Universidad Zaragoza

Academic Year/course: 2022/23

69718 - Medical robotics and robotic exoskeletons

Syllabus Information

Academic Year: 2022/23
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

2. Learning goals

3. Assessment (1st and 2nd call)

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The educational activities will be carried out based on:

- Class attendance. The teacher will present the themes of the programme and practical exercises corresponding to each. Students will solve exercises or cases proposed by the teacher in class, which will be evaluated
- Laboratory Practice: Students will develop laboratory practice using the equipment and software provided. They will be evaluated based on the activity performed during the session and from a subsequent report results
- Seminars developed by expert guest lecturers
- Practical work. The students will solve individually or in group practical cases proposed by the teacher, which will be evaluated
- Research articles. The teacher may propose the reading and analysis of advanced and current articles on the subject, which will be presented by the students, and will be evaluated

4.2. Learning tasks

In order to achieve the learning outcomes described above and acquire the skills designed for this subject, the following training activities are proposed:

- A01 Presential Lectures (15 hours). Presentation by the teacher of the main contents of the subject. This activity will take place in the classroom in person. The teaching contents include performing exercises or simple practical cases by the teacher and students. In each course the possibility of conducting seminars by external experts will be considered.
- A02 Problem resolution and case study (6 hours). Problems and Case Studies resolution individually or in group.
- A03 Labs (9 hours). Laboratory practices will be performed with the available equipment. The student

must perform a preliminary study prior to conducting the practice in the laboratory, develop the proposal during the session practical activity, and perform a brief report on the results obtained. All these activities in accordance with the provisions of section Assessment will be evaluated.

- A06 Tutoring (12 hours). Time for personalized attention to students with the aim of reviewing and discussing the materials and topics presented in both theoretical and practical classes.
- A07 Study (30 horas). Personal work of the student theoretical part, conducting exercises, preparation of oral presentations, and development of practical individuall or group work.
- A08 Evaluation (3 hours). Theoretical and practical set of written tests, oral presentations, reports, and laboratory work will be evaluated. The detail is in the section on evaluation activities.

4.3. Syllabus

1. Introduction to Robotics. Manipulation Robotics. Mobile robotics. Medical robotics
2. Generation of a robotic manipulator movements. Polyarticulated mechanism modelling, trajectory generation, kinematic and dynamic motion control
3. Robotic exoskeletons. Application of robotic manipulation techniques to control exoskeletons
4. Exoskeleton control from biosignals (EEG, EMG). Muscle activation and miosignals processing (EMG).
5. Bioinspired models for exoskeleton control.
6. Biomedical Applications of manipulation and mobile Robotics

4.4. Course planning and calendar

Scheduling and presentation of works:

The schedule of the course, both the sessions in the classroom and the laboratory sessions, will be determined by the academic calendar that the Center established for the corresponding course. The schedule for submission of works will be announced at the beginning of the course.

4.5. Bibliography and recommended resources

Software y equipment:

- Software: Matlab-Simulink, OpenSim
- Equipamiento de adquisición y procesamiento de señales EMG
- Exoesqueleto robótico

http://biblos.unizar.es/br/br_citas.php?codigo=69318&year=2019