Universitat Autònoma de Barcelona

2020/2021

Microbiology, Immunology and Cell Culture

Code: 103275
ECTS Credits: 8

Degree	Type	Year	Semester
2501922 Nanoscience and Nanotechnology	OB	3	2

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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Use of Languages

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

Teachers

Jose Ramon Palacio Cornide
José Luis Corchero Nieto

Prerequisites

This subject does not need any requirements.

Objectives and Contextualisation

The subject Microbiology, Immunology and Cell Culture, is taught in the 2nd semester of the 3rd year of the degree of Nanoscience and Nanotechnology in the Faculty of Sciences. This is a subject with a certain degree of specialization that is divided into three large blocks (Microbiology, Immunology and Cellular cultures) in which the student is expected to acquire some basic notions to begin with the methodologies used in the culture and manipulation of bacterial cells, in immunology laboratories and in cultures and manipulation of eukaryotic cells. That is why it is a subject with an important practical component.

Objectives of the subject:

1) Know the bacterial cell

2) Know the basic methodologies used in a Microbiology laboratory

3) Knowing the basic concepts of Immunology

4) Know the basic methodologies used in a Immunology laboratory

5) Know the basic equipment of a ell culture laboratory

6) Know the basic methodologies used in a Cell Culture Laboratory

Competences

- Adapt to new situations.
- Apply the concepts, principles, theories and fundamental facts of nanoscience and nanotechnology to solve problems of a quantitative or qualitative nature in the field of nanoscience and nanotechnology.
- Apply the general standards for safety and operations in a laboratory and the specific regulations for the use of chemical and biological instruments, products and materials in consideration of their properties and the risks.
- Be ethically committed.
- Communicate orally and in writing in ones own language.
- Demonstrate knowledge of the concepts, principles, theories and fundamental facts related with nanoscience and nanotechnology.
- Handle the standard instruments and materials of physical, chemical and biological testing laboratories for the study and analysis of phenomena on a nanoscale.
- Interpret the data obtained by means of experimental measures, including the use of computer tools, identify and understand their meanings in relation to appropriate chemical, physical or biological theories.
- Learn autonomously.
- Manage the organisation and planning of tasks.
- Obtain, manage, analyse, synthesise and present information, including the use of digital and computerised media.
- Operate with a certain degree of autonomy.
- Propose creative ideas and solutions.
- Reason in a critical manner
- Recognise the terms used in the fields of physics, chemistry, biology, nanoscience and nanotechnology in the English language and use English effectively in writing and orally in all areas of work.
- Resolve problems and make decisions.
- Show motivation for quality.
- Show sensitivity for environmental issues.
- Work correctly with the formulas, chemical equations and magnitudes used in chemistry.
- Work on the synthesis, characterisation and study of the properties of materials on a nanoscale from previously established procedures.

Learning Outcomes

1. Adapt to new situations.
2. Be ethically committed.
3. Communicate orally and in writing in ones own language.
4. Correctly use the laboratory material, microorganisms and cells used in biology laboratories.
5. Correctly use the necessary computer tools to interpret and expose the results obtained.
6. Describe the biology of microorganisms and the scientific bases of their application to nanoscience and nanotechnology.
7. Descriure el sistema immunitari i les bases científiques de l'aplicació dels anticossos als nanosensors.
8. Evaluate the danger and risks of the use of samples and reagents, and apply suitable safety precautions for each case.
9. Identify and distinguish the protocols for using complex equipment for characterisation, analysis and manipulation of biomolecules and cells.
10. Identify and situate safety equipment in the laboratory.
11. Identify the basics of cell culture techniques.
12. Interpret the results obtained in biology laboratories on microbiology and animal cell cultures.
13. Learn autonomously.
14. Manage the organisation and planning of tasks.
15. Obtain, manage, analyse, synthesise and present information, including the use of digital and computerised media.
16. Operate with a certain degree of autonomy.
17. Perform basic operations in microbiology, immunology and cell culture laboratories.
18. Propose creative ideas and solutions.
19. Reason in a critical manner

20. Recognise the English terms employed in biochemistry, molecular biology, microbiology, immunology and in subjects related with nanoscience and nanotechnology.
21. Resolve problems and make decisions.
22. Safely handle chemical and biochemical reagents.
23. Safely handle microorganisms and animal cells.
24. Safely use laboratory instruments used in biochemistry, microbiology, cell cultures and bioanalysis.
25. Show motivation for quality.
26. Show sensitivity for environmental issues.
27. Understand texts and bibliographies in English on biochemistry, molecular biology, microbiology, immunology and in subjects related with nanoscience and nanotechnology.
28. Use knowledge of microbiology, immunology and cell cultures to resolve technical problems and questions with regard to nanoscience and nanotechnology.
29. Use the suitable strategies for the safe elimination of reagents, microorganisms, cells and nanomaterials.
30. Work correctly with the formulas, chemical equations and magnitudes used in chemistry.

Content

Theory program*

Microbiology

Introduction to microbiology
Levels of organization
The bacterial cell
Techniques of observation of microorganisms
Isolation and culture techniques of microorganisms
Techniques of sterilization and conservation of microorganisms

Immunology

Basic principles of immunology: innate immunity and acquired immunity. The immune system: anatomy, cells and molecules

Components of innate immunity. Mechanisms of innate immunity. Connection between innate and acquired immunity
Components of acquired immunity. Mechanisms of acquired immunity. Immune response to pathogens
Immunopathology. Pathologies of the immune system. Pathologies that affect the immune response
Technologies related to the immune response. Immunotherapy and immunomotion

Cell cultures

Introduction to cell cultures
Laboratory of cell cultures
Types of cell cultures
Techniques of cellular characterization
Light and fluorescent microscopy

Laboratory program*

Microbiology

Module 1: Counting of microorganisms

Module 2: Methods of isolation of microorganisms

Module 3: Observation of microorganisms

Module 4: Identification of microorganisms

Module 5: Ubiquity and microbial diversity

Immunology

Module 6: Separation of cells from the blood by Ficoll

Module 7: Analysis of cell populations by cytometry

Module 8: Immunocytochemistry for the detection of specific markers with a monoclonal antibody

Cell cultures

Module 9: Culture of a cell line.

