

Cellular Culture

Code: 100929
ECTS Credits: 3

Degree	Type	Year	Semester
2500253 Biotechnology	OB	3	2

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

Other comments on languages

Cell culture

Prerequisites

There are not

Objectives and Contextualisation

Cell Culture course is taught in the 2nd semester of the 3rd year of the Biotechnology 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) To know the basic equipment of a cell culture laboratory.
- 2) To know the basic methodologies used in cell cultures.

Competences

- Apply general laboratory security and operational standards and specific regulations for the manipulation of different biological systems.
- Apply the principal techniques for the use of biological systems: recombinant DNA and cloning, cell cultures, manipulation of viruses, bacteria and animal and plant cells, immunological techniques, microscopy techniques, recombinant proteins and methods of separation and characterisation of biomolecules.
- Describe the molecular, cellular and physiological bases of the organisation, functioning and integration of living organisms in the framework of their application to biotechnological processes.
- Design and implement a complete protocol for obtaining and purifying a biotechnological product.
- Interpret experimental results and identify consistent and inconsistent elements.
- Make decisions.
- Think in an integrated manner and approach problems from different perspectives.

- Work individually and in teams

Learning Outcomes

1. Apply the different waste disposal processes correctly.
2. Apply the general safety rules in place in a biotechnology laboratory.
3. Describe the fundamental theory behind the basic and advanced techniques for obtaining and characterising biomolecules.
4. Interpret experimental results and identify consistent and inconsistent elements.
5. Make decisions.
6. Recognise the functioning of physiological processes in plants, with a view to using them in biotechnology.
7. Think in an integrated manner and approach problems from different perspectives.
8. Use basic techniques of immunodetection.
9. Use the appropriate methodology for studying the different types of biological samples.
10. Use the techniques for cultivating prokaryote and eukaryote cells and for manipulating biological systems.
11. Work individually and in teams

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. Equipment and tooling

Unit 3. Design and distribution of facilities

Unit 4. Levels of biological containment and basic norms of biosecurity

Block III_ BASIC PRINCIPLES OF ANIMAL CELLULAR CULTURE

Unit 5. Physicochemical conditions of cell culture

Unit 6. Types of cultures and their production

Unit 7. Quantification, tests of cytotoxicity and cell death

Unit 8. Cell cryopreservation

Unit 9. Contamination of cell cultures

Unit 10. Characterization and authentication

Unit 11. Special techniques

Block IV_BIOTECHNOLOGY IN ANIMAL CELLS AND TISSUES

Unit 12. Cell lines in research and biotechnology production

Unit 13. Scale-up 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.
- Cytogenetic and immunofluorescent characterization.
- Cell differentiation.
- Freezing and thawing: rate of recovery and survival.

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 weeks of the second semester with a dedication of 4h / week for 2 weeks in a row and two additional hours. 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.

Given the theoretical-practical nature of the subject, the practical classes are not associated with the Integrated Laboratory 6 subject. The Manual of the practical sessions will be available in * pdf format in the Moodle platform. It is a requirement that the student read comprehensively the protocol of practices and view the recommended videos prior to their attendance at each session

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. The list of students by turn will be published in the Moodle platform. The students will work in groups of 2 people and, at the end of each practice, they will have to fill a sheet of results. This sheet will remain in the possession of the teaching staff and, together with a final report, prepared by each group and delivered during the 15 days after the completion of the practices, will be used to evaluate this part of the subject.

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.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lectures	10	0.4	6, 3, 4, 7, 11
Practices	16	0.64	1, 6, 2, 4, 7, 5, 11, 9, 8, 10
Type: Supervised			
Tutorials	6	0.24	6, 4, 7, 5, 11

Study	38	1.52	3, 4, 7, 5, 11
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Assessment

The evaluation of academic achievements by students will be assessed through four different activities, 2 corresponding to the theoretical part of the subject (70% of the overall grade) and 2 to the practical module (30% 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:

- 1) Multiple choice test (35% of the mark).
- 2) Written exam of short questions to develop (35% of the mark).
- 3) Results of the Laboratory Practices (25% of the mark).
- 4) Practices report (5% of the mark).

General Considerations

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).

To pass the subject, a minimum mark of 3 out of 10 is required in each of the four assessment activities and, that the weighted average of all of them is 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.

The retake will consist of two written tests: a multiple choice exam and specific questions to develop. All activities corresponding to the practical part of the subject are excluded from the retake: sections "results of the laboratory practices" and "report of practices".

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 in advance.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Laboratory practice results	25%	0.5	0.02	1, 6, 2, 3, 4, 7, 5, 11, 9, 8, 10
Laboratory report	5%	1	0.04	4, 7, 5, 11
Test	35%	1.5	0.06	6, 4, 7, 5, 9
Written exam	35%	2	0.08	1, 2, 5, 9, 10

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.

Free access 6th ed for UAB students: <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.

-J.P. Mather and D.W. Barnes (eds.). Methods in Cell Biology, vol 57: Animal Cell Culture Methods. Academic Press, 1998.