# Advanced Semiconductor lasers

**Academic Year: ( 2020 / 2021 )** **Review date: 24-02-2021**

**Department assigned to the subject: ENG/Masters interuniversitarios**

**Coordinating teacher: ESQUIVIAS MOSCARDO, IGNACIO**

**Type: Electives ECTS Credits : 3.0**

**Year : 1 Semester : 2**

## REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Photonics Technologies I; Photonics Technologies II; Photonics Technologies III

## OBJECTIVES

Basic skills...

+ Knowledge and understanding that provide a basis or opportunity for originality in developing and / or applying ideas, often in a research context.

+ That the students can apply their knowledge and ability to solve problems in new or unfamiliar in wider or multidisciplinary environments related to their field of study.

+ That the students can integrate their knowledge, as well as handle the complexity of making judgements from an incomplete or limited information, but which could include reflections about the social and ethic responsibilities that could be linked to the application of their judgements and knowledge.

+ That the students possess learning skills that allow them following their long-life learning in a self-conducted and self-sufficient way.

General skills ...

+ Ability to propose, design, implement and maintain a system with photonic components for a specific application.

Specific Skills ...

+ Identify the different blocks which are present in a system where photonics plays an essential role, the specificities of its design, possible subsystems to be used, its integration and its final verification.

+ Handling of tools aiming to design photonic devices and systems.

+ To be aware of the current trends in different applications of photonic technologies and learned experiences from real cases.

+ Capacity of selecting novel photonic components, technologies and subsystems.

+ Capacity of designing photonic devices, passive and active, and of evaluating its performance.

+ Capacity of effectively searching information, as well of identifying the state of the art in a technological problem in the field of photonic devices and systems.

LEARNING OUTCOMES:

Upon finishing he course, the students must be able to:

+ To apply the appropriate analysis tools to determine the performance of photonics devices as a part of complex systems.

+ To describe the development techniques and applications of advanced lasers and their limitations and differences between commercial lasers, choosing the most suitable type of laser for a specific application.

+ To define and apply the design rules of complex semiconductor-based laser structures required to obtain devices with unique performance, showing their potential applications.

## DESCRIPTION OF CONTENTS: PROGRAMME

1. Review of laser diode fundamentals
2. Resonators for laser diodes and emission spectra
3. Tunable laser diodes
4. Dynamic properties
5. High-power laser diodes

## LEARNING ACTIVITIES AND METHODOLOGY

TRAINING ACTIVITIES:

lecture
Practical classes
theoretical and practical classes
Laboratory practices
tutorials
Team work
Individual student work

TEACHING METHODS:

Exhibitions in class with teacher support and audiovisual media, in which the main concepts of matter are developed and the literature is provided to supplement student learning.

Critical reading recommended by the teacher of the subject texts: newspaper articles, reports, manuals and / or academic papers, either for later discussion in class, either to expand and consolidate the knowledge of the subject.

Resolution of practical cases, problems, etc. posed by the teacher individually or in groups.

Exposure and discussion in class, under the moderation of the professor, of subjects related to the content of the subject, as well as practical cases.

Preparation of papers and reports individually or in groups.

## ASSESSMENT SYSTEM

Ordinary call:

+ Individual or group works, including written or oral during the course: 40%

+ Final exam (individual) 60%

Extraordinary call:

An extraordinary final exam will be made. The evaluation may be following the continuous evaluation procedure with the same weights as in the ordinary call or 100% of the final exam mark.

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| **% end-of-term-examination:** | 60 |
| **% of continuous assessment (assigments, laboratory, practicals…):** | 40 |

## BASIC BIBLIOGRAPHY

- 1. Larry A. Coldren, Scott W. Corzine, Milan L. Mashanovitch  Diode Lasers and Photonic Integrated Circuits, Wiley, 2012
- 2. BUUS, Jens; AMANN, Markus-Christian; BLUMENTHAL, Daniel J.  Tunable laser diodes and related optical sources, New York: Wiley-Interscience, 2005

- 3. DIEHL, Roland (ed.) High-power diode lasers: fundamentals, technology, applications, Springer Science & Business Media, 2003