Course guide
320191 - ROBAS - Basic Robotics

Last modified: 04/07/2023

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: 2023 **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

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 characterisics.
- Proprioceptive and exteroreceptive 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 Aplication 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:
Final_Mark=0.225*EX2 + 0.225*MAX(EX1, EX1') + 0.1375*LAB1 + 0.4125*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