Program	59ID – Data Engineering & Systems B. Eng.

Course number and name	
Number	595000510
Name	Data Acquisition Systems
Semester	S2 [(February-June)]

Credits and contact hours	
ECTS Credits	6
Contact hours	56

Coordinator's name	Fraile, Rubén [r.fraile@upm.es]

Specific course information

Description of course content

This course is an introduction to the basics of data acquisition systems, including electrical magnitudes, basic electrical circuits, measuring and uncertainty, sensors, analog to digital conversion, serial ports, GPIO ports, and fundamentals of embedded systems. System interconnection and real time systems are covered in later courses in the programme.
Basic circuits with sensors are built, and an ARM microntroller is programmed for acquiring, processing and transmitting data. Programming is done in C/C++ language.

List of topics to be covered

1. Basic theory of electrical circuits
2. Measurements and data capturing
3. Data digitization
4. Microcontrollers for data acquisition. Event-drive programming
5. Finite state machines and real-time systems

Prerequisites or co-requisites

Computer programming
Basic physics (A level / High School)
Calculus

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

- Describing basic data acquisition systems.

- Providing and interpreting measuring results, including uncertainty estimation.
- Programming basic data acquisition systems managed by a microcontroller.

Further reading and supplementary materials
– Dwarkadas Pralhaddas, et al. *Embedded systems*. New Academic Science Ltd, 2014 – BINDAL, Ahmet. *Electronics for Embedded Systems*. Springer, 2017 – HARRIS, Sarah; HARRIS, David. *Digital design and computer architecture: ARM edition*. Morgan Kaufmann, 2015 – HEATH, Steve. *Embedded systems design*. Elsevier, 2002 – SCHERZ, Paul; MONK, Simon. *Practical electronics for inventors*. 4th ed. New York: McGraw-Hill, 2016 – SILBERSCHATZ, Abraham; GALVIN, Peter Baer; GAGNE, Greg. *Operating system concepts essentials.* John Wiley & Sons, Inc., 2014 – IBRAHIM, Dogan. *ARM-Based Microcontroller Multitasking Projects*. Newnes, 2020.

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