Fundamentals of Photonics

Semester
Fall

In brief

Course langage: French, English

Presentation

Learning objectives

This course is designed for students who wish to strengthen their knowledge in the fields of photonics, optics and electromagnetism. There are many job opportunities in large corporations as well as in small and medium-sized companies, for jobs ranging from design offices to R&D, in the defense, aeronautics or biomedical sectors...

The teaching will be divided into two main themes: (1) the generation and (2) the propagation of light.

Description of the programme

Light generation:

This theme will be mainly devoted to the study of Lasers, which are an omnipresent instrument in the industry of the XXIst century. The teaching will begin with the fundamental aspects of laser emission and will conclude with the intervention of industrialists (Thales, Leukos, Amplitude-Systèmes...) on the latest technical developments in pulsed power lasers or white supercontinuum light... Other recent sources (nano-antennas, quantum boxes, nano-diamonds, fluorescent markers) which are useful in a wide variety of fields such as biomedical imaging, quantum cryptography or nanotechnologies... will also be studied.

Light propagation :

This part will start with a reminder of the fundamental concepts of wave optics (interferometry, diffraction) and electromagnetism (plane waves, polarization, dispersion and causality) in order to study more specific fields such as polarimetry, media (dielectric, chiral, conductive or magnetic) and nonlinear optics.

Teaching structure:

The lectures/DD will be complemented by experimental lab work: Assembly and adjustment of a pulsed laser, generation of a 2nd harmonic, study of a laser diode, electro- or acousto-optic modulations, polarization and spectroscopy.

Generic central skills and knowledge targeted in the discipline

Electromagnetism and plane waves, Fundamentals of Lasers, Pulsed lasers and applications, Non-linear optics, Advanced polarization, Interferometry and Advanced Electromagnetics (joint course with the Europhotonics Master)

The lectures/DD will be completed by experimental lab work: Assembly and adjustment of a pulsed laser, Generation of a 2nd harmonic, Study of a laser diode, Electro or acousto-optic modulations, Polarization and Spectroscopy.

How knowledge is tested

CC1 = 6 one-hour papers = 100

Bibliography

« Ondes Lumineuses », Champeau

« Electrodynamique classique », Jackson

« Électromagnétisme », Pérez

« Optique non-linéaire », Sanchez

« Polarisation de la lumière », Huard

Teaching team

- Miguel Alonso

- Laurent Gallais

- Jean Bittebierre

- Frédéric Lemarquis

- Nicolas Sandeau

- Julien Fade

- Frédéric Zolla

- External speakers

Sustainable Development Goal



Access to health



Climate action

Total des heures		**100h**
CM	Master class	80h
TP	Practical work	20h

Useful info

Name responsible for EU

Lead Instructor

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