



230569 - PHOTOV - Optoelectronic and Photovoltaic Technologies

Coordinating unit:	230 - ETSETB Barcelona School of Telecommunications Engineering
Teaching unit:	710 - EEL - Department of Electronic Engineering
Academic year:	2015 - 2016
Degree:	Master's Degree in Photonics Erasmus Mundus Master's Degree in Photonics Engineering, Nanophotonics and Biophotonics
ECTS credits: 3	Teaching languages: English

Academic staff

Coordinator:	Ramon Alcubilla (UPC)	ramon.alcubilla@upc.edu
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Degree competences to which the subject contributes

Transversal:

1. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.
2. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.
3. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding how companies are organised and the principles that govern their activity, and being able to understand employment regulations and the relationships between planning, industrial and commercial strategies, quality and profit.
4. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

Teaching methodology

Lectures

Activities

- Laboratory visits

Objectives and short description of the course

The basic concepts and tools for the understanding and analysis of optical semiconductor devices are presented. Representative devices for light generation and detection are treated. Special emphasis is devoted to photovoltaic solar cells, covering conventional crystalline structures, thin film cells and organic solar cells. A basic background about semiconductors is required (electrons and holes, bands, Fermi statistics).

Study load

Total learning time: 75h	Hours large group:	22.5h	30%
	Hours medium group:	0h	0%
	Hours small group:	0h	0%
	Guided activity:	2.25h	3%
	Self study:	50.25h	67%



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Course index

1. Currents in a semiconductor. Generation and recombination. Radiative and non radiative recombinations. Continuity equation. Diffusion equation.
2. Photodiodes: Diode electrostatics. PIN and Avalanche Photodiode (PIN & APD)
3. Heterojunctions. Band diagrams. Current –voltage characteristics.
4. LED's basic structure. Emitted Power calculation.
5. Laser diodes: Population inversion. Fermi's pseudo –levels.
6. Properties of sunlight. Solar cell operation and PN junctions
7. Crystalline solar cells.
8. Thin film solar cells.
9. Solar cell characterization.
10. New concepts in solar cells.

Qualification system

- Written exam (60%)
- Exercises and homework (20%)
- Attendance (20%)

Bibliography

- Safa O. Kasap: Optoelectronics & Photonics. Principles & Practices. Prentice Hall 2012
- Jenny Nelson. The Physics of solar cells. Imperial College Press 2004