Laboratory I

Code: 101907
ECTS Credits: 6

2024/2025

Degree	Type	Year
2501230 Biomedical Sciences	OB	1

Contact

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Teachers

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Teaching groups languages

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

Prerequisites

There are no official requirements, but is advisable that students hold sufficient knowledge of the following areas.

1) Biology, mainly human.

2) Organic and inorganic chemistry.

3) The official languages of the UAB.

Objectives and Contextualisation

The subject "Laboratori I" in the 1st course of the Degree develops the foundations of the more basic techniques in biomedical research. The subject is formed by eight independent areas or modules, being the ECTS allocated as follows:

1.- Bioquímica I (1 ECTS).

2.- Bioquímica II (1 ECTS)

3.- Genètica (1 ECTS).

4.- Biologia cel·lular (1 ECTS).

5.- Histologia (0.5 ECTS).

6.- Fisiologia (0.5 ECTS).

7.- Microbiologia i virologia (0.5 ECTS).

8.- Bibliografia biomèdica (0.5 ECTS).

This subject is followed in the 2nd course by the subject "Laboratori II", also allowing a better understanding of other subjects with a high experimental content, such as Pharmacology o Molecular Biology of the Cell.

Subject aims:

1) To identify the main basic experimental techniques used in every one of the aforementioned modules.

2) To apply the acquired knowledge in the planning and implementation of research projects, as well as in the development and innovation in a Clinical or Biomedical laboratory. To identify and to apply the correct study methodologies in the development of research projects. To plan and implement experiments and procedures of analyses in the biomedical field.

3) To demonstrate that the bases and the elements used in the development and validation of techniques of diagnoses and therapeutics are known. To identify and critically evaluate methodologies for the experimental study of diseases.

4) To correctly use the security protocols in the laboratory, as well as the residues management.

5) To be competent in the use of the basic information sources used in science: to correctly identify accredited information sources, to learn to correctly cite works and to evaluate the impact of the publication.

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Apply knowledge acquired to the planning and implementation of research, development and innovation projects in a biomedical research laboratory, a clinical department laboratory or the biomedical industry.
- Display knowledge of the bases and elements applicable to the development and validation of diagnostic and therapeutic techniques.
- Display knowledge of the basic life processes on several levels of organisation: molecular, cellular, tissues, organs, individual and populations.
- Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
- Read and critically analyse original and review papers on biomedical issues and assess and choose the appropriate methodological descriptions for biomedical laboratory research work.
- Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
- Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
- Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.

- 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.
- Work as part of a group with members of other professions, understanding their viewpoint and establishing a constructive collaboration.

Learning Outcomes

1. Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
2. Correctly use protocols for laboratory safety and waste management.
3. Describe the fundamental principles of analytical methodology used in the diagnosis of diseases.
4. Identify and apply suitable functional study methodologies for the development of research projects.
5. Identify and critically evaluate methodologies for the experimental study of diseases.
6. Identify the different components of the immune system: molecules, cells and organs.
7. Identify the principal experimental techniques in cell and molecular biology, genetics and immunology.
8. Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
9. Relate the behaviour, structure and function of chromosomes to human pathology.
10. Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
11. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
12. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
13. Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
14. Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
15. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
16. Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
17. Understand techniques of amplification, restriction and hybridation of nucleic acids.
18. Understand the diagnostic techniques based on immunological methods.
19. Understand the processes of genetic manipulation.
20. Understand the techniques for obtaining and observing DNA, chromosomes, proteins, cell organelles and cells.
21. Use immunological techniques.
22. Use optical and electronic microscopy to identify cell types, their components and their principal characteristics.
23. Use procedures for analysing the structure, properties and function of cellular molecules and organelles.
24. Use procedures of organic synthesis, purification, identification and quantification of biologically active compounds, biomolecules and cell organelles.
25. Work as part of a group with members of other professions, understanding their viewpoint and establishing a constructive collaboration.

Content

"Laboratori I" consists in Laboratory or classroom work applicable at any biomedical research issue which a future Graduate in Biomedical Sciences can found:

Biomedical Bibliography Module (0.5 ECTS):

1.- UAB libraries search engine.

2.- Information sources in Biomedicine.

3.- Bibliographic citations.

4.- Copyright.

Biochemistry Module I (1 ECTS):

1. Determination of glucose concentration by a colorimetric methods.

2. Preparation of buffer solutions.

3. Gel-filtration chromatography.

4. Process of Expression and Purification of a heterologous protein.

5. Determination of protein concentration by a colorimetric methods.

6. Separation of proteins by SDS-electrophoresis.

Cell Biology Module (1 ECTS):

1.- Introduction to the optical microscope.

2.- The plant cell.

3.- The animal cell.

4.- Introduction to the electron microscope.

5.- Osmosis and simple diffusion.

6.- Mitotic and meiotic cell division.

7.- Cellular fragmentation and organelle isolation.

8.- Basic cell culture techniques: counting and viability assays.

Genetics Module (1ECTS):

1. Observations in human chromosomes.

2. Observations of wing mutations in D. melanogaster.

<spanlang="EN-US">3. Determination of a genetic map.

4. Determination of genetic variability.

Module Virology and Microbiology (0.5 ECTS):

1. Techniques of sterilization.

2. Preparation of culture media.

3. Methods of microorganism counting.

4. Methods of conservation and isolation of microorganisms.

5. Observation of microorganisms. Staining and motility.

6. Identification of microorganisms.

Histology Module (0.5 ECTS):

Practice 1: To learn histological techniques from animal sources. Microscopic identification of epithelial, conjunctive, adipose, cartilaginous and bone tissue.

Practice 2: Obtaining and staining of blood smears. Microscopic identification of blood elements and of the nervous and muscular origin.

