Universitat Autònoma de Barcelona

2021/2022

Integrated Laboratory Class 6

Code: 100923
ECTS Credits: 3

Degree	Type	Year	Semester
2500253 Biotechnology	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

Name: Maria Plana Coll
Email: Maria.Plana@uab.cat

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

Margarida Julia Sape

Escarlata Rodriguez Carmona

Carme Roura Mir

Prerequisites

443/5000

You must be attending simultaneously or have taken the theory subjects corresponding to the contents of the practices:

Bioinformatics

Immunology

Advanced Experimental Techniques

Virology

To be able to attend it, it is necessary for the student to justify having passed the biosafety and security tests that he will find in the Virtual Campus and be knowledgeable and accept the operating regulations of the laboratories of the Faculty of Biosciences.

Objectives and Contextualisation

The Integrated Laboratory 6 is the last subject of a group of 6 that are distributed over the 6 semesters corresponding to the first three years of the Degree in Biotechnology.

The training objectives of these subjects focus on the acquisition of competences within the framework of the practical training of the student.

The contents are organized in a growing order of complexity and associated to the needs and progress of the theoretical contents of the Degree.

The Integrated Laboratory 6 has as its training objectives the acquisition of practical skills in 4 specific contents:

- Bioinformatics

- Immunology

- Advanced Instrumental Techniques

- Virology

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.
- Design continuation experiments for problem solving.
- Interpret experimental results and identify consistent and inconsistent elements.
- Lead and manage teams, and develop capacities for organisation and planning
- Learn new knowledge and techniques autonomously.
- Make decisions.
- Obtain information from databases and use the software necessary to establish correlations between the structure, function and evolution of macromolecules.
- Search for, obtain and interpret information from the principal databases on biology, bibliography and patents and use basic bioinformatic tools.
- Think in an integrated manner and approach problems from different perspectives.
- Use ICT for communication, information searching, data processing and calculations.
- Use analytical methodologies for assaying the biological activity of cellular components, especially enzymes, both in vitro and in vivo.
- Work individually and in teams

Learning Outcomes

1. Apply the different waste disposal processes correctly.
2. Apply the fundamental techniques used in the analysis, purification, and characterisation of biomolecules.
3. Apply the general safety rules in place in a a biotechnology laboratory.
4. Apply the principles of sterility to processes of manipulation and counting of microorganisms.
5. Describe the theoretical grounding and apply the appropriate techniques for the structural and functional characterisation of proteins and nucleic acids.
6. Design continuation experiments for problem solving.
7. Extract complementary information from databases to support the analysis of results and the writing of reports on experiments.
8. Interpret experimental results and identify consistent and inconsistent elements.
9. Isolate cell populations of the immune system in density gradients, and interpret flow cytometry experiments for their identification.
10. Lead and manage teams, and develop capacities for organisation and planning
11. Learn new knowledge and techniques autonomously.
12. Make decisions.
13. Think in an integrated manner and approach problems from different perspectives.

14. Use ICT for communication, information searching, data processing and calculations.
15. Use ICT tools to compare sequences and calculate kinetic parameters.
16. Use basic techniques of immunodetection.
17. Use the appropriate methodology for studying the different types of biological samples.
18. Use the basic techniques for analysing enzyme activity.
19. Use the basic techniques for handling, separating, detecting and analysing proteins and nucleic acids.
20. Use the basic techniques for manipulating, identifying, observing through a microscope and counting viruses.
21. Use the basic techniques for preparing and observing samples with an optical microscope and an electron microscope.
22. Use the different ICT tools to ascertain the properties and structures of proteins.
23. Use the techniques for cultivating prokaryote and eukaryote cells and for manipulating biological systems.
24. Work individually and in teams

Content

The subject is structured in 4 types of contents:

Bioinformatics

3 sessions of 4 hours, in principle, in the computer room.

The student will carry out a miniproject that will consist of discovering a new gene, and characterizing it, using bioinformatics tools. As a "new gene", we understand one that has not been previously annotated.

