Microwave and Optical Sensors

Component
École Nationale Supérieure d'Électrotechnique d'Électronique

In brief

- **Ametys Code:** N9EE12A
- **Open to exchange students:** Yes

Presentation

Objectives

Raise students' awareness of the many possible applications and wide variety of industrial sectors.

Teach them, through analysis of the physical principle, to quickly identify the advantages/disadvantages of the device and make an informed choice based on specifications and customer needs.

Microwave sensors section

Become familiar with the measurement of electric and magnetic fields in radio frequency and microwave applications in telecommunications and other industries, through the modeling and characterization of the most commonly used electric and magnetic field probes, and also through the use of standard microwave measurement instruments.

Description

This is an introduction to industrial applications of laser systems.

The course is based on an introduction to physical principles (time of flight, interferometry, triangulation, etc.), their respective advantages/disadvantages, and therefore a critical and comparative analysis of their limitations.

Examples of commercially available devices are presented, as well as numerous applications in sectors as varied as aeronautics and space, the environment, biomedicine, metallurgy and mechanics, automotive, etc.

Microwave sensors section

Electromagnetic probes: electromagnetic analysis of probes – electrical diagram models – characteristics of E and H probes – analysis of reference probes – probe design

Standard RF and microwave measurement instruments: Theoretical review of spectral analysis and dipole and quadrupole analysis in terms of S parameters – Block diagram of standard instruments and networks – Main characteristics of spectrum analyzers and networks – Choice of instruments according to applications

Applications: characterization of RF and microwave sources, components, and devices using probes, spectrum analyzers, and networks (examples: CW mode RF generator/preamplifiers/magnetic probes/electrical probes/directional couplers (waveguide version/planar version)/inductive coupling system, etc.)

Pre-requisites

Optoelectronics (laser operating principles and main properties)

Microwave techniques (electromagnetic theory, transmission lines, electromagnetic waveguides, resonant cavities, microwave circuits, S-parameters)