

PhotonHub Demo Centre

Hands-on course on Quantitative Phase Imaging at Cellular Level

First course at **21 March 2022**

Register

https://ecosystem.photonhub.eu/trainings/product/?action=view&id_form=7&id_form_data=22

Course Provider

Institute of Micromechanics and Photonics

Warsaw University of Technology

Warsaw, Poland

Course Overview

Photonics plays an important role in many biomedical applications, from diagnosis and sensing of disease and infection to minimally invasive imaging of tissue during clinical procedures.

This one-day hands-on training course provides:

- industry, especially those developing new 2D and 3D microscopic instrumentation and
- biomedical sectors such as diagnosis/histopathological medical laboratories/hospitals, cell and tissues factories, pharmaceutical industry

with a detailed overview, comparison and metrology of label-free, quantitative phase imaging (QPI) devices and their applications in laboratory and clinical environments.

The course will focus on three technology demonstrators and their applications:

- 1) Digital Holographic Microscope for phase/dry mass measurement and monitoring in biological cells and cell cultures;
- 2) Fourier Ptychographic Microscopy for amplitude and phase imaging of histopathological samples;
- 3) Optical Diffraction Tomograph for 3D QPI of refractive index distribution in cells/cell cultures/tissues.

Course attendees will learn how these devices are built, calibrated and how the data are processed and analyzed.

Target Audience

It is desirable but not essential that course attendees have a basic understanding of photonics and image processing. The course is ideally suited to those planning to develop novel imaging devices or sensors for biomedical application at cellular level as well as to those who develop applications using 2D and 3D/4D quantitative data gathered by these devices.

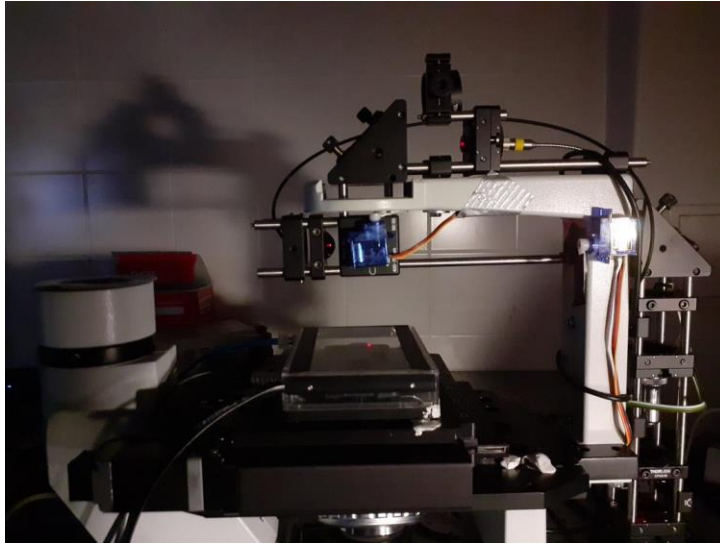
Expected Outcomes

- ✓ Understanding of key features of quantitative phase imaging for biomedical applications
- ✓ Understand the optomechanics design of 2D and 3D phase imaging microscopic systems based on coherent and incoherent light (hands-on activity)
- ✓ Understand the full data processing scheme and its influence on the proper interpretation of results (hands-on activity)
- ✓ Understand & be able to determine the metrological parameters of QPI devices (hands-on activity)

Course Schedule

Time	Demo Activity
09:00 – 10:15	WUT Orientation, Course Introduction & Tutorial
10:30 – 12:15	Demo 1: Digital Holographic Microscopy for integrated phase and dry mass measurements (hands-on)
13:30 – 15:15	Demo 2: Fourier Ptychographic Microscopy for large field of view imaging (hands-on)
15:30 – 17:15	Demo 3: Optical Diffraction Tomography with limited angle of projections for 3D refractive index determination (hands-on)
17:15 – 18:00	Follow-Up Questions & Close

