

Course Unit Description - (COFIO)

(Optical Fiber Communications)

(Mestrado em Engenharia Electrotécnica e de Computadores)

Academic year: 2008/2009



Subject group: Electrónica e Telecomunicações

	Semestral	Compulsory	
Mode of study	Diurno	Hours/Week	T-Teórica 2
Year	1 ^o		PL-Prática-Laboratorial 2
Semester	2 ^o		OT-Orientação Tutorial 1

ECTS 6

Objectives

Optical Fiber Communications Technology covers the fundamentals of a point-to-point optical communications system considering the light propagation inside a waveguide or in free space. It comprehends optical emitters and receptors, highlighting the main components such as optical sources and detectors. The discipline provides also practical information, namely, types of optical fibre cables (inside and outside), types of connectors and others. The program of the discipline ends with the presentation of various applications of optical fibre systems deployed nationally and internationally, as well as the expected future developments in this field of knowledge. Another important aspect of the discipline is the work in the laboratory, where the students have the possibility to work with relevant experiments and equipment. Finally, the discipline aims constantly to have a strong link between theoretical, practical and laboratorial lectures.

Course Contents

1. Historical introduction.
2. Optical fiber waveguides
 - 2.1 Electromagnetic mode theory for optical propagation
 - 2.2 Ray theory transmission
 - 2.3 Cylindrical fiber
 - 2.4 Singlemode fibers
3. Transmission characteristics of optical fibers
 - 3.1 Attenuation
 - 3.2 Material absorption
 - 3.3 Nonlinear scattering
 - 3.4 Fiber Bend
 - 3.5 Dispersion
 - 3.6 Polarization
 - 3.7 Nonlinear phenomena
4. Cables, optical fibers and connections types
5. Optical sources
 - 5.1 LED (Light emitting diode)
 - 5.2 Laser
6. Optical detectors
 - 6.1 PIN photodiode
 - 6.2 APD photodiode
7. Direct detection
 - 7.1 Noise
 - 7.2 Receiver noise
 - 7.3 Receiver structures
8. Optical amplification
 - 8.1 Optical amplifiers
 - 8.2 Semiconductor amplifiers
 - 8.3 Fiber amplifiers
9. Optical fiber measurements
10. Applications and future developments

Recommended reading

Theoretical notes, Francisco Pereira.
John Senior, "Optical Fiber Communications — Principles and Practice", 2nd ed, Prentice Hall, 1992, ISBN 0-13-635426-2
Gerd Keiser, "Optical Fiber Communications", 3rd ed, McGraw-Hill, 2000, ISBN 0-07-232101-6
Djafar Mynbaev, Lowell Scheiner, "Fiber-Optic Communications Technology", Prentice Hall, 2000, ISBN 978-0139620690
Jeff Hecht, "Understandig Fiber Optics", 3rd ed, Prentice Hall, 1999, ISBN 0-13-956145-5

Teaching Methods

The teaching methods are based on three fundamental vectors. Theoretical lectures promoting the discussion of the subjects and participation of the students. The second vector focus on the development of problem solving skills of the students. Finally, the experimental set-ups of the practical lectures allow the students to consolidate the teaching methods. The students are always invited to get new sources of information beyond the lectures of the discipline.

Assessment methods

The student will be evaluated by two components: a practical one with written reports (30%) and an exam (70%).

The final mark of each student will be according to:

$$0.3 \times \text{NFREQ} + 0.7 \times \text{EXAME}$$

Min NFREQ = 6 marks;

Min EXAME = 7 marks;

The evaluation to obtain a better mark will comprehend the completion of a written exam.

	Name
Teacher responsible:	Francisco Jose Dias Pereira (FDP)
Lecturer:	Francisco Jose Dias Pereira (FDP)