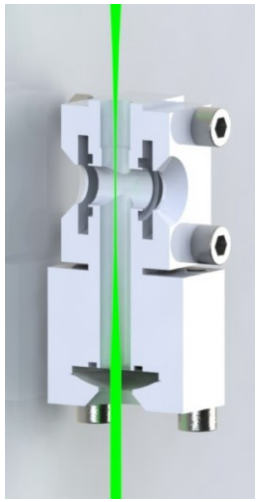
Demo 1: Massimo Fedel

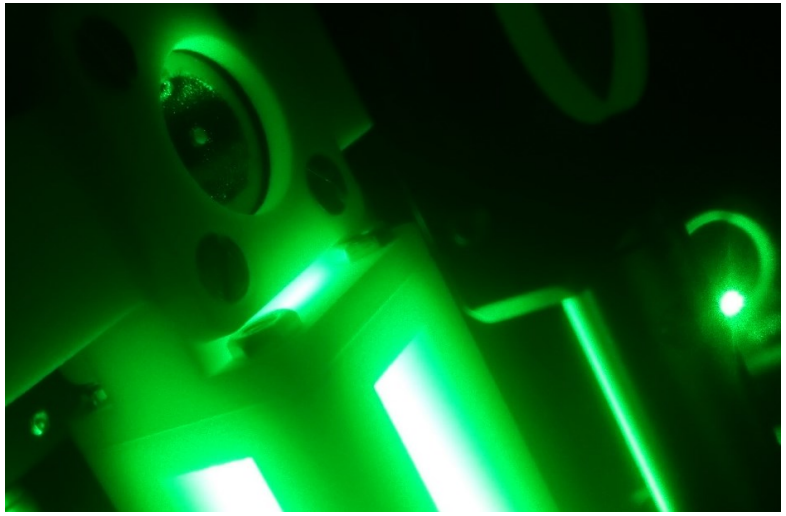
Demo 2: Lorenzo Cocola

Outreach: Paola Zuppella

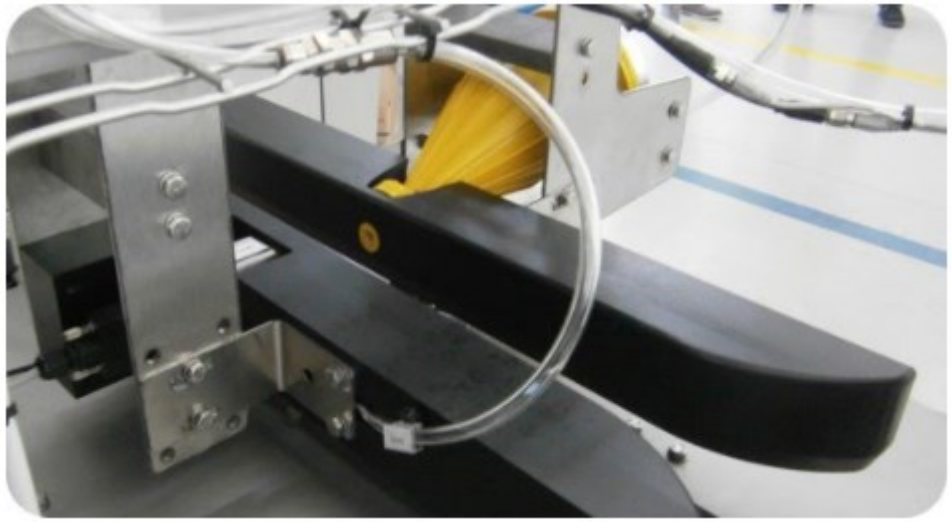
Course Demonstrators







Demonstrator of Raman spectroscopy



Demonstrators of absorption spectroscopy

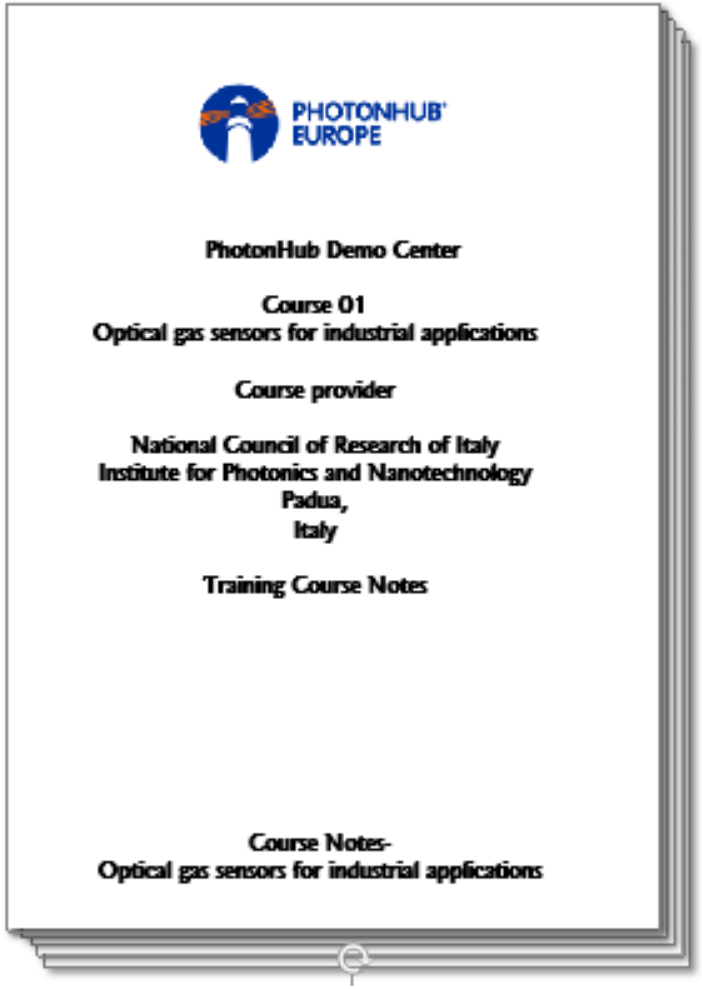
Course Location, Schedule & Cost

- Course Schedule (January, July, December – exact dates to be confirmed)
- Number of people (Max 15 attendees per course)
- Course Cost (250 Euros per person, includes catering and project consumables)

Further Information

- luca.poletto@pd.ifn.cnr.it
- sandra.serazin@pd.ifn.cnr.it
- www.pd.ifn.cnr.it

Course Material (technical hand-outs)



Keywords

Tunable Diode Laser Infrared Spectroscopy, Oxygen, Carbon Dioxide, Water Vapor, Pressure sensing, Non Invasive Sensing, Packaging, Pharmaceutical, Modified Atmosphere, Food Shelf Life, Quality Control, Leak Testing, Raman Spectroscopy, Natural Gas, Biogas, Gas composition, Food Analysis

Venue

The course is organized by the Institute of Photonics and Nanotechnology of Padova. The course will be held in CNR didactic laboratory The city of Padua is picturesque, with a dense network of arcaded streets opening into large communal piazza. The open squares of Padua are a delight in the evening with their many bars and lively atmosphere. The University of Padua, one of the oldest in the world is the true archetype of modern university, and the pivot of the science route in town. Its historical building, the Bo Palace, preserves the oldest anatomy theatre in the world as well as some historical sites and outstanding items, as the 14th-century Medicine Room, the chair of Galileo Galilei - who was a professor in Padua from 1592 to 1618.