Research Technologies I

Academic Year: (2022 / 2023) **Review date: 16-01-2023**

Department assigned to the subject: Electronic Technology Department

Coordinating teacher: SANCHEZ REILLO, RAUL

Type: Compulsory ECTS Credits : 3.0

Year : 3 Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Subjects related to baseline Mathematics

OBJECTIVES

- Be able to specify, design and evaluate electronic instrumentation systems and optoelectronic systems for Security applications.
- Ability to design, analyze, optimize, install and maintain different energy conversion systems.

- Knowledge about the general concepts associated to the measurement of physical parameters and instrumentation
- Knowledge about the different kind of sensors and transducers and their applications.
- To know the main features and functionalities of video cameras and other kind of image acquisition devices (CCD, CMOS)
- To know IR image monitoring systems, as well as night vision devices

DESCRIPTION OF CONTENTS: PROGRAMME

1: Introduction
2: Optics and Sensors
  2.1 - Optic Group
  2.2 - Sensors
3: Information Coding
  3.1 - Image Files
  3.2 - Video Files
4: Storage
  4.1 - Magnetic
  4.2 - Optic
  4.3 - Semiconductor
5: Communication Interfaces
  5.1 - Synchronous Serial Communication (I2C and SPI)
  5.2 - USB
  5.3 - Firewire
  5.4 - Ethernet
  5.5 - Bluetooth
  5.6 - WiFi
6: Screens
  6.1 - Types and Parameters
  6.2 - Interfaces
7: Other Technologies
  7.1 - NIR
  7.2 - FIR
  7.3 - X-Rays
  7.4 - Computerized Axial Tomography (CAT)
  7.5 - Ultrasounds
  7.6 - Magnetic Resonance
  7.7 - Millimetric Waves and THz

LEARNING ACTIVITIES AND METHODOLOGY

There are face-to-face activities as well as remote participation.
- Face-to-face ECTS: 1.2 credits, related to the classroom attendance as well as exercise resolution and in depth analysis with the help of the lecturer.
- Remote participation ECTS: 1.8 credits, related to a personal research work and the continuous study of the subject and exam preparation.

ASSESSMENT SYSTEM

Assessment will consist on a 60% from a written exam at the end of the semester, and a 40% of the results of a group work assignment on research technologies.

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

BASIC BIBLIOGRAPHY

- Fredrik Nilsson and Communications Axis Intelligent Network Video: Understanding Modern Video Surveillance Systems, CRC Press.
- Julie K. Petersen Understanding Surveillance Technologies: Spy Devices, Privacy, History & Applications, Taylor & Francis Group, LLC.
- N. K. Ratha, Venu Govindaraju Advances in Biometrics: Sensors, Algorithms and Systems, Springer.
- Raúl Sánchez Reíllo Transparencias de la Asignatura, Universidad Carlos III de Madrid, 2018

ADDITIONAL BIBLIOGRAPHY

- Omar Javed and Mubarak Shah Automated Multi-Camera Surveillance: Algorithms and Practice, Springer.

BASIC ELECTRONIC RESOURCES

- Raúl Sánchez Reíllo . Material Docente de la Asignatura: https://www.cugc.es/aulavirtual/