Program	59EC – Communications Electronic Engineering B. Eng. 59SC – Telecommunications Systems Engineering B. Eng. 59SO – Sound and Image Engineering B.Eng. 59TL – Telematics Engineering B. Eng.

Course code and name	
Code	595000028, 595024028
Name	Microprocessor-based Systems
Semester	S5 [(September-January)]

Credits and contact hours	
ECTS Credits	6
Contact hours	60

Coordinator's name	Nieto Valhondo, Julián [julian.nieto.valhondo@upm.es]

Specific course information	
Tuition language	Spanish

Description of course content

The student will get a deeper understanding of the hardware architecture of a commercial microcontroller using standard software tools for a wide range of these devices. The final goal is to analyze, design, develop, and test a medium-complexity system (based on a real application). The final project will be documented in a technical report that will record each of the decisions made at each stage of the application.

List of topics to be covered

1. ARM Cortex Microcontrollers. Keil ARM CMSIS:
    a. ARM Cortex Architecture: reset, clocks, interrupts.
    b. Development cycle for developing an application using CMSIS for Cortex ARM
    c. GPIOS-Timers
2. Functional blocks of a microcontroller-based system
    a. CMSIS Driver. User interfaces: Graphic LCD
    b. Sensors/Actuators.
    c. Communications
    d. Operating system for embedded applications: RTOS.
3. Designing applications of medium complexity

Prerequisites or co-requisites

- Microprocessors, Programming I, Programming II

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
• RA735 – Analyze the software and hardware architecture of a microcontroller-based systems of medium-complexity. • RA734 – Use an Integrated Developing System to code, compile, and debug an application for a microprocessor-based system. • RA737 – Write the code required to develop an application based on a microcontroller. • RA263 – Interpret the specifications of a system based on a medium-complexity microcontroller with an embedded operating system. • RA971 – Manage hardware timers to control the timing and synchronization of an application. • RA970 – Establish and manage asynchronous serial communication between two systems. • RA907 – Develop applications in teams. • RA736 – Discuss the software and hardware architecture of microcontroller-based systems of medium complexity.. • RA730 – Connect a peripheral device to a microcontroller using interfaces based on standard protocols, • RA733 – Learn how to handle any medium-complexity peripheral device of a microcontroller using the documentation provided by the manufacturer. • RA968– Handle specific electronic instrumentation for developing systems based on microprocessors. • RA738 – Write a report justifying and describing the decisions taken in developing a project and defend it orally with accuracy and detail.

Further reading and supplementary materials
– Moodle. – Keil MDK Professional. – STM32-Nucleo-F429ZI – Mbed Application Board. – USB Logic Analyzer – Basic Laboratory Instrumentation.

Teaching methodology			
__ **lectures**	__ **problem solving sessions**	_X_ **collaborative actions**	X **laboratory sessions**
Other:			