

27150 - Introduction to Systems Biology

Syllabus Information

Academic year: 2024/25

Subject: 27150 - Introduction to Systems Biology

Faculty / School: 100 - Facultad de Ciencias

Degree: 446 - Degree in Biotechnology

ECTS: 6.0

Year: 4

Semester: Second semester

Subject type: Optional

Module:

1. General information

This subject aims to provide students with knowledge of the fundamentals of genomics, proteomics and metabolomics and familiarize them with their applications. It also seeks that students perceive the advances, controversies and challenges that the progress of research provides and that they acquire additional skills related to the search for information and its critical analysis, and with the writing and communication of scientific content.

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs), Agenda 2030 of the United Nations (<https://www.un.org/sustainabledevelopment/es/>), so that the acquisition of the learning results provides training and competence to contribute to some extent to their achievement.

2. Learning results

This discipline consists of the systematic collection of information to identify and define the biological function of genes expressed in living beings, their regulation in different environmental conditions, their interrelationships both in the physiological regulation of the cell and of the organism as well as in pathological alterations. Experimental approaches of large-scale analysis using the relevant methodologies to explore the various parameters and mathematical models and computer tools to organize and interpret the data generated are essential in its development.

To pass this subject, the student must demonstrate the following results:

To understand the techniques used in genomics, metabolomics, proteomics, transcriptomics, etc...

To face the integration of results and modelling and to understand its difficulties and challenges.

To understand and appreciate the relevance of advances in the field and their applications to medicine or biotechnology.

To search for and analyse specific information and convey aspects of the subject matter in an understandable manner. To explain and argue adequately the fundamentals of the various aspects that make up the subject.

To present work done individually.

Upon completion of the subject, the student will be able:

1. To understand the techniques used in genomics, proteomics and metabolomics.

2. To interpret techniques used to identify and characterize proteins in complex samples 3. To perform the final integration of all the results in functional networks.

In addition to these specific competencies, the student will develop:

Observation capacity.

Ability to solve specific problems. Critical analysis of information.

Synthesis and integration of information.

Public presentation of topics.

3. Syllabus

Theoretical Program

1. Introduction to Systems Biology and Synthetic Biology.

2. Fundamentals and applications of genomics.

3. Fundamentals and applications of epigenomics and metagenomics.

4. Transcriptomics.

5-6. Technical fundamentals of proteomics. Differential analysis and comparison of proteomes. Combinatorial libraries of expression of peptides and proteins.

7-8. Fundamentals of metabolomics and lipidomics.

9. Characterization of posttranslational modifications of proteins.

10-12. Protein interaction networks. Network construction and analysis. Network applications.

Practical Program

Production written presentation and exhibition of a work.

4. Academic activities

Theoretical classes Face-to-face. 4 ECTS. In them, students are introduced to the basic theoretical knowledge of the subject that is indicated in the syllabus (section 3).

Presentation and exhibition of a work. 2 ECTS. This activity consists of students collecting information on a specific topic, with the help of the teacher, and presenting and discussing it in class.

Complementary activities: Seminars and lectures will be given by experts, which will be announced to students during the term

5. Assessment system

To pass this subject, the student must achieve an overall minimum grade of 5 points out of 10, **by means of the following assessment activities:**

A) Presentation and exhibition of an individual work

The completion of this work will be mandatory to pass the subject. It will be graded from 0 to 10 and will contribute 40% to the final grade.

Assessment criteria:

Coherence of the information; Clarity in the presentation; Degree of elaboration of the presentation; Degree of internalization of the contents with own suggestions. The student will discuss their work with teachers and students.

B) Performance of an objective test

The specific competences on the theoretical contents of the subject will be evaluated by means of written tests that will include:

- 25 multiple choice questions of 5 answers each, (only one is true). Incorrect answers will deduct 0.2. (value:

2.5 points out of 10)

- 6 to 9 short development questions (value: 7.5 points out of 10)

The objective test will contribute 60% to the final grade. A minimum grade of 4.5 (out of 10 points in this test) will be required to pass the subject.

In addition to what has been previously described, students will have the possibility of being evaluated in a **global test** that will judge the achievement of the learning results previously mentioned.

6. Sustainable Development Goals

3 - Good Health & Well-Being

4 - Quality Education

9 - Industry, Innovation and Infrastructure