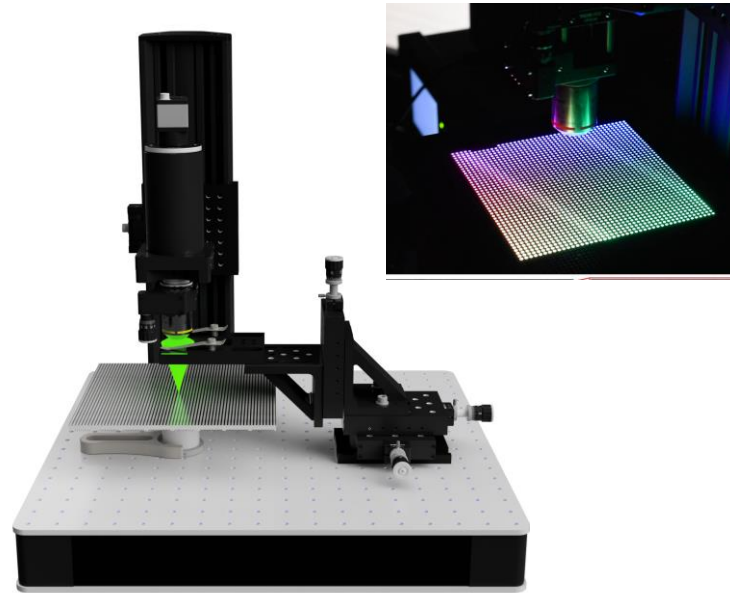
Course Trainers



**Demo 1: Digital Holographic
Microscopy Demonstrator**

Course Director: Prof. Malgorzata Kujawska

Course Manager: Dr Anna Pakuła



**Demo 2: Fourier Ptychographic
Microscopy Demonstrator**



**Demo 3: Optical Diffraction
Tomography Demonstrator**

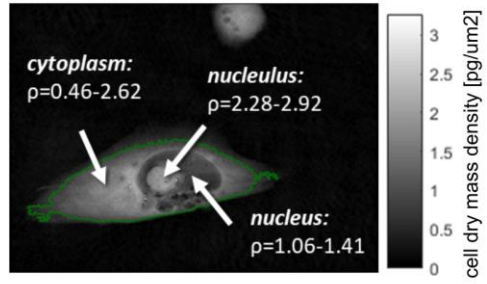
Demo 1: Mr. Piotr Stepień

Demo 2: Dr. Piotr Zdankowski

Demo 3: Dr. Arkadiusz Kus

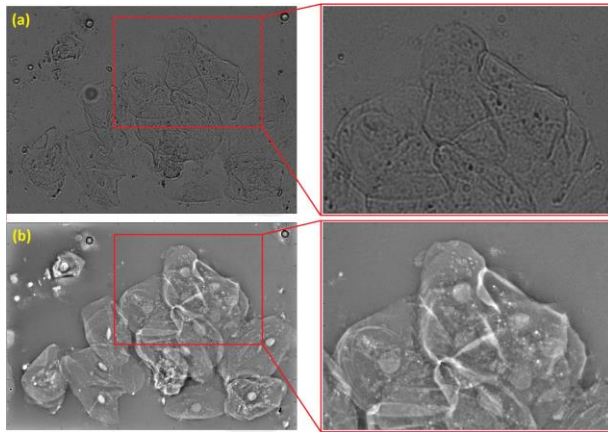
Course Demonstrators: results

Demo 1

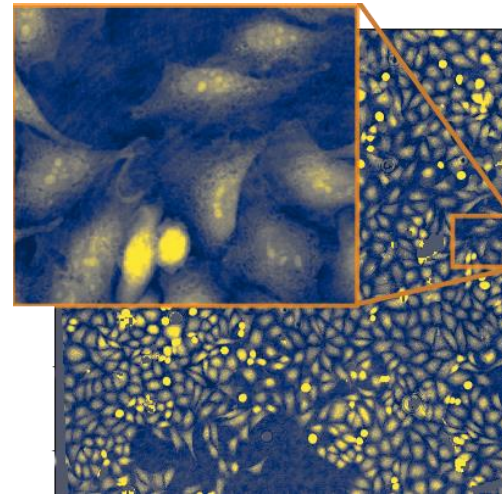


Dry mass density distribution in HaCaT cells

Demo 2



Amplitude (a) and phase (b) images of human cheek cells obtained with FPM demonstrator

