Experimental and/or numerical projects in the field of photonics

In brief

- **Course langage:** French

Presentation

Prerequisites

Ondes et Signal (ou équivalent)

Learning objectives

This UE proposes to put into practice theoretical notions and concepts seen in the course, through experiments and numerical simulations that will be performed in small groups of students, supervised by a teacher.
At the end of the course, students will know the technical details of the implementation (in the lab or on a computer) of two different topics in photonics. They will also learn how these implementations can be used for practical applications.

Description of the programme

This year 4 topics will be proposed:

1. Laser cutting process: simulations and experiments. (L. Gallais)
Project mixing numerical simulation of laser/material interaction and experiments to compare experiments/simulations to be carried out on the laser cutter installed in the laboratory.

2. Numerical simulations and experiments on polarized beam focusing. (N. Sandeau)
Project composed of simulations and experiments on the focusing of a polarized laser beam in different media.

3. Interferential multilayer stacks. (F. Lemarquis)
Multilayer interferential stacks allow to realize many spectral filtering functions of light such as antireflection, mirrors, bandpass, highpass, lowpass filters, and polarizers. After a brief presentation of the theme as a whole (design, fabrication, and use), and a

detailed presentation of the theoretical elements specific to these components, the teaching will consist of project work that may cover various aspects of this theme, such as
- the design of stacks (step which consists in defining the formulas of stacks giving such or such properties of filtering) through the use of dedicated software;
- the development of calculation programs for multilayer stacks;
- activities straddling experimentation and numerical calculation, such as the characterization of the index of thin film materials.

4. Optical coherence (M. Alonso)
Brief presentation of the statistical theory of light in the description of coherence (spatial and temporal) and partial polarization, followed by a numerical project to simulate these phenomena and some of their applications.

Generic central skills and knowledge targeted in the discipline

In-depth knowledge of several optical technologies and the computational and theoretical tools for modeling them.

How knowledge is tested

The modalities of control of knowledge will be in the form of two projects in team.

Bibliography

Selected scientific articles

Teaching team

Miguel ALONSO,

Frédéric LEMARQUIS,

Laurent GALLAIS,

Nicolas SANDEAU

Sustainable Development Goal

Access to health

Quality education

Climate action

Total des heures **30h**

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TP	Practical work	30h