Cellular Culture

Code: 100887
ECTS Credits: 3

2024/2025

Degree	Type	Year
2500252 Biochemistry	OB	2

Contact

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Teaching groups languages

You can view this information at the end of this document.

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

THEORETICAL CLASS PROGRAM. It basically consists of knowing the equipment, facilities, materials and techniques necessary for the manipulation and culture of animal cells and the use of biological material in sterile conditions

Introduction to cell cultures

1. Brief history, interest, and applications of cell cultures.

Basic principles of cell cultures in animals

1. Cell cultures according to their origin.
2. Cell cultures according to their structure.
3. Physicochemical conditions of cultures.
4. Organization of the cell culture laboratory.
5. Biosafety.

Basic techniques in cell cultures: quantification, cytotoxicity tests, and cell death.

1. Cryopreservation of cells.
2. Contamination of cultures.
3. Characterization and authentication of cells.

Advanced techniques in cell cultures

1. Selection and purification of cells.
2. Cell cycle analysis, and cell synchronization.

PRACTICAL CLASS PROGRAM

In broad terms, the practical sessions involve the manipulation of eukaryotic animal cell cultures. The 5 laboratory sessions are designed for students to complement their theoretical training with basic techniques and the use of a cell culture laboratory. During the practical sessions, you will work on:

1. Subculturing animal cell lines in a biological safety cabinet.
2. Establishing a cell growth curve.
3. Immunofluorescent detection of microtubules and observation under an epifluorescence microscope.
4. Cell freezing and thawing: recovery rate and survival.
5. Induction and analysis of apoptosis.
6. Cell cycle alteration using different drugs.
7. Discussion of results

Activities and Methodology

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

The subject of cell cultures consists of theoretical master classes (10 hours) using audiovisual materials and practical classes in the laboratory (16 hours)

Theoretical Classes:

The theoretical master classes will be conducted using audiovisual material prepared by the professor. This material will be available to students on the Virtual Campus (CV) of the UAB before each session. It is recommended to consult the audiovisual material and the recommended books in the Bibliography section of this teaching guide to consolidate the content explained in class.

Practical Classes:

The practical classes for this subject are designed to help students learn to use laboratory instruments and enhance their theoretical knowledge. These practical classes are not associated with the Integrated Laboratory IV subject, as the cell culture subject is theoretical-practical.

There are 5 practical sessions totalling 16 hours, scheduled from Monday to Friday. Prior to starting the first session, a mandatory presentation session will be held for each group. The practical guide will be available in PDF format on the CV.

Each day, students will need to submit an exercise (via CV) or complete a questionnaire (in the classroom) at the beginning of each practical session related to the day's experiments. These activities will be evaluated and contribute to the final grade for the subject. Late arrival to the session will result in the inability to complete the questionnaires.

Students will work in pairs. Each pair must submit a report showing and discussing the results obtained, both individually and as part of the practical group. The goal of this activity is to promote scientific reasoning at both the individual and team levels.

Tutorials:

Tutorials will be personalized and held in the professor'soffice (Room C2/042) at a convenient time. They should be used to clarify concepts, reinforce acquired knowledge, and facilitate student study.

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.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Laboratory exercices and questionnaires	10%	0.5	0.02	2, 7, 13
Laboratory results	10%	4	0.16	1, 2, 3, 5, 8, 10
Practices and results discussion exam	15%	1	0.04	2, 3, 4, 6, 7, 8, 9, 12, 13, 14
Resolution of a problem / case	10%	1	0.04	3, 7, 8, 13, 14
Theory test exam	55%	1.5	0.06	5, 6, 7, 8, 9, 11, 12, 13

To pass the subject, you'll need to achieve a minimum overall score of 5 out of a maximum of 10 points. The scheduled evaluation activities are as follows:

Theory Exam:

Consists of two distinct parts. In the first part, students must demonstrate their knowledge of various concepts taught in theory classes. This part represents 40% of the grade. The second part presents a practical case, and students must determine which experiments would lead to the expected results. This part contributes 20% to the overall grade.

Laboratory Practices:

Account for 20% of the subject's grade. Attendance at laboratory practical sessions is mandatory. Punctuality is crucial, as the first 30 minutes of each session cover the different methodologies used during the practice. Delays of 10 minutes result in a 0.1-point deduction per delay (and no questionnaire can be completed; see below). If the delay exceeds 30 minutes, the penalty is 0.3 points.

Students receive a "Not Evaluable" grade if their absence exceeds 20% of the sessions.

To ensure smooth functioning and understanding of the practices, students must read the corresponding practice guide before each session. Each day, they should complete a questionnaire related to the day's

practice before the session begins. This questionnaire is evaluated with a maximum daily score of 0.1 point, up to a total of 0.4 points. Scores below 0.4 will impact this block's grade.

Practices are conducted in pairs. Each pair must submit a report on the results obtained and discuss both their own results (as a pair) and those of the "practice class group" in comparison with the expected results. The maximum score for this work is 10 points, and submissions are made through the CV.

Examination on Laboratory Techniques:

Represents 20% of the subject's grade. A written exam covering the various techniques used and the results obtained during the practices.

Subject Grade Calculation:

Theory (40% + 20%) + Practices (20% + 20%)

Recovery:

To participate in the recovery, students must have been previously evaluated in a set of activities that account for at least two-thirds of the total subject or module grade.

Students receive a "Not Evaluable" grade if the weight of the evaluation activities performed is less than 67% of the final grade.

There will be a recovery exam for students who scored below 3.99 in the knowledge exam (which contributes 40% of the grade). The "practical case" (20% of the grade) and "practices" (20% of the grade) exams will not be retaken

NB: This text has not been proofreading by a native English, so incase of any doubt or incongruity, the information provided in the Catalan/Spanish version will prevail.

Bibliography

-R.I. Freshney. Culture of Animal Cells: A manual of basic technique and specialized applications. 7th ed. Wiley-Blackwell. John Wiley & Sons, Inc. 2016. Accés lliure a la 6th ed (2010) al personal UAB: https://onlinelibrary.wiley.com/doi/book/10.1002/9780470649367

- A. Doyle and J.B. Griffiths Eds. *Cell and Tissue Culture: Laboratory procedures in biotechnology.* John Wiley & Sons Ltd. 1999. ISBN: 978-0471982555 (no hi ha cap nova edició)

-J.P. Mather and D. Barnes Eds. *Animal Cell Culture Methods.* Methods in Cell Biology. Academic Press.1998. (en paper i electrònic). ISBN: 978-0124800403

Software

No software is used

Language list

Name	Group	Language	Semester	Turn

(PLAB) Practical laboratories	321	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	322	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	323	Catalan	second semester	morning-mixed
(TE) Theory	32	Catalan	second semester	afternoon