Organic Photonics

Academic Year: (2019 / 2020) **Review date: 09/12/2020 11:54:56**

Department assigned to the subject:

Coordinating teacher: OTON SANCHEZ, JOSE MANUEL

Type: Electives ECTS Credits : 3.0

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 know how to communicate their conclusions and knowledge as well as the ultimate reasons that support them to both specialized and non-specialized audiences, in a clear way and avoiding ambiguities.

+ 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.

+ 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 OUTCOMES:

To overcome this subject students should be able to:

+ To analyze and apply electrooptics and light polarization knowledge for selecting and using organic photonic devices in display applications and photonic systems.

+ To understand the basis of operation of organic devices based on electro-optic effects to determine driving sequences for switching and stabilization control.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction: primary photophysic processes
2. Fundamentals of organic semiconductors
3. Organic light-emitting diodes (OLEDs): applications to displays and lighting
4. Organic photodetectors: organic photovoltaic cells
5. Fundamentals of light polarization
6. Liquid crystals: physical and electrooptical properties
7. LC displays: driving, multiplexing and dynamic response
8. LC spatial light modulators: LCoS, phase gratings, computer-generated holograms
9. LC photonic devices: beam steerers, tunable lenses and prisms, vortex generators
10. Fundamentals of organic waveguides: passive, tunable cladding, reactive mesogens

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.

Preparation of papers and reports individually or in groups.

ASSESSMENT SYSTEM

% end-of-term-examination/test:	30
% of continuous assessment (assigments, laboratory, practicals…):	70

Ordinary call:

+ Individual or group works, including written or oral during the course: 70%

+ Final exam (individual) 30%

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

- Amnon Yariv and Pochi Yeh Photonics: optical electronics in modern communications, 6th Edition, Oxford University Press, 2007

- Bahaa E. A. Saleh, Malvin Carl Teich Fundamentals of Photonics, 2nd Edition, Wiley, 2007

- D.K. Yang and S.T. Wu Fundamentals of Liquid Crystal Devices, John Wiley & Sons, 2006

- G. Nall Organic Electronics, English Press (Delhi), 2011

- I.C. Khoo Liquid Crystals, 2nd Edition, Wiley, 2007

- S. Kasap, P. Capper (Eds.) Springer Handbook of Electronic and Photonic Materials, Springer, 2006