

**COURSE DATA****DATA SUBJECT**

Code: 33194
Name: Plant Biotechnology
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2026-27

STUDY (S)

| Degree | Center | Acad. year | Period |
|-------------------------------|-------------------------------------|------------|----------------|
| 1111 - Grado en Biotecnología | Facultat de Ciències Biològiques | 4 | Second quarter |

SUBJECT-MATTER

| Degree | Subject-matter | Character |
|-------------------------------|----------------|-----------|
| 1111 - Grado en Biotecnología | Optability | ELECTIVES |

COORDINATION

BENLLOCH ORTIZ REYES

SUMMARY

Plant biotechnology is an optional subject in the Degree of Biotechnology. The theoretical and practical contents, together with activities that are developed during the course are designed considering two main aspects. First, provide the knowledge that students should have about Plant Biotechnology and second, to avoid overlap with other core and optional courses. In this respect, students have previously studied the following two core subjects: Plant Biology and Obtaining Transgenic Organisms. Also they might be attending an optional course on Molecular Biology of Plants, as well as other somewhat less related disciplines.

Both classical plant breeding and breeding by the use of biotechnological processes are necessary and complementary. On this basis, a first section of the lectures is dedicated to the contributions of in vitro culture of plant cells and tissue to plant breeding. This section is supplemented with the contents of the lab classes, as these subjects are taught almost exclusively in Plant Biotechnology.

The second section focuses on the comparative study of the different systems of plant genetic transformation, analyses of gene expression, and the characterization of transgenes. The content for this section, which includes a practical class, have been limited to avoid overlap with similar plant-related sections on the programs of Obtaining Transgenic Organisms and Plant Molecular Biology.

The third program section is devoted to different applications of genetic manipulation of plants, mainly in



relation to tolerance to different types of biotic and abiotic stresses, synthesis of both plant products and exogenous products as well as some aspects of plant development including productivity. The program ends with brief comments on the regulation of the use of genetically modified plants and plant This section includes student debates on recent scientific and general articles.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

COMPETENCES / LEARNING OUTCOMES

1102 -

Analizar a nivel molecular el resultado de la manipulación de un organismo.

Aplicar soluciones biotecnológicas a problemas medioambientales.

Diseñar procesos de manipulación y obtención de productos biotecnológicos.

Diseñar y aplicar aproximaciones biotecnológicas en el campo de la Agroalimentación.

1111 - Grado en Biotecnología

Actuar con autonomía en el aprendizaje, tomando decisiones fundamentadas en diferentes contextos, emitiendo juicios en base a la experimentación y el análisis y transfiriendo el conocimiento a nuevas situaciones

Colaborar eficazmente en equipos de trabajo, asumiendo responsabilidades y funciones de liderazgo y contribuyendo a la mejora y desarrollo colectivo

Contribuir en el diseño, desarrollo y ejecución de soluciones que den respuesta a demandas sociales, teniendo en cuenta como referente los Objetivos de Desarrollo Sostenible

Demostrar razonamiento crítico y autocrítico en el ámbito de la titulación, considerando aspectos tales como la ética profesional, los valores morales y las implicaciones sociales de las diferentes actividades realizadas

Propose creative and innovative solutions to complex situations or problems, typical of the area of connection, to donate responses to the various professional and social needs

Saber comunicarse de manera efectiva, tanto de forma oral como escrita, adaptándose a las características de la situación y de la audiencia



DESCRIPTION OF CONTENTS

1. Theoretical contents

Unit 1. Introduction to plant biotechnology.

Unit 2. Physiological and molecular bases of growth and development.

Unit 3. Theoretical and methodological bases of plant in vitro culture.

Unit 4. Plant regeneration from somatic tissues.

Unit 5. Plant regeneration from gametic tissues.

Unit 6. Genetic resources and germplasm conservation.

Unit 7. Obtaining protoplasts and somatic hybridization.

Unit 8. Mutagenesis.

Unit 9. Plant genetic transformation.

Unit 10. Analysis of transgenic plants.

Unit 11. Strategies for improving tolerance to pathogens and pests.

Unit 12. Strategies for improving tolerance to abiotic stresses.

Unit 13. Strategies to improve plant production.

Unit 14. Regulation and acceptance of genetically modified crops. New Breeding Technologies and legislation.



2. Practical contents

1. Preparation and sterilization of media for different in vitro cultures. Disinfection and cultivation systems for plant material.
2. Obtaining plants by direct morphogenesis (foliar). Cell dedifferentiation and indirect morphogenesis.
3. Propagation by axillary buds and acclimatization of plants obtained by in vitro culture.
4. Virus-induced gene silencing.
5. Obtaining transgenic plants (selection with antibiotics and herbicides), study of the heritability of transgenes and analysis of gene expression.

WORKLOAD

PRESENCIAL ACTIVITIES

| Activity | Hours |
|--------------------|--------------|
| Tutorials | 2,00 |
| Theory | 38,00 |
| Laboratory | 20,00 |
| Total hours | 60,00 |

NON PRESENCIAL ACTIVITIES

| Activity | Hours |
|---------------------------------------|--------------|
| Attendance at other activities | 0,00 |
| Individual or group project | 20,00 |
| Independent study and work | 30,00 |
| Preparation of lessons | 10,00 |
| Preparation for assessment activities | 10,00 |
| Resolution of case studies | 20,00 |
| Total hours | 90,00 |

TEACHING METHODOLOGY

The teaching methodology includes synchronous theoretical classes taught by the faculty, in which student participation is encouraged. Likewise, a significant portion of the classes will be dedicated to solving practical problems with the aim of consolidating the theoretical knowledge explained in class. Students will participate in the sessions through the presentation of seminars or other classroom activities that will be specified at the beginning of the term. Laboratory practices will consist of practical classes in the laboratory, during which students will develop experiments autonomously under the supervision and guidance of the faculty.



Attendance at theoretical classes is not mandatory, although it is especially recommended when the class includes any classroom activity. Attendance is also highly recommended for the two sessions dedicated to tutorials.

Attendance at practical classes is mandatory and cannot be made up.

EVALUATION

Assessment will be carried out through the following components:

- **Theoretical examination (70% of the final grade).** The exam may consist of multiple-choice questions, short-answer questions, and/or a practical case study to be developed. **Oral exams may be administered.**
- **Assessment of practical work.** This assessment may be conducted through a practical exam or through the submission of a laboratory report. In any case, the weight of this component will not exceed 15% of the final grade. **Oral exams may be administered.**
- **Other classroom activities (seminars, debates, outreach, etc.).** These additional activities may account for up to 15% of the final grade.

In both the first and second examination sittings, students must pass the theoretical-practical exam. Upon passing this exam, the grades from the practical work and classroom activities will be added to the exam grade to obtain the final mark.

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REFERENCES

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