Universidad Zaragoza

Academic Year/course: 2024/25

28920 - Biotechnology

Syllabus Information

Academic year: 2024/25
Subject: 28920 - Biotechnology
Faculty / School: 201 - Escuela Politécnica Superior
Degree: 583 - Degree in Rural and Agri-Food Engineering
ECTS: 6.0
Year: 3
Semester: First semester
Subject type: Compulsory
Module:

1. General information

The objectives of the subject are:

students will understand the fundamentals of biotechnology and be familiar with techniques that will be applied in agri-food processes.

On the other hand, they must be able to carry out basic activities of a biotechnology laboratory, whether plant or animal, following the most frequent protocols and handling the corresponding instruments.

The general contents of the subject are in line with the following sustainable development objectives:

Goal 2. To end hunger, achieve food security and improved nutrition, and promote sustainable agriculture.

Biotechnological tools that contribute to the improvement of production processes in the agricultural sector are explained training is relevant to goals 2.3, 2.4 and 2.5.

Goal 12. Ensure sustainable consumption and production patterns: targets 12.2, 12.3 and 12.4.

2. Learning results

Explain the fundamentals of the most relevant biotechnological applications in agronomy, both in the field of plant production and livestock production.

Describe the basic techniques of molecular biology and know how to apply some of them.

Understand and explain the techniques of in vitro culture and genetic engineering of plants.

Apply in vitro plant culture techniques.

Understand, describe and contrast the different biotechnologies used in animal health, reproduction and genetic improvement.

Apply reproductive biotechnologies in laboratory and field for the development of animal breeding programs.

3. Syllabus

Theory program

1.- Introduction and general context.

2.- Fundamentals of biotechnological advances: biochemistry and molecular biology.

3.- Molecular genetic tools and techniques (I).

4.- Molecular genetic tools and techniques (II).

5.- Genomic tools.

6.- Proteins and proteomics.

7.- In vitro culture of plant tissues and organs.

8.- Applications of plant micropropagation.

9.- Plant genetic engineering.

10.- Biotechnology of animal reproduction I. Oestrus detection and synchronization.

11.- Biotechnology of animal reproduction II. Artificial insemination.

12.- Biotechnology of animal reproduction III. Embryonic technologies.

13.- Biotechnology applications in animal breeding. Animal genetic engineering.

14.- Biotechnological applications in animal feed.

15.- Biotechnological applications in animal health.

Practical program:

1.- The protocol in the plant biotechnology laboratory.

2.- Isolation of DNA from plants.

3.- In vitro DNA synthesis: the polymerase chain reaction.

4.- DNA electrophoresis.

5.- Bioinformatics: databases and primer design.

6.- Bioinformatics: analysis of microsatellite markers.

7.- In vitro plant culture (I).

8.- In vitro plant culture (II).

9.- The protocol in the animal biotechnology laboratory.

10.- Spermiogram (I). Classical evaluation.

11.- Spermiogram (II). Advanced evaluation.

12.- Oocyte procurement and in vitro embryo culture.

13.- Sex determination and literature review.

14.- HUMECO Day.

4. Academic activities

Participative lectures. 30 face-to-face hours, 2-hour sessions dedicated to a topic of the theoretical program.

2.- Laboratory/cabinet internships, 30 classroom hours, 15 sessions of 2 hours duration to carry out a practical experience in correspondence with the theoretical program.

3.- Study for the written test, a total of 84 hours of autonomous work by the student. The teachers provide notes on the theoretical lectures and the slides used in the lectures. It also suggests basic bibliography and *online* self-learning tools.

4.- Tutoring sessions to monitor the learning process.

5.- Passing the written tests and the practical test: 6 classroom hours.

5. Assessment system

Global assessment will be based on the following activities:

1.- Two written test performed in informatic cabinet by the moodle platform. Each test will contain 15 multiple choice questions about theoretical and practical aspects from the first block of 6 topics. Correct answers will be valued with 0.1 points and wrong answers with -0.033 points. Final grade of this activity will be obtained as the sum of the two tests. Passing this exam will require obtaining at least 1.5 points.

2.- Written test at the end of the course, in first and second call, on contents exposed in theoretical and practical classes. This test will consist of multiple choice and/or open questions, and will be graded out of 10 points. Passing this exam will require obtaining at least 5 points. Students who pass the partial tests (1) may eliminate questions referred to block 1 from their exam, and the final grade will be obtained from the sum of the two grades if in this written test they have at least 3.5 points.

3.- Practical laboratory or cabinet exam, on the same dates as the official exams, on the program of practices and graded out of 10 points. A minimum of 5 points is required to pass this test.

The final grade of this subject will be obtained as:

FG = 0.75 x Theory grade (1+2 or 2) + 0.25 x Practical grade.

If the minimum requirements are not reached in the evaluation activities of the subject, it will not be considered approved even if the final grade averaged FG, is equal or higher than 5. In this case, the final grade that will be reflected in the course transcripts will be:

- If final grade averaged, FG ≥ 4, Fail, 4.
- If final grade averaged, FG < 4, Fail, FG.

In case of passing only one of the tests, the grade of that part will be retained only during the following exam of the same academic year.

The success rates for the subject in the last three years are: 2020/21: 78,95%; 2021/22: 52,94%; 2022/23: 60,87%

6. Sustainable Development Goals

2 - Zero Hunger
12 - Responsible Production and Consumption