



## NANOPHOTONIQUE

### NANOPHOTONICS

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| Lecturers : 16.0 | TC : 0.0 | PW : 8.0 | Autonomy : 0.0 | Study : 4.0 | Project : 0.0 | Language : MI

#### Objectives

Significant advances have been achieved in Photonics, for light emission, processing, transport and detection, with implications in a wide range of application areas. Progress related to fabrication, which leverage the microelectronics infrastructure and expertise regarding the realization of micrometer scale devices, has enabled the implementation of new concepts of integrated optics for the control of light, which are now commonly used. Current research is very active in the field of sub-micrometer devices, such as photonic crystals, and will benefit to key application areas: information and communications, biology, energy. The aim of this course is to give the physics background underpinning these new technologies, for understanding a more specialized literature.

**Keywords :** Birefringence, Optical Waveguide, Photonic Crystal, Non-Linear Optics

#### Programme

Polarization of the light

Planar guided optics

Integrated Optics & Fiber Optics

Photonic crystals and nanophotonics: basics and possible applications

Nonlinear optics: Kerr effect, frequency doubling, wavelength conversion.

2 Lab works: Finite Difference Time Domain » simulation of integrated optics devices, Transmission of a signal using electro optic modulation

1 tutorial: Non linear Optics for wavelength conversion

#### Learning outcomes

- to be able to describe the light propagation in a birefringent material
- to understand and to use the effects of the index profile and the wavelength on optical guided modes
- to understand and to be able to use the dispersion properties of micro-nanophotonics structures
- to understand the origin of the nonlinear optics phenomena and how they can be applied to all-optical signal processing

#### Independent study

Objectifs :

Méthodes :

#### Core texts

B.E. A . Saleh, M. C Teich, *FUNDAMENTAL OF PHOTONICS*, Wiley, 2007

H. Rigneault, J.M. Lourtioz *LA NANOPHOTONIQUE*, Lavoisier, 2005

#### Assessment

70% knowledge (final exam), 30% knowhow (Labs/tutorial)