

Academic Year/course: 2022/23

66030 - Advanced methods in molecular and cellular biology

Syllabus Information

Academic Year: 2022/23

Subject: 66030 - Advanced methods in molecular and cellular biology

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

1.1. Aims of the course

The overall objective of this subject is to deepen the student's knowledge on manipulation techniques and analysis of genetic material, collection, purification and characterization of proteins, immunology, cell culture, electron microscopy, electrochemical sensors, as well as the most important applications of these techniques. This objective will be acquired through lectures, solving practical cases in the classroom and presentation of papers.

With the development of personal work it is intended to deepen students' prior knowledge and acquire additional skills related to finding information and critical analysis, writing and communication of scientific content, etc.

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the Agenda 2030 of the United Nations (<https://www.un.org/sustainabledevelopment/es/>), in such a way that the acquisition of the learning outcomes of the subject provides training and competence to contribute to a certain extent to its achievement:

Objective 3: Health and well-being.

Objective 6: Clean water and sanitation.

Objective 13: Climate action.

Objective 14: Underwater life.

1.2. Context and importance of this course in the degree

All work is aimed to make the students know delve into the latest advances in techniques of molecular and cellular biology.

1.3. Recommendations to take this course

To follow this course, the student must have a basic knowledge of Molecular and Cellular Biology techniques including those related to the analysis of genes and proteins and the identification of cells and organelles.

2. Learning goals

2.1. Competences

After passing this course, the students will be:

1. Competent to design the most appropriate methodology to answer the questions presented in the field of Molecular and Cellular Biology.
2. Able to assess the relevance of developments in the field.
3. Capable to search and critically analyze specific information.
4. Competent for presentations and exhibitions of issues related to technology Molecular and Cell Biology.
5. Able to identify the most appropriate strategy to achieve the best result to solve a particular problem in the field of molecular and cellular biology techniques.

2.2. Learning goals

For passing this subject, the student should demonstrate to be able to:

- Assess of the relevance of developments in the field.
- Planning the molecular cloning of a gene, site-directed mutagenesis experiments, genetic analysis of diseases, functional study, propose methods to use, carry them out, and interpretation of the results.
- Searching, analysis and transmission of information on specific aspects of molecular and cell biology.
- Solve specific problems that might arise in a laboratory of molecular and cellular biology
- Present its work

2.3. Importance of learning goals

As a result of following this course, students will be able to select the most appropriate technique when addressing a problem to solve in the identification and analysis of cells, genes, proteins or metabolites. In turn it will know how to tackle more efficiently the characterization of the different cells and biomolecules.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

The teaching and assessment activities will be carried out in person unless, due to the health situation, the provisions issued by the competent authorities and by the University of Zaragoza arrange to carry them out electronically.

The student must demonstrate that they have achieved the expected learning outcomes through the following assessment activities

1. A presentation, based on one or more scientific articles in which various techniques of Molecular and Cellular Biology have been used

These presentations will deal with a theme related to the subject, which each student will specify with the teacher. The work must be submitted in writing and an exposition of it will be performed in the class. At the end, a discussion will be established in which the participation of the rest of the students will also be valued.

Valuation criteria and levels of demand:

The presentation of this work will be mandatory to pass the subject. It will be scored from 0 to 10 and will contribute 45% to the final grade. The evaluation criteria are as follows:

- ? Coherence of information.
- ? Clarity of concepts.
- ? Degree of elaboration of the presentation.
- ? Degree of internalization of the contents with critical analysis and own suggestions.
- ? Ability to debate and answer questions about work

2. Participation in class and in the debates after the presentations of the work

Will contribute to the final grade with 10%

3. Carrying out an objective test

The test will consist of a series of short questions and / or test questions about the theoretical content of the subject. It will be scored from 0 to 10 and will contribute 45% to the final grade.

The objective test will take place on the day and time indicated on the Moodle platform of the University of Zaragoza <https://moodle2.unizar.es/add/> and on the subject's moodle.

To pass the course, it is an essential requirement to pass this test with a minimum of 5 points out of a total of 10.

To compensate for the qualifications obtained in points 1 and 3, a minimum grade of 4 points out of 10 must be obtained in each of the sections.

Tests for non-contact students

For those non-contact students, the following tests will be carried out:

1. Presentation of an individual work

The work will be on a theme related to the subject, which each student will specify with the teacher. The teacher will supervise the student's personal work. The exhibition of the same will be carried out in the same way as in the face-to-face mode.

