69318 - Medical robotics and robotic exoskeleton

Información del Plan Docente

Academic Year	2018/19
Subject	69318 - Medical robotics and robotic exoskeleton
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	547 - Master's in Biomedical Engineering
ECTS	3.0
Year	1
Semester	Second semester
Subject Type	Optional
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 methodology followed in this course is oriented towards achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as

- Class attendance. The teacher will present the course contents and practical exercises corresponding to each topic. Students will solve exercises or cases proposed by the teacher in class, which will be evaluated
- Laboratory Practice sessions: Students will do laboratory work using the equipment and software provided. They will be evaluated based on the activity performed during the session and from a subsequent report of results.
- Seminars by expert guest lecturers.
- Assignments. The students will solve individually or in group practical cases proposed by the teacher, which will be evaluated

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- Research articles. The teacher will 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

The course includes the following learning tasks:

- **A01 Lectures (22 hours).** The teacher explains the main contents of the course in the classroom. The contents include doing exercises or simple practical cases by the teacher and students. In each topic, the possibility of conducting seminars by external experts will be considered.
- **A03 Laboratory sessions (4 hours).** These sessions will be carried out with the available equipment. The student must do a preliminary study prior to conducting the practical work in the laboratory, develop a proposal during the session, and write a brief report on the obtained results. All these activities will be evaluated in accordance with the provisions of section Assessment tasks.
- **A05 Assignments.** The student must individually solve practical cases proposed by the teacher. If the proposed case study is complex it may be done in groups as established by the teacher. This activity will be evaluated in accordance with the section Assessment tasks.
- **A06 Tutorials.** Students can review and discuss the materials and topics presented in both theoretical and practical classes during the teacher's office hours.
- **A08 Assessment.** A set of theoretical and practical written tests, oral presentations, reports, and laboratory work. The details are in the section Assessment tasks.
- **Autonomous work** (including guided work, assessment, assignments, and personal study) corresponds to 49 hours.

4.3.Syllabus

The course will address the following topics:

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. Control exoskeletons from biosignals. Muscle activation Miosignals processing (EMG). Bioinspired models for exoskeleton control. Exoskeleton control from lectroencephalographic signals (EEG)

4.4.Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the EINA website.

4.5.Bibliography and recommended resources

Software and equipment to be used:

- Software: Matlab - Simulink, OpenSim
- Equipment for electromyographic signals (EMG) acquisition and processing
- Robotic exoskeleton