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Politecnico di Torino

Academic Year 2009/10 (first time established in A.Y.2007/08)

02JDCJA

Optoelectronics

1st degree and Bachelor-level of the Bologna process in Electronic And Computer Engineering - Vercelli (III FACOLTA' DI INGEGNERIA)

Teacher	Status	SSD	Les	Ex	Lab	Years Stability
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SSD	CFU	Activities	Area context
ING-INF/01	5	D - A scelta dello studente	A scelta dello studente

NOTA: Il programma non e stato modificato rispetto a quello dell'anno accademico 2008/09

Objectives of the course

To provide an overview on the main optoelectronic devices (sources, modulators, receivers) appearing in optical communication systems, their technology and their physical operation principles.

Expected skills

Knowledge of the physics and technology of optoelectronic devices. Basic of optical communication systems.

Prerequisites

Basic understanding of semiconductor devices and of electronic circuits.

Syllabus

Semiconductor materials for optoelectronic devices: crystal and electronic structures, alloys, quantum wells and other reduced dimensionality structures. Optical properties of semiconductors: perturbation theory, selection rules. Absorption, spontaneous emission and gain profiles. Detectors: basic parameters, photodiodes, pin photodiodes, avalanche photodiodes (APD). Frequency response and noise. Sources: LED for optical systems and other applications. Blue light and white light LEDs. LED direct modulation. Lasers: operating principles, threshold conditions, spectral response. Fabry Perot, DFB, DBR, tunable lasers. Laser frequency response under direct modulation and chirp. Laser noise. Modulators: electrooptic modulators, materials (Lithium Niobate), the Mach-Zehnder modulator, travelling-wave modulators. The frequency response and chirp. Electroabsorption modulators physics, structures, frequency response and chirp. Basics on fiber and semiconductor optical amplifiers. Optical system design: the fiber, limits due to dispersion and attenuation, receiver sensitivity. Comparison between pin and APD receivers. Two extra seminars are typically devoted to optoelectronic integrated circuits and to advances in lasers.

Laboratories and/or exercises

There will be a number of classroom practices on the numerical problems proposed.

Bibliography

G.Ghione, Semiconductor devices for high-speed optoelectronics (in preparation)
J.Singh, Optoelectronics: An Introduction to Materials and Devices, McGraw-Hill, Inc. (1996)
G.Ghione, Lecture slides
G.Ghione, Questions and problems

Revisions / Exam

Written or oral test based on the solution of open and multiple choice questions (2/3) Homework solution of proposed problems (1/3).

Programma definitivo per l'A.A.2008/09

