Photonics Technologies I

Academic Year: (2019 / 2020) **Review date: 09/12/2020 11:52:18**

Department assigned to the subject:

Coordinating teacher: NARANJO VEGA, FERNANDO

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 1

OBJECTIVES

BASIC
- 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
- Ability to produce English-language documents, plans and projects in the field of Photonics Engineering
- Ability to propose, design, implement and maintain a system with photonic components for a specific application
- Ability to understand the generalist and multidisciplinary nature of photonics applied to the resolution of problems or applications
- Capacity to apply the scientific method as a fundamental work tool both in the professional and the research fields, managing the sources of information.

SPECIFIC
- 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
- To be aware of the current trends in different applications of photonic technologies and learned experiences from real cases
- Handling of measurement instruments and photonics with the support of electronics to develop different devices and systems, with application in communications, avionics, automotive, energy sector and civil infrastructures
- Capacity of selecting novel photonic components, technologies and subsystems
- 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
Students should be able to do the following upon completion of this subject:

- To analyze optic and photonic systems in free space and guided media
- To understand the bases of operation of passive optical elements (lenses, diffraction gratings, polarizers, optical fibers, etc.) and select and use the most appropriate ones in an application.
- To apply knowledge of electromagnetic optics to the propagation of signals in optical fibers.

DESCRIPTION OF CONTENTS: PROGRAMME

The subject formed by this course, Photonics Technologies II and Photonics Technologies III provides the students the fundamental knowledge for the correct development of the different tracks proposed in the Master. This first course addresses key concepts for understanding the following courses, such as image formation, propagation of Gaussian beams and propagation in waveguides and periodic structures.

1. Photonic energy propagation and image formation.
2. Propagation in dispersive and anisotropic media. Non linear effects.
3. Theory of diffraction.
4. Propagation of Gaussian beams.
5. Devices based on polarization.
6. Devices based on periodic structures.
7. Optical waveguides.
    a. Integrated waveguides.
    b. Fiber optics: Limitations and non linear effects.

LEARNING ACTIVITIES AND METHODOLOGY

Learning activities:
- Lectures.
- Practical classes.
- Theoretical and practical classes.
- Laboratory practices.
- Tutorials.
- Team work.
- Individual student work.

Methodology:
- Lecture class with support of audiovisual media, in which the main concepts of the subject are developed and the literature is provided to supplement student learning.
- Critical reading recommended by the subject teacher texts: reports, manuals, scientific articles, either for subsequent class discussion, either to expand and consolidate the knowledge of the subject.
- Practical cases resolution, problems, etc. set by the teacher in an individual or group way.
- Preparation and defense of documents and reports in an individual or group way.

ASSESSMENT SYSTEM

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

Ordinary call:
- Individual or group working, and continuous assessment oral or written tests : 40 %
- Final exam (individual): 60 % (a minimum of 3.5 is mandatory)

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.

BASIC BIBLIOGRAPHY

- B.E.A. Saleh, M.C. Teich Fundamentals of photonics 2nd edition, John Wiley and Sons, 2007

- S.O. Kasap Optoelectronics and Photonics: Principles and Practices, Prentice Hall, 1999

- Teachers of the subject Documents of the subject, Teachers of the subject, 2017

ADDITIONAL BIBLIOGRAPHY

- E. Hetch, A. Zajac Óptica, Prentice Hall, 2000

- J. Capmany Fundamentos de Comunicaciones Ópticas, Síntesis, 2001

- J. Wilson, J.F.B. Hawkes Optoelectronics: an introduction, Prentice Hall, 1998