

## 27107 - Instrumental Techniques in Biotechnology

### Syllabus Information

**Academic year:** 2023/24

**Subject:** 27107 - Instrumental Techniques in Biotechnology

**Faculty / School:** 100 - Facultad de Ciencias

**Degree:** 446 - Degree in Biotechnology

**ECTS:** 9.0

**Year:** 2

**Semester:** Annual

**Subject type:** Compulsory

**Module:**

### 1. General information

The subject Instrumental Techniques in Biotechnology is a compulsory subject of the fundamental module of the degree in Biotechnology that aims to provide students with basic experimental training in a series of methodologies used in the study and manipulation of biomolecules. It is structured in 5 sections: Analytical (15%), carbohydrates (15%), lipids (15%), nucleic acids (10%) and proteins (45%).

Its approach and objectives are aligned with the Sustainable Development Goals (SDGs) of the United Nations Agenda 2030 (<https://www.un.org/sustainabledevelopment/es/>), specifically the acquisition of the intended learning results in this subject provide training and competence to contribute to the achievement of SDG 3, SDG 5, SDG 6, SDG 10 and SDG 12.

### 2. Learning results

- To apply basic techniques in a biotechnology laboratory.
- To understand the physicochemical and biological fundamentals of these techniques.
- To be organized in the laboratory in the handling and execution of these techniques.
- To prepare a laboratory notebook with the results and incidents that occur on a daily basis.
- To plan simple tasks in the laboratory.
- To interpret and discuss the results obtained in the laboratory in biological terms.
- To respect and apply safety standards in a biotechnology laboratory.
- To analyse and present in public the experimental results obtained.
- To work as a team sharing material prepared in the laboratory and knowledge with the other students.

### 3. Syllabus

The program consists of 20 sessions:

1. Laboratory safety. PH measurement.
2. Quantification of biomolecules. UV-visible spectroscopy.
3. Applied high pressure liquid chromatography (HPLC).
- 4-6. Lipids: extraction (Folch's method), thin layer separation, gas chromatography of methyl esters.
- 7 and 8. Sugars: separation of glycoproteins by affinity chromatography and characterization by double immunodiffusion and non-denaturing electrophoresis.
9. Determination of sugars.
- 10 and 11. Nucleic acids: collection and characterization.
- 12-14. Protein isolation: fractionation, ion exchange and affinity chromatography.
15. Determination of enzymatic activity.
16. Protein quantification. Bradford method.
17. Determination of,  $k_{cat}$  and catalytic efficiency of an enzyme.
- 18 and 19. Denaturing electrophoresis and electrotransfer.
20. Resolution of questions and calculations. Preparation of reports.

### 4. Academic activities

**Laboratory practices:** 80 hours

Practical work in the laboratory that is developed after a theoretical introduction to the techniques used during the session.

**Presentation and discussion of results:** 8 hours

Interpretation, oral presentation, discussion and defence of the results.

**Tutored seminars:** 2 hours

Preparation of presentations and reports.

**Personal study:** 135 hours**Assessment tests.** 6 hours

## 5. Assessment system

Independent evaluation of **practical work (maximum 4 points)** and **knowledge of the techniques studied (maximum 6 points)**. The final grade will be the sum of both grades, provided that 50% of the maximum grade is reached in each of them. Otherwise, the lowest grade obtained will appear in the official records.

**Assessment of practical work of each section:**

15% Analytical, 15% Carbohydrates, 15% Lipids (**maximum 0.6 points each section**), 10% Nucleic acids (**maximum 0.4 points**) and 45% Proteins(**maximum 1.8 points**). All sections will be evaluated:

- Laboratory: Individual laboratory work (50%).
- Presentation of results and reporting: Assessment in pairs (20% and 30%, respectively).

The completion of practices, presentation of reports and presentation of results is mandatory. If this requirement is not met, a practical laboratory exam must be passed.

**Assessment of the studied techniques**

There will be two midterm exams. The final grade in the two exams will be the sum of both midterm exams, in proportion 55% first and 45% second, provided that for each of them the grade is equal to or higher than 5 points out of 10.

First midterm (Analytical, Carbohydrates, Lipids, Nucleic Acids): If the grade is equal to or higher than 5 points (on 10) eliminates subject matter, if the student fails this midterm, the call is not used up.

Second midterm exam (Proteins): If the grade is equal to or higher than 5 points (out of 10) it is not necessary to repeat it in the second call.

The tests will consist of questions and exercises to be answered in a justified manner and/or single-answer multiple-choice questions.