Universidad Zaragoza

Academic Year/course: 2024/25

69711 - Cell Mechanobiology

Syllabus Information

Academic year: 2024/25
Subject: 69711 - Cell Mechanobiology
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

Cellular Mechanobiology aims to provide the student with the necessary skills to quantify cellular mechanical behaviour under different environmental conditions. The subject focuses on a series of basic knowledge that allows understanding cellular mechanical behaviour, both passive (mechanical resistance) and active (force generator). For this purpose, different experimental and computational methodologies will be studied and presented. Special attention will be paid to the mechanisms that regulate cell migration and adhesion. Finally, the different mechanisms of cellular mechanotransduction that regulate cell behaviour will be studied.

2. Learning results

Upon completion of this subject, the student will be able to:

Know basic concepts of biology and cellular mechanics.

Be familiar with the different types of experimental techniques to quantify the active and passive mechanical properties of cells.

Understand the structural and biological mission of the cell cytoskeleton, membrane and nucleus.

To know fundamental mechanisms of cell behaviour such as cell migration, adhesion and contraction.

To know and understand the regulatory mechanisms of cellular mechanotransduction.

3. Syllabus

Topic 1. Fundamental concepts of cell mechanics

Topic 2. Introduction to statistical mechanics

Topic 3. Experimentation in cell mechanics

Topic 4. Mechanics of the cytoskeleton

Topic 5. Cell membrane mechanics

Topic 6. Cell nucleus mechanics

Topic 7. Cell adhesion and contraction

Topic 8. Individual migration

Topic 9. Collective migration

Topic 10. Cell mechanotransduction

4. Academic activities

A01 Participative master class (18 hours). Presentation by the teacher of the main contents of the subject.

A03 Laboratory practices (8 hours). For the development of the practices there will be some scripts that the student will have to read before the practice, proposing a series of activities to be carried out during the same.

A05 Performance of practical application or research work. At the beginning of the academic year, the work or works to be performed will be explained. The works will be oriented to the application of the theoretical knowledge presented in the subject.

5. Assessment system

- E1: Final exam (40%).

Written exam, with a grade from 0 to 10 points. The test will consist of several theoretical and practical questions.

- E2: Tutored practical work (45%).

Graded from 0 to 10 points. The evaluation will take into account the quality of the work presented, the scope and bibliographic study of the proposed solution, as well as the oral presentation.

- E3: Computer practice (15%).

Graded from 0 to 10 points. The assessment of the practical sessions will be done through the reports presented after them, as well as the work done in the computer lab. It may require obtaining some previous theoretical result related to the content of the practice.

The student must obtain a minimum total grade of 4 points out of 10 in each of the activities (E1, E2 and E3) to average with the rest of the evaluation activities, otherwise they will not pass the subject.

There will be a global test in each of the exams established throughout the academic year on the dates and times determined by EINA for those who do not pass the subject by continuous assessment.

6. Sustainable Development Goals

3 - Good Health & Well-Being
4 - Quality Education
9 - Industry, Innovation and Infrastructure