

## Course guide

### 320191 - ROBAS - Basic Robotics

**Last modified:** 02/04/2024

**Unit in charge:** Terrassa School of Industrial, Aerospace and Audiovisual Engineering  
**Teaching unit:** 707 - ESAII - Department of Automatic Control.

**Degree:** BACHELOR'S DEGREE IN AUDIOVISUAL SYSTEMS ENGINEERING (Syllabus 2009). (Optional subject).  
BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Optional subject).  
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Optional subject).  
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).  
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Optional subject).  
BACHELOR'S DEGREE IN TEXTILE TECHNOLOGY AND DESIGN ENGINEERING (Syllabus 2009). (Optional subject).  
BACHELOR'S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject).  
BACHELOR'S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Optional subject).  
BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2010). (Optional subject).  
BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject).

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

#### LECTURER

**Coordinating lecturer:** Josep Cugueró i Escofet

**Others:** Manuel Meixide i Vázquez  
Jaume Figueras i Jové

#### TEACHING METHODOLOGY

- Face-to-face lecture sessions.
- Face-to-face practical work sessions.
- Independent learning and doing exercises.
- Preparation and completion of group activities subject to assessment.

#### LEARNING OBJECTIVES OF THE SUBJECT

#### STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours small group	30,0	20.00
Hours large group	30,0	20.00

**Total learning time:** 150 h



## CONTENTS

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### Basic Concepts

**Description:**

- History of the robotics
- Fields of application

**Specific objectives:**

Understanding basic concepts within the world of robotics.

**Full-or-part-time:** 6h

Theory classes: 2h

Self study : 4h

### Robots and Manipulators

**Description:**

- Manipulators and robots: basic concepts.
- Fundamental characteristics.
- Proprioceptive and exteroceptive sensors.
- Actuators.
- Robot control systems.

**Specific objectives:**

Give the student basic principles and knowledge about robotics.

Give the student the capacity to analyze and select robotic systems given a task to be robotized.

**Full-or-part-time:** 12h

Theory classes: 4h

Self study : 8h

## Types of Robots

### Description:

- Introduction.
- industrial Robots:
  - fundamental characteristics.
  - Types of Robots.
  - specific Sensors.
- mobile Robots:
  - terrestrial Robots
    - fundamental Characteristics.
    - specific Sensors
  - air Robots
    - fundamental Characteristics.
    - specific Sensors
  - submarine Robots
    - fundamental Characteristics.
    - specific Sensors
- Other robots

### Specific objectives:

Give the student basic knowledge about the different types of robots.

### Related activities:

Programming a mobile robot given a task to be performed. Presentation of the solution in a contest format.

### Full-or-part-time: 66h

Theory classes: 8h

Laboratory classes: 22h

Self study : 36h

## End Effectors

### Description:

- End effectors: Fundamental characteristics .
- Types of End effectors.
- End effectors: Specific design.

### Specific objectives:

Give the student the capacity to design, select and connect the end effectors given the type of robot and the task to be done.

### Full-or-part-time: 6h

Theory classes: 2h

Self study : 4h

### Geometric concepts

**Description:**

- Object position and orientation
- Reference frames used by a robotic system.
- Introduction to robot kinematics

**Specific objectives:**

Give the student the knowledge and basic principles of positioning and orientating objects in space.  
Give the student the capacity to select the necessary reference systems given a task to be robotized.  
Introduce the student to robot kinematics.

**Full-or-part-time:** 15h

Theory classes: 5h

Self study : 10h

### Robot Programming

**Description:**

- Introduction to robot programming.
- Programming types.
- Programming Languages: basic and advanced features.
- The robot as a multi task system:
- Flow control in a robot system programming
- Task Control in a robot system programming

**Specific objectives:**

Understand basic concepts on robot programming.  
Give the student the capacity to program robots.  
Understand the multi tasking operation of robots.

**Full-or-part-time:** 30h

Theory classes: 4h

Laboratory classes: 8h

Self study : 18h

### Robot Application Fields

**Description:**

- Introduction to the task robotization
- Adapting the environment to the robot or adapting the robot to the environment.
- Fields of robot application :
- Service Robotics
- Medical Robotics
- Industrial Robotics
- Robotic in education
- ...

**Full-or-part-time:** 12h

Theory classes: 4h

Self study : 8h



## Safety

### Description:

- Safety and protection elements
- Safety regulation in the robotized environments

**Full-or-part-time:** 3h

Theory classes: 1h

Self study : 2h

## GRADING SYSTEM

- Exams: 45%
- \* 1st exam: 22.5% (EX1) or 0% (see formula)
- \* 2nd exam (renewal part): 22.5% or 0% (EX1') (see formula)
- \* 2nd exam: 22.5% (EX2)
- Laboratory: 55%
- \* Part 1: 13.75% (LAB1)
- \* Part 2: 41.25% (LAB2)

The mark of the first exam may be renewed with a second chance examination, which will be done on the same date as the day set for

the second exam. The final qualification of the first exam will be the highest mark between the first exam mark (EX1) and the mark of the second chance exam (EX1').

The following formula formalizes the final mark computation:

$\text{Final\_Mark} = 0.225 \cdot \text{EX2} + 0.225 \cdot \text{MAX}(\text{EX1}, \text{EX1}') + 0.1375 \cdot \text{LAB1} + 0.4125 \cdot \text{LAB2}$

## BIBLIOGRAPHY

### Basic:

- Fu, K.S.; González, R.C.; Lee, C.S.G. Robótica: control, detección, visión e inteligencia. Madrid: McGraw-Hill, 1988. ISBN 8476152140.

## RESOURCES

### Audiovisual material:

- Nom recurs. Resource