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Introduction to Optics and Photonics

Start date
28-10-2027

Location
Multiple locations

Price per participant
€1,450.00 excl. VAT

Duration
2 consecutive days

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Introduction

At its core, optics encompasses the study of light and its interaction with matter. Photonics, a closely related discipline, focuses on the generation, manipulation, and detection of light, or light particles (photons). Together, these fields underpin a vast array of modern technologies, shaping industries ranging from telecommunications to healthcare, and from entertainment to manufacturing. The relevance of optics and photonics in nowadays society cannot be overstated. In communications, optical fibers form the backbone of the internet, facilitating rapid data transmission across the globe. In medicine, laser-based technologies enable precise surgical procedures and non-invasive diagnostics. In renewable energy, photovoltaic cells harness the power of sunlight to generate electricity sustainably. The list of applications is virtually endless, illustrating the indispensable role of optics and photonics in our daily lives.

Beyond practical applications, the fascination for optics and photonics lies in its intrinsic beauty and complexity. The study of light encompasses a wide variety of phenomena, from the wave-particle duality to the mesmerizing interplay of colors in optical spectra. Exploring these phenomena not only deepens our understanding of the natural world but also inspires wonder and curiosity, driving scientific discovery and innovation. Moreover, optics and photonics represent a frontier of interdisciplinary research, bridging the gap between physics, engineering, chemistry, biology, and beyond. This interdisciplinary nature stimulates collaboration and cross-pollination of ideas, leading to groundbreaking discoveries and paradigm shifts in diverse fields.

This training is available for open enrollment as well as for in-company sessions. For in-company sessions, the training can be adapted to your specific needs.

Target audience

This course is intended for those who have an affinity with optical phenomena and their technological applications. For those who want to

Practical information

Location
Multiple locations

Duration
2 consecutive days

Frequency
Once per year

Price
€1,450.00 excl. VAT

Included
Lunch buffet
Course binder
Energy break

Certification
HTI Certificate
Microcredentials

Delivery
Open enrollment (for individual participation)
In-company (for a group of employees)

Your trainer

Jean Schleipen

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understand more about this subject of growing importance, thereby learning to speak the language of their expert optics and photonics colleagues. For those with no particular background in physics, optics or mathematics, for managers and project leaders, for marketeers and sales employees.

Objective

After having attended this course, the participant:

- knows the language of optics and photonics;
- understands the basic principles of optical phenomena, such as light rays and waves, reflection and transmission, refraction and diffraction, scattering and absorption, polarization and interference;
- knows the basic principles of various optical systems like the telescope, the microscope, the spectrometer and the wafer stepper used in lithography;
- knows the basic principles of various light sources and optical detectors;
- is able to collaborate more effectively with her/his optical expert team members in an optical design project.

Method

A mixture of short lessons, videos and many plenary demonstrations. Course material: a course binder with a copy of the slides.

Program

In this introductory 2-day course on optics and photonics, we will delve into the fundamental principles governing light, and examine some key technological applications where optics plays a crucial role. We will touch upon a wide variety of optical phenomena, aiming at providing a better understanding of the technological challenges that a modern optical designer is confronted with. And we will do so without diving into the underlying mathematical complexity. The focus of this training is on classroom demonstrations of these basic phenomena like reflection,

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refraction and diffraction of light, optical imaging and aberrations, polarization of light, light sources, lasers and detectors and some important applications like microscopy, optical metrology and lithography. And you will learn about the origin of the rainbow and why the sunset is red and the sky is blue.

Basic concepts include:

- Rays, Waves, Photons, Basic Properties of Light
- The Electro-Magnetic Spectrum
- Speed of Light and Refractive Index, Propagation of Light, Scattering, Reflection and Transmission, Refraction of Light
- Optical Fiber Applications, Fiber Bragg Grating sensing

Electro-Magnetic Waves & Diffraction of Light and Waves, Optical Resolution

Interference of Light & Interferometry:

- Young's double slit, The Diffraction Grating
- Quantum Mechanics and Energy Levels
- Spectroscopy, Interferometer, plane wave, beams, interfergrams
- Zernike analysis
- (Optical) Surface Inspection Techniques
- Measuring distances, Optical Coatings, Filters, Bragg Mirrors

Polarization of Light:

- Linear Polarizer, Polaroid Sunglasses, Birefringence, Circularly Polarized Light, Applications
- Geometrical Optics - Raytracing, Lenses, Mirrors, Optical Imaging, Aberrations, Image Quality, Example: Coma and astigmatism
- Modulation Transfer Function
- Optical Systems, Optical Design, Raytracing, The Human Eye, Eyesight Correction, The Telescope, The Microscope, Optical Lithography

Light Sources & Lasers:

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- Black-body radiation
- Incandescent lamp
- Efficacy, efficiency, Watts and Lumens, Power, intensity and brightness, Spectral power, intensity and brightness
- Fluorescent lamp (CFL), The LED
- Absorption and Emission of Radiation
- The Laser, Optical gain, Longitudinal modes, Transversal modes, Laser cavity, Q-switching, The CO2 laser, The dye laser, The semiconductor laser, Extremely high power Optical Detectors, Semiconductor Photodiodes, PN-photodiode, Quantum Efficiency, Image sensors, Signal to noise ratio Photonic Integrated Circuits, Photonic Waveguides, applications.

Ready to register?

Reserve your seat via our website or make a provisional reservation to hold your place while you finalize your plans.

Have questions?

We are happy to help you find the right course. Reach us at training@hightechinstitute.nl or call us at +31 85 401 3600.

About High Tech Institute

For more than 15 years, High Tech Institute has been helping engineers and tech professionals develop the skills needed to succeed in the high-tech industry. Through expert-led training programs, in-company courses, and industry events, we combine deep technical expertise with practical application.