Electronic, photonic and electro-optical devices

Academic Year: (2022 / 2023) **Review date: 19-05-2022**

Department assigned to the subject: Electronic Technology Department

Coordinating teacher: GARCIA SOUTO, JOSE ANTONIO

Type: Compulsory ECTS Credits : 3.0

Year : 1 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

No prerequisites.

OBJECTIVES

+ Know the different types of electronic components and micro-electromechanical used in the design and implementation of both analog electronic systems and digital power and instrumentation (assets and liabilities), including the latest technologies used (new materials and structures) and be able to use in the design and specification of different electronic subsystems.

+ Know the different types of photonic and electro-optical components used in the design and implementation of electronic systems, communications and instrumentation (assets and liabilities), including the latest technologies used (new materials and structures), meet their functional characteristics and use, and be able to use in the design and specification of different subsystems.

+ Know the capabilities of new electronics, photonics and power components and devices (including new materials and structures), to improve the performance of existing systems or applications.

DESCRIPTION OF CONTENTS: PROGRAMME

This course details various electronic, photonic, electro-optical and micro-electro-mechanical components, which require deepening in technological aspects in order to make them part of the electronic systems, thus achieving an added value.

The latest technologies, new materials and new structures are included, so that they can be used in the designs and specifications of complex electronic subsystems.

- Power electronic devices and components of specific use; for example those based on Wide Bandgap technologies such as silicon carbide (SiC) and gallium nitride (GaN) for high voltage, high current and high power.
- High frequency active components such as MESFETs, HEMTs, HBTs, and their application circuits.
- Passive and active photonic devices and components; for example, fiber Bragg gratings, quantum cascade lasers, optical modulators (Mach-Zehnder, electroabsorption), optical amplifiers and demultiplexers based on optical ring resonators.
- Devices based on liquid crystals and micro-electro-mechanical devices (MEMS), their properties and application environments; for example, capacitive sensors, bioengineering, SAW filters, spatial light modulators SLM and chromatic filters.

This course provides each student with the ability to integrate the latest electronic, micro-electro-mechanical, photonic and electro-optical components available on the market that are part of high value-added electronic systems.

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

Ordinary call:

Students will take on group work and lab related to a component or type of component that will involve 20% of the evaluation.
They completed up to three questionnaires (one subject block) each of which provide 10% of the evaluation.
Finally they made a theoretical and practical test as a final exam, corresponding to 60% of the evaluation.

Extraordinary call:

The assessment may be by continuous assessment procedure with the same weights than in the ordinary call or a final exam with 100% rating.

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

BASIC BIBLIOGRAPHY

- Paul Horowitz, Winfield Hill The Art of Electronics Third Edition, Cambridge University Press, 2015

ADDITIONAL BIBLIOGRAPHY

- Dr.-Ing. Arendt Wintrich Application Manual Power Semiconductors, SEMIKRON International GmbH, 2015

BASIC ELECTRONIC RESOURCES

- RP Photonics . The Encyclopedia of Laser Physics and Technology: http://www.rp-photonics.com/encyclopedia.html