Photonics Technologies III

Academic Year: (2019 / 2020) **Review date: 30/04/2019 15:49:55**

Department assigned to the subject:

Coordinating teacher: SANCHEZ PENA, JOSE MANUEL

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

No prerequisites.

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 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 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
- 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 RESULTS
Upon successful completion of this course students will be able to:
- Understand and apply optical modulation and multiplexing techniques
- Propose and design photonic systems based on discrete components for sensor applications
- Understand the working principle of photodetectors, photodectectors arrays, amplifiers and signal conditioning circuits to select and use the most suitable ones in an application
- Know the noise sources in photonic systems in order to evaluate their performance

- Apply signal and image processing techniques to improve optical systems
- Analyze current optical communications systems

DESCRIPTION OF CONTENTS: PROGRAMME

This course together with the other two contained in the subject "Foundations of Photonic Engineering" (Photonic Technologies I and Photonic Technologies II) provides students the fundamental knowledge for the development of itineraries proposed in the Master. Contents proposed in this subject provide new tools and concepts associated with the operation, specification and design of photonic systems, including the selection and use of active and passive photonic devices available in the market and that can be incorporated in high added value photonic systems.

The program of the subject "Photonic Technologies III" is divided into 4 blocks:

I: Receivers in Photonic Systems
- Photodetectors and photodetector matrices. Working principle
- Amplifiers and conditioning circuits
- Noise in optical receivers
- Signal and image processing techniques

II: Optical Modulation and Multiplexing
- Modulation techniques. Modulation techniques for optical communications systems
- Multiplexing techniques (OTDM, WDM, OFDM, SDM...)

III:Current Optical Communications Systems Analysis
- Optical communications link components and performance
- Application examples

IV: Photonic Systems for Sensors Applications
- Sensors based on photonic components. Working principle
- Application examples

LEARNING ACTIVITIES AND METHODOLOGY

TRAINING ACTIVITIES:

- Lectures
- 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 of subject texts recommended by the teacher : 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.

- Preparation and defense of papers and reports individually or in groups.

ASSESSMENT SYSTEM

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

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 structure as in the ordinary call or 100% of the final exam mark.

In both calls a minimum grade of 3.5 / 10 is required to pass.

BASIC BIBLIOGRAPHY

- 1. Faculty of the subject Documentation of the subject, Faculty of the subject, 2019

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

- 3. S.O.Kasap Optoelectronics and Photonics: Principles and Practices, Pearson Education, 2013