The student will have to put into practice the knowledge acquired in the subject of Bioinformatics, for example: study of the characteristics of the starting protein, database searches, and advanced BLAST searches, multi-alignments and phylogenetic trees, prediction of Three-dimensional structure, study of domains, comparison and structural classification

Immunology

3 4-hour sessions in the laboratory that will include the following analyses:

1. Separation of mononuclear cells with density gradient.
2. T-cell proliferation test and analysis by flow cytometry
3. Precipitation and agglomeration of serum immunoglobulins.
4. Quantification of human immunoglobulins by Elisa.
5. Analysis of the premium system's lytic function (calculation CH50)

Advanced Instrumental Techniques

3 sessions of 4 hours, two are on the laboratory and the last one at the computers room.

Session 1: Microscopy

Session 2: Plasmid transformation

Session 3: Cytometry

Session4 : Calculation of Minimum inhibitory Concentration (MIC)

Session 5: Computer session: Results analysis: ImageJ and Flowing Software

Session 3:

Titration of tyrosine of a protein

Study of the interaction of DNA with the bromide of ethid by means of spectrofluorimetry.

Quantitative PCR: theoretical and practical foundation, analysis of results, obtaining a fusion curve and calculation of the amplicon Tm.

Virology

4 sessions of 3 hours (from mondays until thursdays) and one session of 4 hours (on friday inluding a seminar of presentation and analysis of the results) that are made at the laboratory.

Quantification and inactivation by temperature of viral suspensions.

Obtaining viral lysates: infection and amplification.

Detection of viruses in wastewater: purification of viral genomes and virus identification by specific amplification of viral genes.

Neutralization of virus by antibodies.

Observation of viruses by transmission electron microscopy.

Approach and execution of a practical problem.

For safety reasons, these practices are carried out with bacteriophages, which can not infect or transduce mammalian cells, and with non-infectious viral nucleic acids. All material delivered to students is free of viruses that can infect or transduce mammals. In any case, the basic techniques of manipulation in a Virology laboratory are comparable to those used when working with bacterial viruses or eukaryotic viruses and, therefore, the proposed objectives can be perfectly achieved.

Methodology

The attendance to the classes of this subject is obligatory since they imply an acquisition of competitions based on the practical work.
The students are divided into 4 practice groups.
Bioinformatics
The sessions will be taught in the computer room.
For the accomplishment of the practices the students will work in pairs under the supervision of the responsible professor.
During the three practical sessions, the resolution of the proposed miniproject will be made where the student will have to apply the tools used in the Bioinformatics subject to the discovery and characterization of an unnamed protein. In the resolution of this case, the student is expected to be able to correctly use the computer tools he knows, ask himself the right questions, prepare a work script and, finally, make a compilation presentation on power point of the information found, along with its interpretation.
Immunology,
Advanced experimental techniques and
Virology
Practical classes of laboratory and data analysis.
The students carry out the experimental work in groups of 2-3 students and under the supervision of the responsible professor.
The practical protocols and, where appropriate, the questionnaires for response, will be available in the Moodle classroom of the subject
Before beginning a practical session the student must have read the protocol and know therefore the objectives of the practice, the foundations and the procedures that must be carried out.
You must have passed the safety and biosecurity test at the laboratory.

In the practical sessions you have to take:
- Protocol and, if applicable, the questionnaire.
- A notebook to collect the information of the experimental work.
- Laboratory baton.
- Safety glasses.
- Permanent marker
- Calculator.
The calendar of internships can beconsulted on the web page of the Faculty of Biosciences.
The distribution of the students in the groups of practices can be consulted in the Space of the Degree in Biotechnology in the Virtual Campus.

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			
supervised	52	2.08	11, 1, 4, 14, 3, 2, 9, 5, 6, 7, 8, 10, 13, 12, 24, 17, 16, 22, 15, 18, 20, 19, 21, 23
Type: Autonomous			
Presentations	7.5	0.3	11, 14, 7, 8, 10, 24
Study	6	0.24	11, 8, 13, 24
results analysis and resolution of questionnaires	7	0.28	11, 14, 5, 7, 8, 13, 24

Assessment

Bioinformatics
The evaluation will be done through the delivery through Moodle of the results obtained. The format will be presented in PowerPoint. The deadline for delivery will be at the end of the last practice session. This powerpoint presentation will allow you to obtain a 25% of the final mark of the subject. This work will be presented to classmates the last day of class in a brief presentation (5-10 min). This oral presentation will allow you to obtain a 20% of the final mark of the subject. 5% of the final mark of the subject will be obtained from the peer evaluation of the submitted work.

