

# OPTICAL COMMUNICATIONS

**Lecturers:** Valerio Annovazzi Lodi Guido Giuliani

**Course name:** Optical Communications

**Course code:** 504994

**Degree course:** Electronic Engineering

**Disciplinary field of science:** ING-INF/01

**University credits:** ECTS 9

**Course website:** <http://www-3.unipv.it/optoele/didattica/didattica.html>

## Specific course objectives

This course is a survey on optical communications, and provides information on the propagation medium (the fiber), lasers and detectors, passive components, optical amplification, and telecommunication systems.

## Course programme

Optical Fiber, Emitters and Photodetectors, Passive components, Networks, Measurements

*Optical Fibers* Single-mode and multi-mode fibers, specialty fibers. Geometrical and optical parameters. Modal theory of fibers. Attenuation. Dispersion.

*Emitters and Photodetectors* Lasers and LEDs for optical communications. Laser/fiber coupling. Photodiodes for optical communications.

*Passive components* Connectors and splices. Coupled-mode theory. Couplers; mirrors and resonators with couplers. Retarders and polarizer. Isolators and circulators. Modulators. Bragg gratings and filters. Arrayed waveguide devices.

*Telecommunication systems* Point to point interconnections. Networks. Power budget. Electro-optic repeater. Optical amplifiers. Multi-wavelength transmission (WDM). Coherent detection.

*Measurements* Measurements on fibers and on devices for optical communications: power, attenuation, return loss, geometrical parameters, dispersion and frequency response. OTDR, BER tester.

## **Course entry requirements**

Basic knowledge of electromagnetic theory, optics and electronics from the courses of the First Level Degree in Electronics and Telecommunications; basic knowledge on lasers and photodetectors.

## **Course structure and teaching**

*Lectures* (hours/year in lecture theatre): 64

*Practical class* (hours/year in lecture theatre): 4

*Practicals / Workshops* (hours/year in lecture theatre): 6

## **Suggested reading materials**

*Gerd Keiser. Optical Fiber Communications, III ed. McGraw Hill.*

*Dispense di Comunicazioni ottiche dalle lezioni dei prof. Silvano Donati, Valerio Annovazzi Lodi, Guido Giuliani. CUSL (in Italian).*

Copies of the teacher's transparencies are on the course web site

## **Testing and exams**

Written examination, including numerical exercises and theory questions