City Center Campus	School of Industrial Engineering and Design
Program	56IA - Bachelor of Science in Industrial Electronics Engineering and Automation

Course number and name	
Number	565005073
Name	Practical Internet of things with Raspberry Pi
Semester	S7 (September-January)

Credits and contact hours	
ECTS Credits	6
Contact hours	60

Coordinator's name	Brunete Gonzalez, Alberto [alberto.brunete@upm.es]

Specific course information

Description of course content

The Practical Internet of Things (IoT) with RaspberryPi module will allow students to use a Raspberry Pi to monitor and control devices around them. The student will learn the knowledge required:

- To use sensors and actuators to monitor rooms or areas, and to be able to control devices (turning lights on and off, controlling motors, etc.)
- To develop programs that collect data and upload it to the cloud, using state-of-the art communication protocols (i.e. MQTT, Restful)
- To manage data in databases and visualize them.

In addition, the student will learn to use the Raspberry Pi: Linux-based embedded operating systems, Python programming, communication protocols, and input and output peripherals. It is important to note that the student will work with real devices. At the end of the course the student will have a working prototype for the IoT world!

List of topics to be covered

1. Introduction
    1.1. Introduction to the Internet of Things
    1.2. Introduction to the Raspberry Pi and its OS (Raspbian)
2. Introduction to Python programming
3. Input and output
    3.1. General purpose input and output (GPIO)
    3.2. Sensors
    3.3. Actuators
4. Threads and concurrency

5. Communications 5.1. Internet protocols 5.2. MQTT 5.3. Serialization 6. REST: Representational state transfer 6.1. Introduction to the REST concept 6.2. Raspberry Pi as a client 6.3. Raspberry Pi as a web server 7. Databases and Visualization
Prerequisites or co-requisites
Programming Notions (any language, preferably C or Python).
Course category in the program

__ R (required)	**_X_ E (elective)** *(elective courses may not be offered every year)*

Specific goals for the course
Specific outcomes of instruction
• RA163 - Have notions of concurrent and distributed programming • RA164 – Have notions of industrial-level networks and communications • RA290 – Be able to create interfaces to communicate with IoT devices • RA289 – Be able to create embedded systems for the internet of things • RA1 - Be able to design industrial control and automation systems.

Bibliography and supplemental materials
– Build modern IoT solutions with the Raspberry Pi 3 and Python, Colin Dow Packt BIRMINGHAM - MUMBAI – https://bitbucket.org/abrunete/practical_iot/wiki/Home – http://docs.python.org.ar/tutorial/3/ – https://projects.raspberrypi.org/en/projects/raspberry-pi-getting-started – RESTful Web Services, Leonard Richardson, Sam Ruby, O'Reilly Media – http://www.elai.upm.es/asignaturas/cyp/ – https://www.carriots.com – http://www.drdobbs.com/web-development/restful-web-services-a-tutorial/240169069

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