Program	59EC – Communications Electronic Engineering B. Eng.

Course code and name	
Code	595000038
Name	Electronic Systems Engineering
Semester	S8 [(February-June)]

Credits and contact hours	
ECTS Credits	4,5
Contact hours	45

Coordinator's name	Barrera López de Turiso, Eduardo [eduardo.barrera@upm.es]

Specific course information	
Tuition language	Spanish
Description of course content	
The course is taught in the last semester of the degree program so the student has finished his previous training in electronics so it integrate the knowledge that has been acquired in the previous subjects. The course is structured in two parts. Firstly the focus is the advanced aspects of microcontroller programming thanks to a practical example on which students are applying the concepts analyzed during the lessons. The second part focuses in the realization of a project. This is why the student must use the concepts acquired during all the degree program, such as analog and digital subsystems, prototyping techniques, programming, hardware / software integration and debugging. The result will be the construction of a complex system in a way that shows the maturity acquired in their studies.	
List of topics to be covered	
1. Advanced programming of microcontrollers in embedded systems 1.1. Communications protocols 1.2. Data conversion peripherals 1.3. Advanced outage management 1.4. Advanced timing techniques 1.5. Characterization of the performance of an application 1.6. Other advanced aspects 2. Project: design, implementation and HW / SW integration of an embedded electronic system 2.1. Analysis of the project specifications 2.2. Design proposal 2.3. Hardware implementation 2.4. Software implementation	

2.5. HW / SW integration, validation and debugging
2.6. Drafting the design documentation: analysis, modular decomposition, integration, test plan, test results
2.7. Presentation of results of the proposed solution.

Prerequisites or co-requisites

- Microprocessors
- Analog Electronics I
- Programming I
- Programming II
- Operating Systems
- Digital Design I
- Microprocessor-based Systems
- Production Technologies Of Electronics Systems
- Electronic Instrumentation,
- Electronic Power Systems

Course category in the program

☑ R (required)	☐ E (elective) *(elective courses may not be offered every year)*

Specific goals for the course

Specific outcomes of instruction

- RA246 – To identify in a technical specification document of an electronic system the technical requirements needed to raise different technological alternatives for the practical implementation of the system.
- RA247 – To develop an electronic system of medium complexity by combining different technologies.
- RA248 – To build electronic systems using PCB applying the appropriate design techniques for each kind of design.
- RA249 – To use the laboratory instrumentation besides the commercial development and debugging tools for the integration and fine-tuning of the electronic circuits and systems.
- RA250 – To know how to generate portable and precise technical documentation about the developed system.

Further reading and supplementary materials

- Lab instruments (power supply, digital oscilloscope, logic analyzer, signal generator, multimeter).
- The Definitive Guide to ARM® Cortex®-M3 and Cortex®-M4 Processors, 3rd Ed.
- ARM Developer – Software Development Tools: https://developer.arm.com/embedded
- CMSIS - Cortex Microcontroller Software Interface Standard: https://developer.arm.com/embedded/cmsis
- Moodle.