



## Course guide

# 295203 - ISABA - Implementation of Arduino-Based Acquisition Systems

Last modified: 27/05/2024

**Unit in charge:** Barcelona East School of Engineering  
**Teaching unit:** 710 - EEL - Department of Electronic Engineering.

**Degree:** BACHELOR'S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Optional subject).  
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Optional subject).  
BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Optional subject).  
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).

**Academic year:** 2024    **ECTS Credits:** 6.0    **Languages:** Catalan, Spanish

## LECTURER

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**Coordinating lecturer:** ENCARNACIÓN GARCÍA VÍLCHEZ  
GUILLERMO VELASCO QUESADA

**Others:** ENCARNACIÓN GARCÍA VÍLCHEZ - T11  
FERNANDO VÁZQUEZ LABRADOR - T12

## PRIOR SKILLS

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Basic Programming skills.

## DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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### Transversal:

07 AAT N3. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

## TEACHING METHODOLOGY

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## LEARNING OBJECTIVES OF THE SUBJECT

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The aim of ISABA course is to provide tools to future Electronic and Biomedical Engineers in order to design and implement automatic measurement and control systems to solve problems in the field of Industrial and Biomedical Electronics Engineering.

Thus, the learning objectives that the course covers are the following:

- Introduce the measurement and control systems for the Energy Engineering using microcontrollers.
- Introduce the Arduino UNO project development board, and the Arduino Integrated Development Environment (IDE).
- Acquire the main sentences, instructions and programming structures for make programs in Arduino and other languages for the realization of HMI interfaces (human-machine interface).
- Approach the main communications protocols in the field of Industrial Computing.
- Know the main sensors, actuators and shields compatible with the development boards of Arduino projects.
- Apply the knowledge acquired in the development of applications based on Arduino UNO to solve problems in industry and in domestic or commercial facilities.



## STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours large group	15,0	10.00
Hours small group	45,0	30.00

Total learning time: 150 h

## CONTENTS

### Introduction to systems based on microcontrollers.

**Description:**

- Digital systems programmed by software.
- Functional blocks of microcontrollers: Memory, CPU, etc.
- Programming languages.

**Full-or-part-time:** 9h

Theory classes: 4h

Laboratory classes: 5h

### Arduino Platform.

**Description:**

- The Arduino UNO Project Development Board.
- Extensions for Arduino (shields).
- Sensors and other functional modules compatible with Arduino.
- The Arduino Integrated Development Environment, IDE (Integrated Development Environment).
- Arduino programming language.
- Arduino libraries.

**Full-or-part-time:** 17h

Theory classes: 4h

Laboratory classes: 13h

### Input and Output Ports.

**Description:**

- Digital inputs and outputs.
- Analog inputs.
- Analog outputs.
- PWM ports.

**Full-or-part-time:** 17h

Theory classes: 4h

Laboratory classes: 13h



### Communications with Arduino.

**Description:**

- Serial Port communications
- Bluetooth communications.
- I2C communication protocols.
- Protocols with Ethernet, WIFI, GSP ...

**Full-or-part-time:** 17h

Theory classes: 3h

Laboratory classes: 14h

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### GRADING SYSTEM

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### BIBLIOGRAPHY

**Basic:**

- Torrente Artero, Óscar. Arduino : curso práctico de formación. Madrid: RC Libros, 2013. ISBN 9788494072505.
- Oliva Ramos, Rubén. Monitoreo, control y adquisición de datos con Arduino y Visual Basic. Barcelona: Marcombo, 2017. ISBN 9788426725677.

**Complementary:**

- Tojeiro Calaza, Germán. Taller de Arduino : un enfoque práctico para principiantes. Barcelona: Marcombo, 2014. ISBN 9788426721501.
- Wilcher, Don. Learn electronics with Arduino. New York: Apress, 2012. ISBN 9781430242666.
- Pallás Areny, Ramón. Sensores y acondicionadores de señal. 4a ed. Barcelona [etc.]: Marcombo Boixareu, cop. 2003. ISBN 8426713440.