Distributed Fiber Optic Sensing

Academic Year: (2019 / 2020) **Review date: 10/12/2020 12:57:17**

Department assigned to the subject:

Coordinating teacher: MARTIN LOPEZ, SONIA

Type: Electives ECTS Credits : 3.0

Year : 1 Semester : 2

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

SPECIFIC

-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 analyzing and designing photonic systems for applications in communications and sensing.
- 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, understand and solve a complex photonic problem from the origin to the end, from aspects such as conceptual planning, bibliographic search to oral and / or written communication of results, in accordance with scientific procedures and methods.
-To design, implement and characterize distributed fiber sensors from their components for applications in different productive sectors.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction to optical fiber sensors.
1.a. Introduction to optical fibers
1.b. Optical fiber sensors
1.c. Types and classification of optical fiber sensors
1.d. Specifications of distributed optical fiber sensors

2. Distributed sensors based on Rayleigh Scattering
2.a. Rayleigh Scattering
2.b. Sensors based on coherent reflectometry
2.c. Applications

3. Distributed sensors based on inelastic scatterings
3.a. Raman Scattering
3.b. Brillouin Scattering
3.c. Distributed sensors based on Raman Scattering (DTS)
3.d. Distributed sensors based on Brillouin Scattering (DTS, DTSS)

4. SNR and acquisition time enhancement.
4.a. Distributed amplification
4.b. Coding
4.c. Signal processing
4.d. Dynamic interrogation

LEARNING ACTIVITIES AND METHODOLOGY

Learning activities:
- Lectures
- Practical classes
- Theoretical and practical classes
- Tutorials
- 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.
-Individual theoretical-practical work proposed by the teacher that the student will have to solve using the tools and material provided in both theoretical and practical sessions.

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 mark of 3.5/10 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, John Wiley and sons, 1991

- G.P. Agrawal Fiber-optic communication systems, John Wiley ans Sons, 2002

- J. Dakin, B. Culshaw Optical Fiber Sensors: Principles and components, Artech House, 1988

- J.M. López-Higuera Handbook of Optical Fiber Sensing Technology, Wiley, 2002