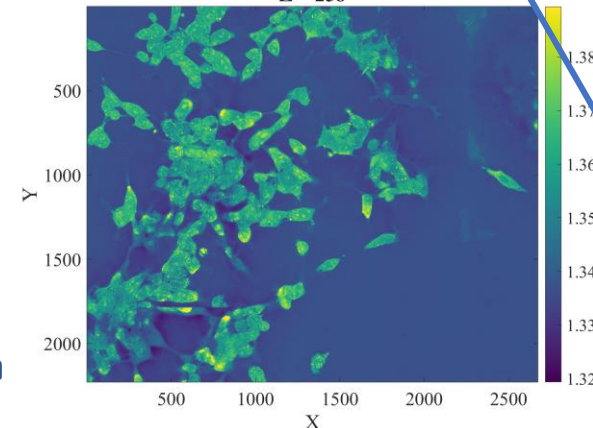


Integrated phase image of Stitched FoV

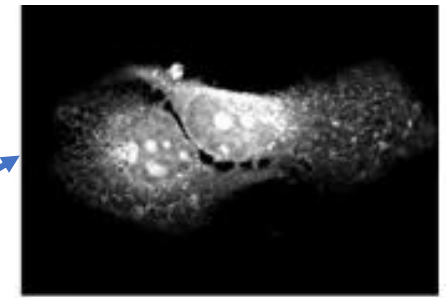
Demo 3



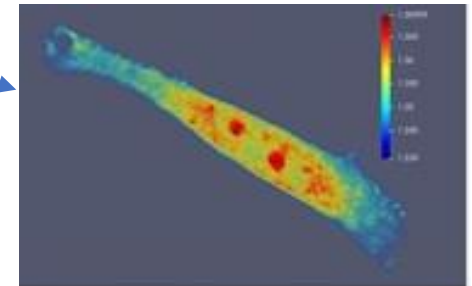
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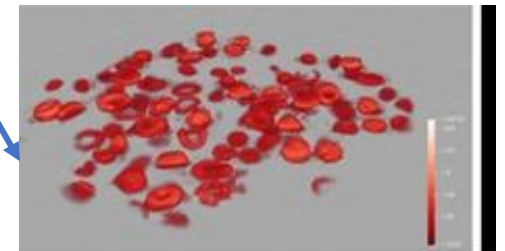
3D reconstruction of refractive index in cells and cell cultures in single and stitched field of view



