

**Cellular Culture**

Code: 100887  
ECTS Credits: 3

Degree	Type	Year	Semester
2500252 Biochemistry	OB	2	1

**Contact**

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**Use of Languages**

Principal working language: catalan (cat)  
Some groups entirely in English: No  
Some groups entirely in Catalan: Yes  
Some groups entirely in Spanish: No

**Prerequisites**

There are not

**Objectives and Contextualisation**

Cell Culture course is taught in the 2nd semester of the 2nd year of the Biochemistry degree in the Faculty of Biosciences. This is a subject with a certain degree of expertise that is intended to acquire a basic knowledge to work in a cell culture laboratory. It is therefore a subject with an important practical component.

Course objectives:

- 1) Know the basic equipment of a cell culture laboratory.
- 2) Know the most used types of cultures.
- 3) Know the basic methodologies used in cell cultures.

**Competences**

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Apply general laboratory security and operational standards and specific regulations for the manipulation of different biological systems.
- Apply the principal techniques used in biological systems: methods of separation and characterisation of biomolecules, cell cultures, DNA and recombinant protein techniques, immunological techniques, microscopy techniques, etc.
- Collaborate with other work colleagues.
- Design and prepare laboratory protocols, including health and safety aspects.
- Design experiments and understand the limitations of experimental approaches.
- Interpret experimental results and identify consistent and inconsistent elements.
- Process cells and tissues to obtain purified sub-cellular organelle preparations, and characterise them biochemically and structurally.

- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
- Think in an integrated manner and approach problems from different perspectives.

## Learning Outcomes

1. Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
2. Apply techniques for culturing eukaryotic cells.
3. Assess experimental data in relation to the values published in the scientific literature.
4. Collaborate with other work colleagues.
5. Design experiments and understand the limitations of experimental approaches.
6. Explain the fundamental theory behind basic and advanced techniques in biochemistry.
7. Explain the fundamental theory behind microscopy and centrifuging techniques, and the instrumentation used.
8. Interpret experimental results and identify consistent and inconsistent elements.
9. Monitor and interpret experiment protocols from a critical perspective.
10. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
11. Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
12. Think in an integrated manner and approach problems from different perspectives.
13. Use the appropriate methodology for studying the different types of biological samples.
14. Use the established methods for eliminating the different types of waste products from a biochemistry and molecular biology laboratory.

## Content

### PROGRAM OF THEORY CLASSES:

Provides the students with the basic knowledge needed for the manipulation and cultivation of animal cells and the use of biological material in sterile conditions.

#### Block I\_INTRODUCTION

Unit 1. Brief history of cell cultures

#### Block II\_ORGANIZATION OF A LABORATORY OF CELLULAR CULTURE

Unit 2. Design of facilities and equipment

#### Block III\_ BASIC PRINCIPLES OF ANIMAL CELLULAR CULTURE

Unit 3. Physicochemical conditions of cell culture

Unit 4. Production of cells and their maintenance

Unit 5. Quantification, tests of cytotoxicity and cell death

Unit 6. Cryopreservation

Unit 7. Contamination of cell cultures

Unit 8. Characterization and authentication

Unit 9. Special techniques: cell synchronization

## Block IV\_CELLS IN CULTURE FOR BASIC AND APPLIED RESEARCH

### Unit 10. Cell lines

### Unit 11. Application of cell cultures

**PROGRAM OF PRACTICAL SESSIONS:** Broadly speaking, the practices consist of the manipulation of animal eukaryotic cells. The 5 laboratory sessions are designed so that the student complements their theoretical training with basic techniques and tools of a cell culture laboratory. In the practical sessions students will work on:

- Subculture of animal cell lines.
- Establishment of a cell growth curve.
- Immunofluorescent detection of microtubules.
- Freezing and thawing: rate of recovery and survival.
- Apoptosis induction and analysis.
- Cell-cycle disturbances.
- Discussion of laboratory results

## Methodology

Given its theoretical-practical nature, the subject of Cellular Culture consists of theoretical master classes -10 hours- as well as practical classes in the laboratory -16 hours- (see table of formative activities).

The theoretical classes are usually scheduled for the first three weeks of the second semester. The content of the theory program will be taught mainly by the teacher in the form of master classes. Teacher's presentations will be available in \*pdf format in the Moodle platform. It is recommended that students print this material and take it to class to use as support when taking notes.

