Universidad Zaragoza

Academic Year/course: 2021/22

27107 - Instrumental Techniques in Biotechnology

Syllabus Information

Academic Year: 2021/22
Subject: 27107 - Técnicas instrumentales en biotecnología
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

2. Learning goals

3. Assessment (1st and 2nd call)

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).

The teaching and assessment activities will be carried out in person unless, due to the health situation, the provisions issued the competent authorities and by the University of Zaragoza arrange to carry them out electronically.

All students will be informed about the risks that the practices of this subject can have, as well as if dangerous products are handled and what to do in the event of an accident. All students must sign the commitment to comply with work and safety regulations in order to perform the practices. For more information, consult the information for students in the Occupational

Risk Prevention Unit: https://uprl.unizar.es/sites/uprl.unizar.es/files/archivos/Procedimientos/inf-prl-inf-03.pdf

4.3. Syllabus

The course will be developed in 20 practice sessions (4 hours each), plus a two-hour seminar session and two presentation and discussion sessions of the results (4 hours each).

AREA OF ANALYTICAL CHEMISTRY

- Session 1. Laboratory safety. Concentration of a solution. Measurement of pH, buffer solutions and buffer powering.
- Session 2. Application to biomolecule quantification of UV-visible spectroscopy. Beer-Lambert law and extinction coefficient. Measurement of iron concentration by complexing with thiocyanate
- Session 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

- Session 4. General theory of lipids. Extraction of total lipids by the Folch method.
- Session 5. Thin layer chromatography applied to the separation of lipids. Preparation of fatty acids methyl esters.
- Session 6. Thin layer chromatography of phospholipids. Introduction to gas chromatography. Data interpretation of gas chromatograms of methyl esters.
- Session 7. Glycoproteins separation by affinity chromatography. Characterization by double immunodiffusion of the separated fractions (Ouchterlony).
- Session 8. Neuraminidase treatment: analysis by electrophoresis.
- Session 9. Determination and characterization of sugars in a sample.
- Presentation and discussion session. Preparation, interpretation, presentation and discussion of results obtained in sessions 1-6.
- Session 10. Nucleic acids preparation.
- Session 11. Separation of nucleic acids by agarose gel electrophoresis. Nucleic acids detection and quantification. Assessment of the purity of the preparation.
- Session 12. Introduction to protein purification. Isolation and characterization of proteins. Homogenization of tissues or cells. Enrichment by fractional precipitation.
- Session 13. Dialysis and preparation of columns for the separation of proteins by ion exchange and affinity chromatographies.
- Session 14. Protein separation by column chromatography. Protein quantitation by spectroscopic methods. Purity criteria.
- Session 15. Determination of specific enzyme activity throughout the different stages of purification of an enzyme.
- Session 16. Quantitation of total protein by the method of Bradford.
- Session 17. Determination of the kinetic parameters of an enzyme: Km and kcat.
- Session 18. Denaturing electrophoresis on polyacrylamide gels (PAGE). Electroblotting: theoretical introduction and preparation of gels.
- Session 19. A) Electrophoresis applied to samples obtained in the different steps of purification as a purity criterion and molecular weight determination. B) Electroblotting to PVDF membranes: sample preparation for sequencing the N-terminus.
- Session 20. Session for solving questions and exercises, finalizing calculations and preparing reports (computer room).
- Presentation and discussion session. Presentation, interpretation and discussion of results obtained in sessions 12-20, class debate and resolution of questions.

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.

Schedules of lectures and problems will coincide with the officially established and will be available at: https://ciencias.unizar.es/consultar-examenes?field_estudio_target_id_entityreference_filter=16

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 the Degree Announcement Board of the grade on the Moodle platform of the University of Zaragoza, https://moodle.unizar.es/add/ and in the moodle page for the course. These ways will also be used to communicate to the enrolled students their distribution by groups of practical sessions, which will be organized by the coordination of degree. Some 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

On this website there will be also available the dates of exams.

4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=27107