Keratinocyte HaCaT



Fibrosarcoma HT-1080



Red blood cells

Course Location, Schedule & Cost



Warsaw Univ. of Technology



Flight time by plane to Warsaw

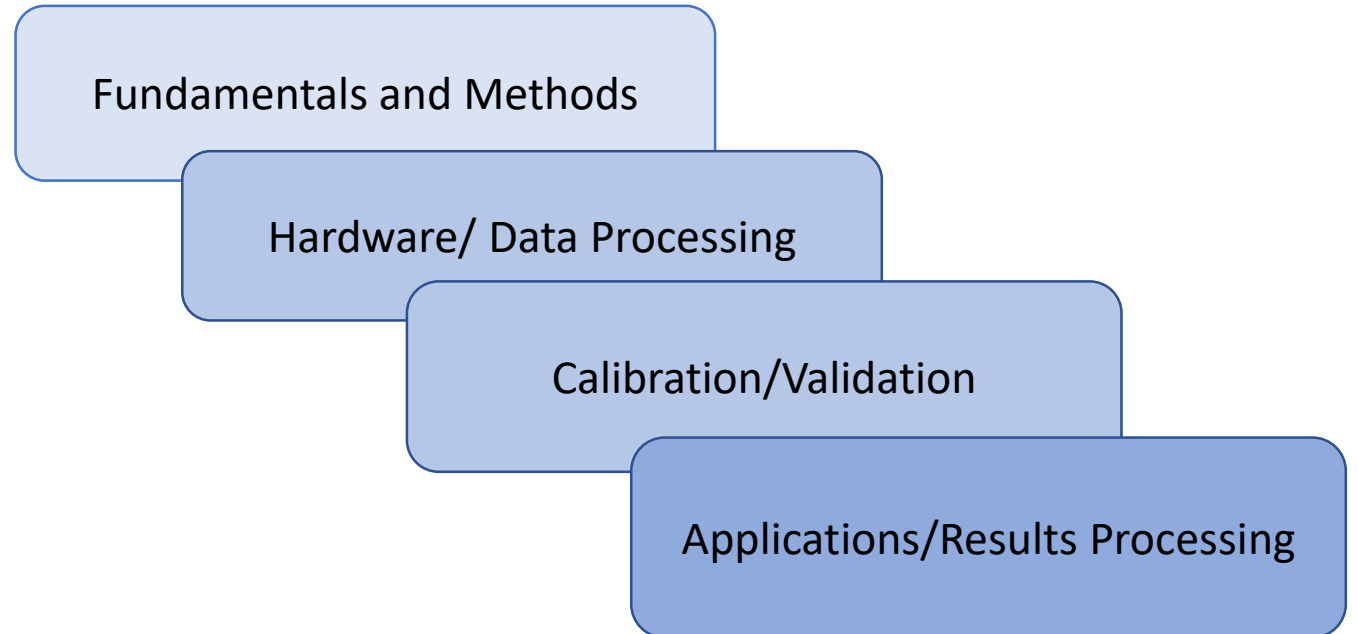
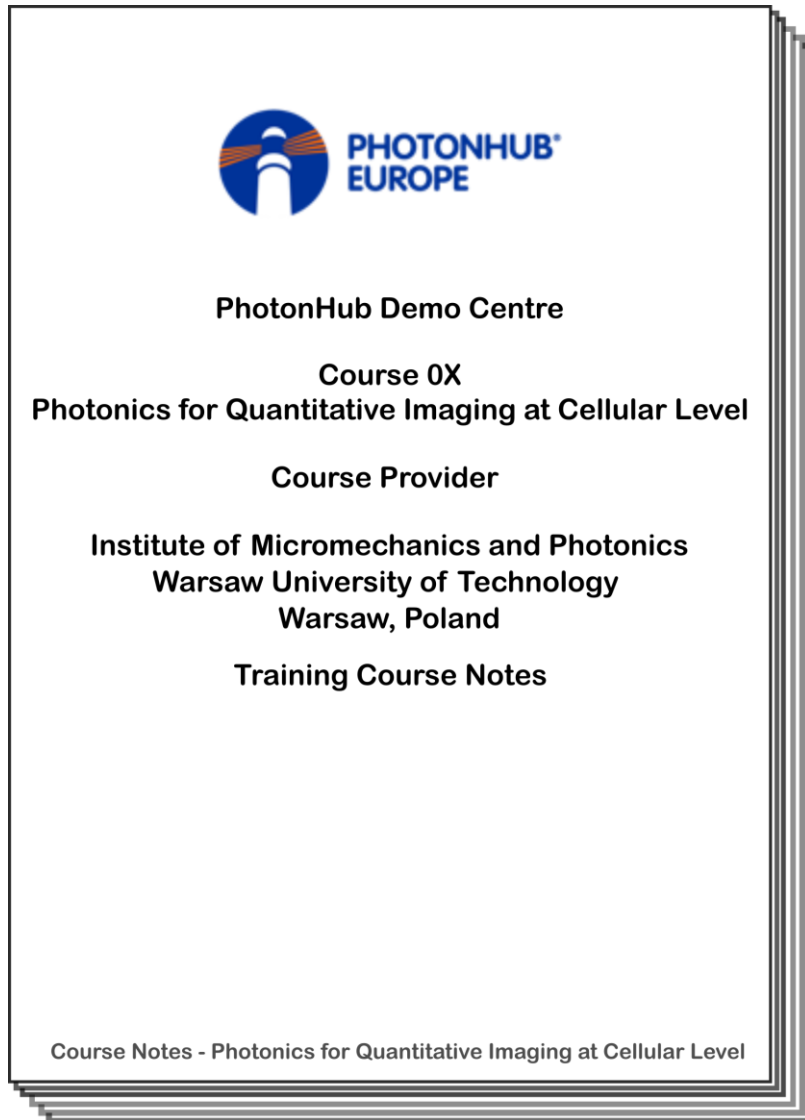


- Course Schedule (February, September – exact dates to be confirmed)
- Number of people (Groups of 2/3/6 people per course)
- Course Cost (200 Euros per person (for Polish participants – 100PLN), includes catering and project consumables)

Further Information

- anna.pakula@pw.edu.pl
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- www.photonhub.eu/euphotonicsacademy

Course Material (technical hand-outs)



See also: <http://biophase.pl>

Keywords

**Medical Devices, Quantitative Phase Imaging, Label-free Diagnostics,
Digital Holographic Microscopy, Fourier Ptychographic Microscopy,
3D Phase Microscopy, Optical Diffraction Tomography,
Equipment, Validation, Image Processing, Automation, 3D Data Analysis
Dry mass , 3D Refractive index, Cell/cell culture/Tissue analysis,**