Immunology

The evaluation is based on three criteria: 1) Individual resolution of a written questionnaire with multiple choice questions and development questions (17.5% of the overall course score), which will be performed once all lab sessions are completed, in a single test for all students, 2) a report (maximum length of a page) on one of the practices in which are described , analyzed and discussed the results obtained (5% of the overall degree of the course). This report must be delivered within 10 days after the last lab session and 3) The student's attitude and work in lab sessions (2.5% of the overall grade of the subject).

Advanced instrumental techniques.

The assessment will be done by means of the resolution of a report that the student must give to the teacher, no later than 15 days after completing the sessions, (20% of the overall grade of the subject) also the attitude of work will be evaluated (5% of the overall grade of the subject).

Virology

The assessment involves two activities: an individual written test (18% of the overall grade of the subject) and an oral presentation of an experimental section in which the content and organization of the exhibition, the quality of the slides and the quality of the communication will be evaluated (7% of the overall grade of the subject).

Global assessment of the subject.

Attendance to the activities programmed in the Integrated Laboratories courses is mandatory. Absence at any of the sessions must be justified. Absences may not exceed 20% of the programmed activities. To pass the subject, you must obtain a final grade equal to or greater than 5 and obtain a minimum grade of 3.5 in each group of contents. Students who do not attain the minimum qualification in one or more of the groups of contents will receive a maximum final grade of the subject of 3.5 points out of 10.

It will be considered that a student obtains the non-evaluable qualification when he has attended less than 20% of the programmed sessions.

Repeat students will only have to perform and be evaluated of the groups of contents that had not been exceeded in the first enrollment (<4). For groups of content passed, the note will be saved for a maximum of three registrations

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Advanced Instrumental Techniques. Solution of the questionnaire and work in the laboratory	25%	0	0	11, 1, 14, 3, 2, 5, 6, 7, 8, 10, 13, 12, 24, 17, 18, 19
Bioinformatics: power point presentation and work in the classroom	25%	0	0	11, 14, 7, 8, 10, 13, 24, 22, 15
Immunology. Resolution of the questionnaire, report and work in the laboratory.	25%	1	0.04	9, 6, 8, 13, 12, 24, 16, 21, 23
Virology Written test quiz questions and oral presentation	25%	1.5	0.06	1, 4, 14, 3, 2, 7, 8, 24, 17, 15, 20, 19, 21, 23

Bibliography

Virology

Bibliography and web links are indicated in the practice protocols or, where appropriate, in the Teaching Guide of the corresponding theory subject.

A. Granoff and R.G. Webster. Encyclopedia of virology (on-line Ed.) Academic Press. London.

(http://www.sciencedirect.com/science/referenceworks/9780123744104)

Cann, Alan J. 2015. Principles of molecular virology. 6th ed. ISBN 9780128019467. Elsevier Academic Press (https://cataleg.uab.cat/iii/encore/record/C__Rb1949706)

Encyclopedia of virology [Recurs electrònic] / editors in chief B.W.J. Mahy and M.H.V. van Regenmortel Llibre digital a la UAB

(https://www-sciencedirect com.are.uab.cat/referencework/9780123744104/encyclopedia-of-virology)

For other modules bibliography is included in the practice protocols.

Software

Programas:

Jalview: https://www.jalview.org/

MEGA X: https://www.megasoftware.net/

Notepad++: https://notepad-plus-plus.org/downloads/ç

Icn3d: https://www.ncbi.nlm.nih.gov/Structure/icn3d/icn3d-3.2.0.zip

PyMol: https://pymol.org/2/

Páginas web y Webservers:

https://www.ncbi.nlm.nih.gov/

https://services.healthtech.dtu.dk/

https://www.expasy.org/

https://bio.tools/

https://www.ebi.ac.uk/services

Immunology

It is not necessary to use specific programs in this subject.

Virology

It is not necessary to use specific programs in this subject.

Advanced Instrumental Techniques

Image J: https://imagej.nih.gov/ij/

Flowing Software: https://bioscience.fi/services/cell-imaging/flowing-software/