Universidad Zaragoza

Year : 2019/20

29827 - Industrial Robotics

Syllabus Information

Academic Year: 2019/20
Subject: 29827 - Industrial Robotics
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
326 - Escuela Universitaria Politécnica de Teruel
Degree: 440 - Bachelor's Degree in Electronic and Automatic Engineering
444 - Bachelor's Degree in Electronic and Automatic Engineering
ECTS: 6.0
Year: 3
Semester: Second semester
Subject Type: Compulsory
Module: ---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The course will be based on combining theoretical explanations with practical exercises, written assignments and laboratory work.

- Lectures will provide theoretical background on robotics fundamentals
- Case studies and problem solving will be worked out at the classroom
- The students will do laboratory work in small groups
- Written assignments will be proposed

Student participation is considered very important in order to acquire the learning outcomes and skills needed.

4.2.Learning tasks

The course includes the following learning tasks:

Classroom activities 2.4 ECTS (45 hours)

1) Lectures (T1) (30 hours).

Fundamentals of industrial robot manipulators (mechanical structure, motor drives, kinematics, dynamics, control

system design and robot programming), mixing theoretical concepts and practical applications.

2) Case studies (T2) (15 hours)

Examples and practical case studies with the active participation of students.

3) Laboratory work (T3) (15 hours).

Five laboratory sessions related to robot control and programming as well as robotic cell design and scheduling. Students have to prepare sessions in advance. This previous work will be evaluated in the laboratory.

Personal work: 3.6 ECTS (90 hours)

4) Assignments (T6) (30 hours)

Assignments for groups of two students (related to robot kinematics and/or robot programming) will be proposed

5) Personal study (T7) (56 hours)

Continuous study will be promoted among students. They can also attend tutorials to solve the specific problems they can face in the course

6) Evaluation activities (T8) (4 hours)

Assessment will be based on coursework (laboratory work and assignments) and final examination

4.3.Syllabus

The course will address the following topics:

1- Introduction to industrial robot manipulators

2- Industrial robot technologies.

- Morphology, mechanical structure features and robot performance
- Robot wrist and tools
- Robotic drives & sensors

3- Robot kinematics

- Mathematical tools for representing position and orientation
- Forward and inverse kinematics: the Denavit-Hartenberg convention
- The manipulator jacobian matrix. Robot singularities

4- Robot Programming

- Language overview
- Examples of robot level languages: KAREL and RAPID

5- Path generation

- Kinematic control overview
- Joint path generation
- Cartesian path generation

6- Dynamic control

- Robot manipulator dynamics
- Independent joint control
- Centralized control
- Adaptive control

7- Flexible robotics

- Force and distance sensors
- Force and compliant motion control
- Contactless motion control

8- Robot selection and cell design

- Industrial robot applications
- Robot safety standards

4.4.Course planning and calendar

Timetables for classroom and laboratory sessions will be published prior to the beginning of the course at the web of the EINA https://eina.unizar.es/ and EUPT https://eupt.unizar.es/

Each teacher will publish his tutoring hours. The other activities will be planned depending on the number of students and will be announced well in advance. It will be available on https://moodle2.unizar.es/add/

4.5.Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=29827&year=2019