

66029 - Advanced methods in biophysics

Syllabus Information

Academic year: 2023/24

Subject: 66029 - Advanced methods in biophysics

Faculty / School: 100 - Facultad de Ciencias

Degree: 537 - Master's in Molecular and Cellular Biology

ECTS: 6.0

Year: 1

Semester: First semester

Subject type: Compulsory

Module:

1. General information

The general objective of the subject is that the students know the application of different biophysical techniques of common use, mainly spectroscopic, in the study of the relationship between structure and function of proteins and other biomolecules, and to interpret the results obtained in biological terms.

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the United Nations Agenda 2030, so that the acquisition of the learning results of the subject provides training and competence to contribute to some extent to their achievement. Goal 3: Health and wellness and Goal 4: Quality Education.

2. Learning results

In order to pass this subject, the student must demonstrate the following results:

- To know the basic principles of various spectroscopic and biophysical techniques.
- To be able to plan applications of these techniques, with the corresponding methodological development to be used, in the determination of the structure, function or structure-function relationship of proteins and other biomolecules.
- To interpret the results of spectroscopic and biophysical techniques. Critical analysis of information.
- Quantitatively analyse experimental results in order to determine interaction, kinetic and thermodynamic parameters of processes involving biomolecules.
- Be able to search and analyse specific information and transmit basic concepts about the methodologies and results obtained from the point of view of Structural Biology.
- Know how to communicate knowledge, conclusions and the ultimate reasons behind them to different types of audiences in a clear and unambiguous way.
- Defend the conclusions obtained.
- Present and exhibit work done individually.

The structural and functional information derived from the use of different biophysical techniques is relevant in many areas not only in Structural Biology, but also in Biochemistry and Molecular and Cellular Biology in general. In addition, the information provided presents relevant applications in Biotechnology and Biomedicine with the consequent benefit for our society.

3. Syllabus

Theory Classes

Fundamentals of spectroscopy. UV-vis absorption spectroscopy. Circular dichroism (CD) and rotating optical dispersion.

Emission spectroscopy. Infrared spectroscopy. Nuclear magnetic resonance. Paramagnetic electronic resonance Calorimetry. X-ray diffraction and crystallography. Transmission electron microscopy. Optical biosensors based on the surface plasmon resonance (SPR) phenomenon. Biacore. Atomic force microscopy (AFM).

Problem solving classes and case studies

Students will analyse the application of the techniques studied in theory classes.

4. Academic activities

Master classes. 24 hours

The students are introduced to the basic theoretical knowledge of the subject. Presentations, including small animations and videos and on/off-line navigation will be used, as well as blended methodologies.

Problem solving classes and case studies. 16 hours

They alternate with the theoretical classes and the application of the techniques explained in the master classes will be analysed. The student will be instructed on how to design the experiments, present data, results and organize their discussion.

Presentation and exhibition of a work. 18 hours

Students individually or in groups (2-3 students) will collect information on a specific topic, supervised by a teacher. The analysis of the information should lead to the development of a presentation and the presentation and discussion in the classroom.

Objective written test. 2 hours

At the end of the subject, students will take an objective test to evaluate the acquisition of basic concepts, procedures and other knowledge.

5. Assessment system

Objective written test. Short questions and/or multiple-choice tests on the contents of the subject related to a scientific article or theoretical-practical case that will be previously delivered to the student. 40% of the final grade.

Presentation and exhibition of a work. Presentation and exposition of an individual or group work on a topic related to the subject. The report submitted will contribute 10% to the final grade, and the presentation and defence of the seminar will contribute 40%.

Problem solving classes and case studies. Elaboration of a "Notebook of practical cases" that will contribute a 10% to the final grade.

In order to use this evaluation method, it is a prerequisite to have attended at least 80% of the classroom hours of the subject.

5.2 Global test and second call

This procedure only affects those students who do not opt for continuous evaluation or who have not passed the subject by this means. The final grade will consist of:

- **Written test** (described in 5.1). 60% of the final grade.

- **Presentation and exhibition of an individual work** (described in 5.1). The report will contribute 10% to the final grade and the presentation 30%.