Module 10: Freezing / defrosting of a cell line

Module 11: Induction anddetection of apoptosis in a cell line

Module 12: Detection of microtubules by immunocytochemistry. Evaluation of the phases of the cell division

Module 13: Use of nanoparticles for cell follow-up. Confocal microscopy

*Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents.

Methodology

The subject of Microbiology, Immunology and Cell culture consists of theoretical master classes and practical classes in the laboratory*.

Theoretical lectures will be made using audiovisual material prepared by the teacher, material that the students will have at their disposal in the Virtual Campus of the UAB before the sessions.

The practical classes are designed so that the students learn to use the instrumental laboratory and complement the theoretical training. The students will complete a total of 13 practical sessions with a total of about 38 hours. Students will work in groups of 2, and at the end of each practice they will have to complete a dossier with the results. These dossiers will remain in the possession of the teaching staff and will be used for the evaluation of the practical part. At the end or during the practice session the results of the different groups will be shared and will be discussed collectively.

The students will have to submit a dossier of the practices.

*The proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory classes	38	1.52	3, 14, 9, 10, 12, 23, 22, 26, 15, 16, 19, 17, 21, 4, 24, 29, 8
Theoretical classes	38	1.52	27, 7, 6, 11, 26, 19, 20, 28
Type: Supervised			
Personalized tutorials	6	0.24	1, 3, 14, 19

Type: Autonomous			
Individual study	105	4.2	1, 13, 27, 14, 26, 15, 16, 19, 20, 21, 28
Preparation of the laboratory report	4.5	0.18	13, 3, 14, 15, 16, 19, 21

Assessment

The subject of MICC (Microbiology, Immunology and Cell Cultures) is made up of three blocks. In order to pass the subject, a minimum score of 5 on a maximum of 10 points is required in each of the three blocks (M, I and CC). Each block consists of a part of theory and a part of practices, which represent 75% and 25% respectively, of each block. In order to pass the subject the student must obtain a mark equal to or greater than 5 in the three blocks of theory (M, I and CC) and in the three blocks of practicals (M, I and CC)*.

The scheduled evaluation activities are:

THEORY:

There will be an independent examination of each of the three blocks of the subject. Each of these exams will have a weight of 25% of the final grade. To overcome them, the grade must be equal to or greater than 5. Marks lower than 5 in one of the blocks will automatically imply a fail in the block and therefore the student will have to retake the subject of the block failed in a retake exam . In this retake exam, again, each block will be evaluated separately and in order to pass the subject the student will have to obtain a grade equal to or greater than 5 in each one of the blocks to retrieve.

LABORATORY PRACTICES:

The practical grade will be obtained from an independent examination for each one of the blocks. In the blocks of Microbiology and Cell Culture in addition to the examination will evaluate the delivery of a dossier of practices. Attendance to practical sessions is mandatory. Students missing more than 20% of programmed sessions will be graded as "No Avaluable"

Each block will be evaluated separately and in order to pass the block the student must obtain a mark equal to or greater than 5 in each one of the examinations of the blocks. Marks lower than 5 in one of the blogs will automatically imply a fail in the blog and the student will have to retake the subject of the block failed in a retake test. Again, each block will beevaluated separately and in order to pass the subject the student will have to obtain a score equal to or greater than 5 in each one of the blocks to retake.

The note of each block will have a weight of 8.33% of the final mark and will be obtained from:

- Microbiology: written exam about the work done in the laboratory. These tests will weight 100% of the grade in this block.

- Immunology: written exam about the work done in the laboratory. These tests will weigh 100% of the grade in this block.

- Cell cultures: a) delivery and discussion of the different results obtained in the practices in power point format (dossier) and b) written exam about the work done in the laboratory. These tests will have a weight of 40 and 60%, respectively, of the grade in this block.

RECOVERY EXAM:

To be eligible for the retake process, the student should have been previously evaluated in a set of activities equaling at least two thirds of the final score of the course or module. Thus, the student will be graded as "No Avaluable" if the weighthin of all conducted evaluation activities is less than 67% of the final score

Students who have not passed one or more of the blocks of the theory exams and / or practices, or not if they have submitted, must present themselves to the retake exam.

To pass the retake exam, students must have a grade equal to or greater than 5 in each one of the blogs examined.

FINAL NOTE: The final grade of the subject will be obtained from the one of the following formula,

FINAL NOTE = [Theory (M + I + CC / 3) * 0.75] + [Practices (M + I + CC / 3) * 0.25]

Students who in any of the blocks of theory and / or practice have a score of less than 5 will have the subject failed.

Non-Valuable: Students will obtain the "Non-Valuable" qualification when the assessment activities carried out have a weighting ofless than 67% in the final grade.

*Student's assessment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Delivery of practical laboratory results	3,5%	0.5	0.02	1, 13, 27, 3, 25, 14, 9, 12, 2, 26, 15, 16, 18, 19, 17, 21, 5, 28
Laboratory exam	18%	3	0.12	27, 19, 20
Laboratory results	3,5%	1	0.04	3, 25, 9, 10, 12, 23, 22, 2, 15, 16, 18, 19, 21, 30, 4, 24, 29, 8
Theory exam	75%	4	0.16	27, 7, 6, 11, 19, 20, 28

Bibliography

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