Valuation criteria and levels of demand:

It will be scored from 0 to 10 and will contribute 40% to the final grade. The assessment criteria are the same as for face-to-face students.

2. Carrying out an objective test

The test will consist of a series of short and / or test questions about the theoretical content of the subject. It will be scored from 0 to 10 and will contribute 60% to the final grade

The objective test will take place on the day and time indicated on the Moodle platform of the University of Zaragoza <https://moodle2.unizar.es/add/> and in the subject's moodle.

TO PASS THE SUBJECT, IT IS AN ESSENTIAL REQUIREMENT TO PASS THE WRITTEN TEST OF THE SUBJECT WITH A MINIMUM OF 5 POINTS OVER A TOTAL OF 10.

In addition, to pass this subject, the student must achieve a minimum overall score of 5 points out of a total of 10.

Tests for students who appear in other calls other than the first.

For those students who have to appear in successive calls for not having passed the subject on first call, the evaluation will consist of the same tests as for first call students, with the following characteristics:

? Those students who in the previous calls have obtained at least 5 points in the presentation of the work will not have the obligation to present a new work.

The date and place of the different calls to the first one will be announced on the Moodle platform of the University of Zaragoza <https://moodle2.unizar.es/add/> and in the subject's moodle.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

This course is designed to address the learning of theoretical knowledge with different specialists. To achieve this goal, in the lectures a large number of teachers, with different backgrounds, is involved to allow students a wider vision of the field.

This strategy will allow the students to review a topic in detail with the supervision of an outstanding professional, who can provide further professional development in the field, when choosing and carry out their thesis project.

4.2. Learning tasks

The program offered to the student to help him achieve the expected results comprises the following activities.

1. Face-to-face activity: Theoretical classes, exposition and discussion of practical cases.

Face-to-face. 30 hours. Participatory master classes. They present students with the basic theoretical knowledge of the subject. The last sessions will be devoted to solving practical cases.

2. Seminars

Face-to-face. 8 hours

3. Presentation of a work.

No face-to-face, 20 hours. This activity consists of the students collecting information on a specific topic, assisted by the teacher, for the presentation of the work. The teacher will supervise the individual work of the students by scheduling tutoring sessions.

3. Tutorials.

10 hours of tutoring.

4. Carrying out an objective test for non-contact studies.

In person, 1 hour; no face-to-face, 3 hours.

4.3. Syllabus

The course will address the following topics:

1. Presentation. Introduction to Molecular / Cellular Biology and its applications. Critical analysis of technologies for nucleic acid research.

2. Functional analysis of promoters. Techniques for the study of DNA-protein interaction. Applications.

3. Bacterial regulators: study methods

4. Transcriptional regulators as antimicrobial targets

5. Vaccines in the 21st century
6. Applications of Flow Cytometry
7. Multidimensional optical microscopy
8. Methods of studying the miRNAs. Applications.
9. Two-component systems
10. Proteomics / immunochemistry techniques
11. New techniques of DNA sequencing
12. OxPhos function analysis. Generation of mutants in mitochondrial DNA. Polarography Mitochondrial synthesis of proteins (35S)
13. Mitochondrial proteomics through gene capture (Gene-trap)
14. Organ on chip: Microfluidic devices to simulate the microenvironment in in vitro cancer models
15. Epigenetics: Concepts, analysis techniques and biomedical applications
16. Practical cases

IMPORTANT: The order of the topics may change depending on the agendas of visiting researchers.
Coordinator: Dr. Maria F. Fillat

4.4. Course planning and calendar

Lectures, case studies and seminars:

First Semester, (the course will begin during the second half of October)

Hours: 16:00 to 18:00 h.

Location: It will be indicated on the Faculty of Science website.

During the teaching period, students may contact the teachers who presented their topic of interest to select their assignment.

Deadline for submission of written assignments: Last school day before Christmas vacation.

Supervision and assignment review: to be informed in class.

Theoretical lessons, case studies and seminars: First semester. Timing: from 16 to 18h.

Deadline for submission of written work: last school day before Christmas holiday

Tutorials: Will be announced at the beginning of the course

4.5. Bibliography and recommended resources

Bibliographic records for this subject will be indicated along each theoretical session

Slides of lessons will be available in the Moodle platform at UNIZAR