Physiology Module (0.5 ECTS):

Practice 1: Nerve impulses in the peripheral nerves.

To learn instruments and techniques in the study of the conduction of impulses from peripheral nerves.

-Learn the meaning of the functional electrophysiological records in the sensory nerves.

-To observe variations in the speed of nerve conduction with body temperature.

-To check the existence ofrefractory periods in the production of the nerve impulses.

-To calculate and interpret thebasic parameters of the electrophysiological recordings in the peripheral nervous system.

Practice 2: Neuromuscular Function.

-To get tension recordings of contractile skeletal muscle.

-To observe the summation of contractions with repeated stimulation.

To demonstrate from appearing muscle fatigue with repeated contraction.

Biochemistry Module II (1 ECTS):

1. Determination of transaminases in liver and in serum.

2. Introduction to bioinformatic analysis of proteins and their ligands.

3. Introduction to Mass Spectrometry and Proteomics.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory classes	97	3.88	19, 17, 20, 18, 3, 6, 4, 5, 7, 13, 12, 9, 25, 22, 2, 23, 24, 21
Type: Supervised			
Tutorship	4.5	0.18	1, 25
Type: Autonomous			
Preparation of questionnaires, reports and panels.	25.5	1.02	1, 16, 15, 19, 17, 18, 6, 5, 14, 13, 12, 10, 11, 25

Study	15	0.6	1, 16, 15, 19, 17, 20, 18, 6, 14, 13, 12, 10, 11, 25

The center of the learning process is the work of the student, structured basically in practical classes. The student learns to work, being the mission of the teacher to help him in this task by providing information or showing the sources where it can be achieved and directing his steps so that the learning process can be carried out effectively. If this is true for any subject, in a fully practical one as "Laboratory I" is not only valid, but the work of the student happens a basic need for the existence of the subject in real time.

At the beginning of each semester the student receives a dossier or script with the practical work that will have to develop in that semester. In general, students have to carry out the experimentation indicated in the script, following the initial instructions provided by the teachers. Once the results are obtained, the results will be shared, discussing both the point of view of the experimental base and the biological context of the results obtained. In this part, or in any other that is considered opportune, it will be possible to carry out small seminars on the technique of interest. The seminars have a double mission. On the one hand the scientific-technical knowledge obtained in the practical classes is worked, to complete their understanding and to deepen in them developing diverse activities, from the typical resolution of problems to the discussion of practical cases. On the other hand, seminars are the natural forum in which to discuss in group the development of practical work, providing the necessary knowledge to bring it forward, or indicating where and how they can be acquired. The mission of the seminars is to promote the capacity for analysis and synthesis, critical reasoning, and problem-solving ability, beyond the simple realization of an experimental protocol.

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
Assessment of attitude and responsibility.	10%	0	0	1, 16, 25, 2
Reports and questionnaires in each of the modules.	90% (total of the sum of each evaluation of each module according to their proportional weight)	8	0.32	15, 19, 17, 20, 18, 3, 6, 4, 5, 7, 8, 14, 13, 12, 10, 11, 9, 25, 22, 2, 23, 24, 21

The subject Laboratory 1 is divided into eight Modules: Biomedical Bibliography (BB), Biochemistry 1 (BQ1), Biochemistry 2 (BQ2), Cell Biology (BC), Genetics (G), Microbiology and Virology (MV), Histology (H) and, finally, Physiology (F). Each one of these Modules is evaluated independently.

To be able to attend lab sessions, the student must prove that has passed the biosafety and safety tests that can be found in the Moodle of the Faculty and be aware of and accept the operating rules of the UAB and the laboratories of the Faculty of Biosciences.

The evaluation of each one of the modules of this subject can include different written tests, the laboratory work and / or the elaboration of different types of works, according to the decision of the responsible teachers of each Module.

Given that attendance at scheduled activities in these subjects is mandatory, the absence of any of them must be justified. In order to pass the subject, a global attendance of at least 75% of the sessions programmed in each Module is required, as well as the minimum qualification set for each Module. A student will be considered "Not Evaluable" when he or she has attended less than 20% of the scheduled sessions.

To pass the subject it will be necessary that the final grade of the subject is equal to or greater than 5. This final grade will be the weighted average of the final marks of each module, as long as the mark of each module is equal to or greater than 4, according to the following formula:

Note Lab 1 = ((BBx0.5) + (BQ1) + (BQ2) + (BC) + (G) + (MVx0.5) + (Hx0.5) + (Fx0.5)) x 1/6

Students who do not obtain the minimum qualification required to pass each of the Modules will not pass the subject. In this case, the maximum final grade of the subject will be a 4. After the second registration, the repeating students will only have to evaluate the specific Modules that were not previously passed. There is no possibility for improving grades, except in the case of repeaters.

This subject does not provide for the single evaluation system, given its exclusively practical typology.

Bibliography

Basic General Bibliography:

1) Practical Approach Series (Enzyme assays, Basic cell cultures, Human cytogenetics, Gel electrophoresis, etc.). 2000-2002, Oxford University Press.

2) Aula Virtual de l'Autònoma Interactiva: https://cv2008.uab.cat

This and many other bibliography, as well as information on UAB libraries, can be found in telematic form in the next links:

https://mirades.uab.cat/ebs/

https://ddd.uab.cat/record/22492

Software

1.- Microsoft Teams

2.- https://www.cgl.ucsf.edu/chimerax/

Language list

Name	Group	Language	Semester	Turn
(PLAB) Practical laboratories	511	Catalan/Spanish	annual	morning-mixed
(PLAB) Practical laboratories	512	Catalan/Spanish	annual	morning-mixed
(PLAB) Practical laboratories	513	Catalan/Spanish	annual	morning-mixed