69318 - Medical robotics and robotic exoskeleton

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	547 - Master's in Biomedical Engineering
ECTS	3.0
Course	1
Period	Second semester
Subject Type	Optional
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

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 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

5.2.Learning activities

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 (22 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.

A03 Labs. (4 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.

A05 Carrying out practical work or research application. The student must individually solve practical cases raised by the teacher. If the proposed case study is complex it may be performed on group as established by the teacher. This activity will be evaluated in accordance with the provisions of section Assessment.

A06 Tutoring. Time for personalized attention to students with the aim of reviewing and discussing the materials and topics presented in both theoretical and practical classes.

A08 Evaluation. 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

The other activities (including tutored work, assessments, deliverables, and personal study) correspond to 49 hours.

5.3.Program
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)
5. Biomedical Applications of manipulation and mobile Robotics

5.4.Planning and scheduling

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.

5.5.Bibliography and recomended resources

BB Craig, John J.. Introduction to robotics : mechanics and control / John J. Craig . - 2nd ed. Reading, Massachusetts : Addison-Wesley, cop. 1989

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BB Fundamentos de robótica / Antonio Barrientos ... [et al.]. - 2ª ed. Madrid [etc.] : McGraw-Hill, cop. 2007

BB Pons, José L. Wearable robots: biomechatronics exoskeletons / J.L. Pons. Chichester : Wiley, 2008

BC Dudek, Gregory. Computational principles of mobile robotics / Gregory Dudek, Michael Jenkin . - 2nd ed. New York : Cambridge University Press, 2010

BC Medical robotics / edited by Vanja Bozovic. Viena : I-Tech EDucation and Publishing, 2008

Software and equipment to be used :

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