

69709 - Motion capture and characterisation

Syllabus Information

Academic year: 2023/24

Subject: 69709 - Motion capture and characterisation

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

This is an elective subject within the specialty of Biomechanics and Advanced Biomaterials. Together with the subjects "Biomechanics of the joints" and "Evaluation of functional capacity", it enables the student to design, develop and use systems for diagnosis, treatment follow-up, as well as therapies and rehabilitation of the musculoskeletal system.

These approaches and objectives are aligned with the Sustainable Development Goals (SDGs) of the United Nations Agenda 2030 (<https://www.un.org/sustainabledevelopment/es/>) and certain specific targets, such that the acquisition of the learning results of the subject will contribute to some extent to the achievement of Objectives 3.6, of Goal 3, and Objective 9.5 of Goal 9.

2. Learning results

- To know the different techniques and systems for motion capture in the biomedical field.
- To be able to propose and solve cases of capture and characterization of human movement by means of reconstruction processes on a pre-established biomechanical model.
- To be able to apply the techniques of rigid solid mechanics and direct and inverse dynamics to perform biomechanical analysis and obtain the corresponding kinematic variables and forces, which are useful for different applications.

3. Syllabus

Topic 0. MoCap technologies and virtual reality environments.

Topic 1. Introduction to human motion capture.

Topic 2. Mechanical fundamentals.

Topic 3. Capture systems.

Topic 4. Marker-based systems. Motive program (Optitrack)

Topic 5. Biomechanics. Skeletal model. Joint angles.

Topic 6. Reference systems for optical systems

Topic 7. Capture protocol. Anatomical calibration.

Topic 8. Gait analysis. Moments of the march cycle.

Topic 9. Individualized gait analysis. DCM Fundamentals.

Topic 10. Human models. Anthropometry.

Topic 11. MH-Vizar environment review

4. Academic activities

- **Participative master class**(21h.). Presentation of the main contents.
- **Laboratory practices**(7h.). Practices will be performed with specific hardware and software for motion capture. Motion capture systems based on optical and/or inertial units will be used.
- **Practical application or research work**(14.5h.). Team work in which the student has to show their ability to assimilate the concepts introduced in the other activities, through the resolution and critical analysis of a specific case related to the biomedical field. The resulting work must be submitted to the teacher and presented and defended orally.
- **Personal study** (30h.).
- **Assessment** (2.5h.).

5. Assessment system

- **E1: Final exam**(35%).

Written subject exam. The test will consist of a minimum test, multiple choice (multiple choice, four answers) or short questions. Estimated duration 1 h.

- **E2: Tutored practical work** (40%).

A work of analysis and motion capture study will be performed on the data captured regarding a proposed case that is related to the biomedical field. The student will show the degree of acquisition of the competences corresponding to the subject: they will have to write a bibliographic list related to that case and interpret the results obtained from the capture of the movement according to a specific protocol in accordance with the purpose of the study.

- **E3: Oral presentation**(25%).

The student must present and defend the practical work orally.

In order to pass the subject the student must have obtained a grade equal to or higher than 4.5 in the final exam and 5.0 in the rest of the exams. If this condition is not met, the final grade will be a failing grade of 4.0, unless the result of the average of all parts is less than 4.0, in which case the final grade will correspond to that value.

In case a student fails or does not show up for the first evaluation, the criteria for the second evaluation are the same. If the student has undergone the first evaluation and has failed any of the tests, the grade of the tests they have passed during the corresponding academic year will be kept.

In addition, there will be a global test in each of the calls established throughout the term, on the dates and times determined by the School.