Universidad Zaragoza

Academic Year/course: 2024/25

69718 - Medical robotics and robotic exoskeletons

Syllabus Information

Academic year: 2024/25
Subject: 69718 - Medical robotics and robotic exoskeletons
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 633 - Master's Degree in Biomedical Engineering
ECTS: 3.0
Year:
Semester: Second semester
Subject type: Optional
Module:

1. General information

In recent years there have been substantial advances in the field of assistive robotics and medical robotics. In relation to assistive robotics, it will be oriented to the modelling and control of robotic exoskeletons, such as orthoses and prostheses. The subject is multidisciplinary, since it covers robot modelling, motion generation, control of polyarticulated mechanisms, and processing and adaptation of biosignals for device control. The applications have a growing social interest, since they are mainly oriented to people with motor disabilities. There is also a clear professional interest since these technologies currently provide automation and robotization tools that are very useful in medical applications.

2. Learning results

- To be able to model polyarticulated systems, such as manipulator robots and exoskeletons.
- To be able to perform the simple design of the control system of a manipulator robot, in particular of robotic exoskeletons.
- To be able to understand the origin and mechanisms of generation and processing of biosignals, in particular EEG (electroencephalographic) and EMG (electromyographic).
- To be able to understand bio-inspired models to generate control signals from biosignals.
- To know the different applications of robotics in the biomedical and healthcare field.

3. Syllabus

- Introduction to robotics. Manipulation robotics. Mobile robotics. Medical robotics. Applications.
- Modelling of a robot manipulator mechanism, trajectory generation, kinematic and dynamic motion control.
- Robotic exoskeletons. Application of manipulation robotics techniques to the control of exoskeletons.
- EEG and EMG biosignal filtering and processing.
- Control of exoskeletons from EEG and EMG biosignals.

4. Academic activities

Lectures: sessions where the professor will explain the subject´s topics: 15 hours.

Problems and cases: sessions to solve exercises and practical cases presented by the teacher: 6 hours

Laboratory practice: practical sessions in the laboratory: 9 hours

Study of the subject, assignments: 42 hours

Assessment tests (3 hours)**.**

5. Assessment system

- **Exam**(30% of the grade, minimum 5 out of 10).

- **Assignments and evaluable activities**(50% of the grade). The evaluation of the work will be based on the report submitted.

Laboratory practice (10% of the grade, minimum 5 out of 10). The assessment of the practical sessions will be done through the reports presented, as well as the work done in the laboratory.

- **Oral presentations**(10% of the grade). Presentation of results of exercises, works and practices and answering questions about them.

In order to pass the subject, the**4 evaluation activities** must be completed.

- **Global test**(official examinations, 100% of the grade, minimum 5 out of 10). The overall test includes:

- **Exam**(40% of the grade, minimum 5 out of 10). It will contain questions related to theoretical contents, case studies and laboratory practices.
- **Assignments and evaluable activities**(50% of the grade). The evaluation of the work will be based on the report submitted.
- **Laboratory practice** (10% of the grade, minimum 5 out of 10). The evaluation of the practical sessions will be based on the report submitted and/or the evaluation of one or more practices in the laboratory.

6. Sustainable Development Goals

3 - Good Health & Well-Being
9 - Industry, Innovation and Infrastructure
11 - Sustainable Cities and Communities