

27107 - Instrumental Techniques in Biotechnology

Syllabus Information

Academic Year: 2019/20

Subject: 27107 - Instrumental Techniques in Biotechnology

Faculty / School: 100 -

Degree: 446 - Degree in Biotechnology

ECTS: 9.0

Year: 2

Semester: Annual

Subject Type: Compulsory

Module: ---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. It is based on the attendance and understanding of the practical classes, in which the teacher will inform the student about the content of the subject. The theoretical knowledge necessary for the understanding of the tasks to be performed will be presented and the student will carry out these tasks in a supervised manner.

Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other course-specific learning materials.

Further information regarding the course will be provided on the first day of class.

4.2.Learning tasks

This is a 9 ECTS course whose learning process has been designed based on the following learning activities:

- Learning activity 1: Acquisition of the basic knowledge of the subject through practical classes in small groups.
Methodology:
 - 1.1.- Theoretical introduction to the techniques used.
 - 1.2.- Practical work in the laboratory.
- Learning activity 2: Development of the knowledge acquired. Methodology:

- 2.1.- Interpretation, discussion and oral presentation of the results obtained.
- 2.2.- Resolution of problems and practical cases related to the practical work done in the laboratory.
- 2.3. Preparation and presentation of reports (written and oral).

4.3.Syllabus

The course will be developed in 19 practice Topics (4 hours each), plus a seminar Topic of two hours and two Topics of presentation and discussion of results (4 hours each).

AREA OF ANALYTICAL CHEMISTRY

- Topic 1. Laboratory safety. Concentration of a solution. pH measurement, buffers and buffer power.
- Topic 2. Application of UV-visible spectroscopy to biomolecule quantification. Beer-Lambert law and extinction coefficient. Measurement of iron concentration by complexing with thiocyanate
- Topic 3. Principles of molecular fluorescence. Structural studies on proteins and monitoring of enzymatic reactions.
- Seminar. Statistical treatment of quantitative results obtained in the laboratory.

AREA OF BIOCHEMISTRY AND MOLECULAR BIOLOGY

- Topic 1. General Theory of lipids. Extraction of total lipids by the Folch method.
- Topic 2. Thin layer chromatography applied to the separation of lipids. Preparation of fatty acids methyl esters.
- Topic 3. Thin layer chromatography of phospholipids. Introduction to gas chromatography. Data interpretation of gas chromatograms of methyl esters.
- Topic 4. Glycoproteins separation by affinity chromatography. Characterization by double immunodiffusion of the separated fractions (Ouchterlony).
- Topic 5. Neuraminidase treatment: electrophoresis analysis.
- Topic 6. Determination and characterization of sugars in a sample.
- Topic 7. Preparation, interpretation, presentation and discussion of results obtained in Topics 1-6.
- Topic 8. Nucleic acids preparation.
- Topic 9. Separation of nucleic acids by agarose gel electrophoresis. Nucleic acids detection and quantification. Assessment of the purity of the preparation.
- Topic 10. Introduction to protein purification. Isolation and characterization of proteins. Homogenization of tissues or cells. Enrichment by fractional precipitation.
- Topic 11. Dialysis and preparation of columns for the separation of proteins by ion exchange and affinity chromatographies.
- Topic 12. Protein separation by column chromatography. Protein quantitation by spectroscopic methods. Purity criteria.
- Topic 13. Determination of specific enzyme activity throughout the various purification steps of an enzyme.
- Topic 14. Quantitation of total protein by the method of Bradford. Determination of purification yield and yield.
- Topic 15. Determination of the kinetic parameters of an enzyme: K_m and k_{cat} .
- Topic 16. Denaturing electrophoresis on polyacrylamide gels (PAGE). Electroblothing: theoretical introduction and preparation of gels
- Topic 17. A) Electrophoresis applied to samples taken at different steps of purification as a criterion of purity and molecular weight determination. B) Electroblothing to PVDF membranes: sample preparation for sequencing the N-terminus.
- Topic 18. Data analysis from protein purification and characterization Topics (computer room).
- Topic 19. Presentation of the results obtained in the purification and characterization of proteins processes (Topics 10-18), class discussion and resolution of issues.

4.4.Course planning and calendar

For each of the sessions in the various areas students will be divided into 4-5 groups depending on the needs of each practice and the availability of laboratories. The sessions will take place in the morning, from 9 to 13h.

Schedules of lectures and problems will coincide with the officially established and will be available at: <https://ciencias.unizar.es/grado-en-biotecnologia>.

The places, calendar and groups for training and practical sessions will be established in coordination with the rest of the subjects at beginning of course. The Coordinator will produce the groups of students for these activities at beginning of course to avoid overlaps with other subjects.

The distribution of the practices assigned to each area involved in teaching will be done considering that the theoretical basis for understanding the processes that are to be analyzed will have been explained in the first quarter or will be studying at the same time in the annual subject of Biochemistry and Molecular Biology. During the first quarter, the practices assigned to the area of Analytical Chemistry and practices of carbohydrates, lipids and nucleic acids assigned to the area of Biochemistry and Molecular Biology will be developed. In the second quarter, the practices concerning the purification and characterization of proteins, also assigned to the area of Biochemistry and Molecular Biology, will be developed

For students enrolled in the subject, places, times and dates of lectures and practical sessions will be public via Bulletin Board advertisements of the grade on the platform Moodle at the University of Zaragoza, <https://moodle2.unizar.es/add/>, and in the moodle page for the course. These routes will be also used to communicate enrolled students their distribution by groups of practical sessions, which will be organized by the coordination of degree. Provisional dates will be available on the website of the Faculty of Sciences in the corresponding section of the Degree in Biotechnology: <https://ciencias.unizar.es/grado-en-biotecnologia>.

In this web there will be also available the dates of exams.

4.5. Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=27107&year=2019