Displays Technologies

Academic Year: (2024 / 2025) **Review date: 17-01-2025**

Department assigned to the subject: Electronic Technology Department

Coordinating teacher: TORRES ZAFRA, JUAN CARLOS

Type: Electives ECTS Credits : 3.0

Year : Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Components and Electronic Circuits

SKILLS AND LEARNING OUTCOMES

CB1: Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study
CB2: Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.
CG3: Knowledge of basic and technological subject areas which enable acquisition of new methods and technologies, as well as endowing the technical engineer with the versatility necessary to adapt to any new situation.
ETEGITT8: Ability to construct, develop and manage telecommunication systems applications, such as systems for capture, analog and digital processing, codification, transport, representation, processing, storage, reproduction, management and presentation of audiovisual services and multimedia information.
ETEGITT10: Ability to select specialized electronic circuits and devices for the transmission, routing, and terminals, in fixed as well as mobile environments.
RA1: Knowledge and understanding of the general fundamentals of engineering, scientific and mathematical principles, as well as those of their branch or specialty, including some knowledge at the forefront of their field.
RA2: Analysis. Graduates will be able to solve engineering problems through an analysis process, identifying the problem, recognising specifications, establishing different methods of resolution, selecting the most appropriate one and implementing it correctly. They must be able to use various methods and recognize the importance of social constraints, human health, safety, the environment, as well as commercial constraints.
RA4: Research. Graduates will be able to use appropriate methods to carry out detailed research and studies of technical aspects, commensurate with their level of knowledge. The research involves bibliographic searches, design and execution of experiments, interpretation of data, selection of the best proposal and computer simulation. May require consultation of databases, standards and security procedures.
RA5: Applications. Graduates will have the ability to apply their knowledge and understanding to solve problems, conduct research, and design engineering devices or processes. These skills include knowledge, use and limitations of materials, computer models, process engineering, equipment, practical work, technical literature and information sources. They must be aware of all the implications of engineering practice: ethical, environmental, commercial and industrial.

OBJECTIVES

The goal of the course is to allow the student knowing the basic electro-optical parameters related to emissive and non-emissive displays and acquiring the ability to select the optimum display for each specific application in the scope of new industrial and multimedia systems.

To achieve this goal, the following competences related to the program outcomes will be acquired:

- Know the basic electro-optical parameters related to emissive and non-emissive displays.
- Know how different display technologies active as well as passive and their main applications
- Measure and evaluate the most relevant parameters from an electrical and optical viewpoint.
- Select the best technology for specific applications (industrial systems, portable systems, among others).

DESCRIPTION OF CONTENTS: PROGRAMME

- State-of-the-art and new trends in displays technologies
- Quality parameters of displays: brighness, contrast ratio, color gamut, response times, etc.
- Emissive displays (CRTs, LEDs, OLEDs, PDPs, ...): electrooptical characteristics and applications
- Non Emissive displays (LCDs, e-ink, ECs, SPDs, ...): electrooptical characteristics and applications
- 3D Technologies, HUD & e-books
- New high-end applications

LEARNING ACTIVITIES AND METHODOLOGY

The training activities are organized as following:
- Lectures (1 ECTS) where the main concepts are presented on the basis of mathematical tools and basic optic's Laws/Theorems (PO a). The learning materials include the lecture notes, the classroom documentation, and the basic bibliography that is used as a reference for completing the themes and study them in depth.
- Practical classes (1 ECTS) that are focused on solving exercises and practical cases related different displays technologies. These classes are completed with the exercises and practical problems that are solved by the students at home. The methods of solving this cases are complemented with the use of computer simulation tools
- Practical work (1 ECTS), where the student characterizes from the electrical and optical point of view different types of screens, both emissive and non-emissive.

ASSESSMENT SYSTEM

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

The evaluation is based on the following criteria:
- 1 partial exam comprising a complete thematic block related to different displays technologies.
- The mark of this thematic block is 40% of the whole mark.
- The student will develop several theoretical and practical assignments. The knowledge acquired by the student will be evaluated, as well as the use of display screens or photonic devices (20% of the final grade).
- Final Exam: The students knowledge of all contents of the course is evaluated as a whole in this activity. Additionally, practical problems that involve several practical cases will allow evaluating the ability of the student to apply them to solve different engineering problems related to the use of different display technologies in real operation conditions (40%).

Percentage of Final Exam (mandatory): 40
Percentage of Evaluation of Other Activities: 60

BASIC BIBLIOGRAPHY

- E. Kaneko Liquid Crystal TV Displays: Principles and Applications of Liquid Crystal Displays, KTK Scientific Publishers, Tokio (1987)..

- J.A. Castellano Handbook of Display Technology, Academic Press, San Diego (1992)..

- M.A. Karim Ed Electro-optical Displays, Marcel Dekker Inc, New York (1992)..

- S. Sherr Electronic Displays, John Wiley & Sons, Inc, New York (1993)..

ADDITIONAL BIBLIOGRAPHY

- B. Bahadur Ed. Liquid Crystals: Applications and Uses Vol. I, II y III,, World Scientific, Singapore (1990, 1992 y 1993)..