School of Physics on Optical Metrology

(on-site+online)

On-site location: Institute of Photonic Sciences (ICFO) Barcelona, Spain

Program

Morning session

Time 9:00-10:30 am

Lecture 1: 2 Peter Petrik, Hungarian Academy of Sciences

Title: Theory and applications of ellipsometry

The scientific background will be discussed in the first part of the tutorial, highlighting how and what can be directly measured, as well as the properties of materials and structures that can be determined using physical models of the investigated systems. The second part of the tutorial will discuss applications including plasmonic, sensor, semiconductor and biological materials.

Time: 10:30-11:00 am

Coffee break

Time 11:00-12:30 am

Lecture 2: Juan P. Torres, ICFO-Institute of Photonic Sciences

Title: New experimental schemes for imaging and sensing: from quantum to classical, and back

In recent years, there has been significant research activity in Classical and Quantum Optics aimed at simulating specific aspects of quantum concepts using Classical Optics. This connection is not surprising given that concepts such as interference or coherence, stemming from the wave-like nature of theories, are fundamental to Quantum and Classical Optics. One of the initial considerations in this direction was to depict classical scenarios with properties analogous to quantum entanglement, making use of the so-called non-separable optical modes. Leaving aside fundamental questions, by examining the analogies and differences between Classical and Quantum Optics, quantum concepts can inspire new classical solutions, known as ``quantum-inspired'' protocols. What quantum algorithms can do that cannot be done in a classical scenario is a complex question that do not have straightforward answers. Fundamental differences exist between classical analogues and their quantum counterparts, such as the absence of non-locality and non-contextuality in the classical case. In this tutorial we will review these ideas considering the experiments that we have performed at ICFO during the last few years.

Time: 12:30-1:3 0 pm
Lunch (free lunch at ICFO for on-site attendants)

Afternoon session

Time 13:30-15:00 pm
Lecture 3 : Silvania Pereira, Delft University of Technology
Title: Coherent Fourier Scatterometry for characterization of nanostructures and defect detection
In this tutorial we will introduce the concept and capabilities of Coherent Fourier scatterometry for several applications regarding characterization of nanostructures and defect detection on surfaces. The technique is based on a low power laser beam that is focussed on a surface and the detection is fully performed at the far field. The main advantages of our technique as compared to other techniques such as atomic force microscope and scanning electron microscope will be presented as well as future prospects of the technique to solve present challenges of the industry.

Time: 15:00-15:30 am
Coffee break

Time 15:30-17:00 pm
Lecture 4: Poul Eric Hansen, Danish Metrology Institute
Title: Digital Twin for Microscopy: Measurements beyond the diffraction limit
We present in this tutorial a virtual microscope capable of simulating the coherent Mueller ellipsometry and scatterometry response from one-dimensional and two-dimensional periodic structures and demonstrate the capability of the virtual microscope by comparing it to experimental data. Furthermore, we demonstrate how the model can be used to simulate the stack of confocal microscopy images used for obtaining a 3D confocal image. Finally, we show how these models may be put together to form a hybrid metrology solution that may solve some of the challenges within nanometrology.

DEADLINE FOR REGISYRATION: OCTOBER 20th 2023

Admission is free of charge. Registration is compulsory.
To register, send email to: s.f.pereira@tudelft.nl and indicate whether you will attend online or on-site. There is a limited number of attendants on-site.

Sponsored by the EURAMET/EMPIR Projects POLight and atMOC
Organised by ICFO and TU Delft