The practical classes of the subject are designed so that students learn to use laboratory instruments and complete their theoretical training. Given the theoretical-practical nature of the subject, the practical classes are not associated with the Integrated Laboratory 6 subject. Practical classes will be scheduled in 4 turns of students and each one of the turns will consist of 5 sessions with a total of about 16 hours distributed from Monday to Friday. An internship presentation session will be scheduled for each of the groups, which will be of mandatory attendance the week before the start of the internship. The list of students by turn will be published in the Moodle platform. Group modifications are accepted but require exchange of students among groups.

The Manual of the practical sessions will be available in \*pdf format in the Moodle platform. For the proper operation and understanding of the practices, students should read the script for each practice session and view the recommended videos. Students will need to submit an exercise or complete a questionnaire each day just at the beginning of the session on issues related to the practice of the day. These activities will be evaluated and will have a weight in the final grade of the subject. Delays in the arrival involves not being able to complete the questionnaires.

The students will work in groups of 2 people and, at the end of each practice, they should fill a sheet of results. On the last day of the laboratory practices, the results obtained in each of the internships will be evaluated and discussed. Each couple must deliver a work -final report-, where they will show and discuss the results obtained by the couple as well as by the group practices. This work will be delivered via Moodle during the 15 days following the end of the internship.

The tutorials will be carried out in a personalized way in the teacher's office (door C2/050 at arranged hours). The students should contact to the teacher at class or by e-mail to schedule a meeting. The tutorials should be used to clarify concepts, settle the knowledge acquired and facilitate the study by students.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

## Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory practices	16	0.64	1, 10, 2, 3, 4, 9, 8, 14, 13
Lectures	10	0.4	2, 3, 9, 5, 6, 7, 12
Type: Supervised			
Tutorials	6	0.24	2, 3, 4, 9, 5, 6, 7, 8, 12, 14, 13
Type: Autonomous			
Study	35	1.4	2, 3, 4, 9, 5, 6, 7, 8, 12, 14, 13

## Assessment

The evaluation of academic achievements by students will be assessed through four different activities, 2 corresponding to the theoretical part of the subject (65% of the overall grade) and 3 to the practical module (35% of the overall grade). Therefore, the assessment will take into account both the scientific knowledge obtained by each student individually and the results obtained and worked by group during the practices.

Specifically, there will be:

### Theoretical

- 1) Multiple choice test (50% of the mark).
- 2) Case study (15% of the mark).

### Practices

- 3) Questions and exercises in Laboratory Practices (5% of the mark).
- 4) Practices report (15% of the mark).
- 5) Multiple choice test of practices (15% of the mark).

It is noteworthy that the attendance at practical sessions is mandatory. The absence of one of the practical sessions implies a penalty of 25% of the mark in this section. Students will obtain the "Non-Appraising" qualification when their absence in the practical module exceeds 20% of the programmed sessions (2 or more sessions).

### General Considerations

To pass the subject, a minimum mark of 4 out of 10 is required in the multiple choice of the theoretical assessment activities and, that the weighted average of all the activities should be equal to or greater than 5 points out of 10.

Those students who initially do not pass the subject can attend a retake process. However, to do so, the student must have been previously evaluated in a set of activities whose weight equals a minimum of 2/3 of the total qualification of the subject (67%). Therefore, students will obtain the "Non-Appraising" qualification when the assessment activities carried out have a weighting of less than 67% in the final grade of the subject.

Only the tests corresponding to the theoretical part of the subject may be recovered: multiple choice test (1) and/or case study (2). Each of them will have a weight equivalent to that of the initial exams. Please note that the practical part of the subject is excluded from the retake: sections "Questionnaires and laboratory exercises", "Practice report" and "Laboratory test type examination".

Finally, those students who - having passed the subject through continuous assessment - want to present themselves to upload a grade, may do so if they inform the teacher one week in advance.

## Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Examination of the techniques used in practices	15%	1	0.04	2, 3, 4, 9, 6, 7, 8, 12, 14, 13
Laboratory exercises and questionnaires	5%	0.5	0.02	2, 7, 13
Laboratory report	15%	4	0.16	1, 10, 2, 3, 5, 8
Resolution of a problem / case	15%	1	0.04	3, 7, 8, 14, 13
Written exam	50%	1.5	0.06	11, 9, 5, 6, 7, 8, 12, 13

## Bibliography

-R.I. Freshney. Culture of Animal Cells: A manual of basic technique and specialized applications. 7<sup>th</sup> ed. Wiley-Blackwell. John Wiley & Sons, Inc. 2016. Free access to 6<sup>th</sup> ed (2010) for UAB students: <https://onlinelibrary.wiley.com/doi/book/10.1002/9780470649367>

Specific bibliography is referenced in the class slides.

## Software

No software is used