2SC6110 – Photonics for the control of physical systems

Instructors: Nicolas Marsal
Department: CAMPUS DE METZ
Language of instruction: ANGLAIS
Campus: CAMPUS DE METZ
Workload (HEE): 60
On-site hours (HPE): 34,50

Description
This course will teach the basic knowledges of the measurement and exploitation of the physical quantities of optical electromagnetic waves, in the context of the exploitation of photonics for the observation and control of physical systems.
It will focus on:

- Optical metrology
- Photonic technologies including semiconductor materials and optical fibers, phase and intensity modulation
- Signal analysis exploiting in particular the non-linear dynamics of a physical system
- Properties and regulation of non-linear systems

Quarter number
ST5

Prerequisites (in terms of CS courses)
Basic knowledge of electromagnetism, materials, electricity and electronics.

Syllabus

- Optical measurement and instrumentation: generalities in metrology and error analysis, photometry, and optical detectors, holographic metrology, velocimetry, interferometry.
- Laser source technologies: additions to solid state physics, materials and semiconductors.
- Modeling and control of sources: analysis and non-linear dynamics of laser sources.
- Generation of optical signals: spatial and temporal modulation techniques of optical signals; engineering and optical beam design.

Class components (lecture, labs, etc.)
30h00 lectures and 3h00 practical exercices

Resources
Lecturers: Nicolas Marsal, Delphine Wolfersberger, Marc Sciamanna

Learning outcomes covered on the course
Thanks to this course, students will learn the physical quantities and tools which allow to spatially characterize optical beams, to analyze their frequencies, to modulate their intensities, their phases to guide them in different physical systems (fiber, waveguide ...)
They will see the linear and non-linear dynamics associated with those beams when they propagate in different materials and / or physical systems.
Thanks to this course and in addition to the EI, the student will be able to physically design a LIDAR, to test its performance and to compare it with other equipment used in optical metrology.

Description of the skills acquired at the end of the course
C1 Analyze, design,and buildcomplex systems with scientific, technological, human, and economic components
C2 Develop in-depth skills in an engineering field and a family of professions