TEACHING GUIDE ON

# OPTOELECTRONIC NANODEVICES

Curso 2019-2020

| MASTER MODULE | SEMESTER | CREDITS | COURSE TYPE |
|---|---|---|---|
| Nanotechnology | 1 | 6 | Optional |

| PROFESSOR(S) | CONTACT DETAILS |
|---|---|
| • ANDRÉS GODOY MEDINA<br>• LUCA DONETTI | Dept. Electrónica y Tecnología de Computadores.<br>Faculty of Science Physics section, 2nd floor.<br>AGM: Room #16, e-mail: agodoy at ugr.es<br>LD: Room #18, e-mail: donetti at ugr.es |
| | **TUTORIALS TIMETABLE** |
| | AG: Monday, Tuesday, Thursday 11-13h<br>LD: Monday, Wednesday, Friday 12-14h |

**MASTER DEGREE**

University Master in Physics: Radiations, Nanotechnology, Particles and Astrophysics, University of Granada

**TEACHING DATES AND TIMES**

From October 1st, 2019 to January 25th, 2020.
Monday from 16:00 to 18:00, Thursday from 16:00 to 17:00 (room A21).

**PRE-REQUISITES FOR REGISTRATION**

Basic knowledge on Semiconductors and Electronics

**BRIEF CONTENTS DESCRIPTION**

Fundamentals of light-matter interaction.
Charge transport in nanoelectronic devices.
Nanodevices for light detection: photodetectors and solar cells.
Light emitting diodes.
Low dimensional semiconductors.

**PROGRAM**

1. Introduction to quantum mechanics applied to electronics and semiconductor heterostructures.
2. Generation and recombination in semiconductors: Radiative and non-radiative processes.
3. Light Emitting Diodes (LEDs).
4. Stimulated emission and absorption. Einstein's equation. Optical gain in a semiconductor. Semiconductor lasers.
5. Light detecting junctions-diodes. Characteristics parameters. Photodetectors and solar cells. Different kind s of photodetectors and their characteristics.
6. Optoelectronics applications in confined systems: quantum wells, quantum wires and quantum dots.

**BIBLIOGRAPHY**

BIBLIOGRAPHY:


- Smets, K. Jäger, O. Isabella, R. Van Swaaij, M. Zeman; "Solar energy: The physics and engineering of photovoltaic conversion, technologies and systems", UIT Cambridge.
- Jasprit Singh, "Electronic and Optoelectronic Properties of Semiconductor Structures", Cambridge University Press, 2003.
- F. Schubert: "Light –Emitting Diodes", 2nd Edition. Cambridge University Press, 2008.
- J. T. Verdeyen, "Laser Electronics", 3rd. Edition Prentice Hall, 1995.


ADDITIONAL BIBLIOGRAPHY:


- Karl F. Renk, Basics of Laser Physics (2 ed.), Springer, 2017.
- Takahiro Numai, Fundamentals of Semiconductor Laser (2 ed.), Springer, 2015.
- Manijeh Razeghi, Technology of Quantum Devices, Springer, 2010.


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