

Course guide

390332 - BTAP - Biotechnology for Production

Last modified: 03/06/2024

Unit in charge: Barcelona School of Agri-Food and Biosystems Engineering
Teaching unit: 745 - DEAB - Department of Agri-Food Engineering and Biotechnology.

Degree: BACHELOR'S DEGREE IN BIOSYSTEMS ENGINEERING (Syllabus 2009). (Compulsory subject).

Academic year: 2024 **ECTS Credits:** 6.0 **Languages:** English

LECTURER

Coordinating lecturer: Roig Villanova, Irma

Others: Roig Villanova, Irma

REQUIREMENTS

Students should have passed the subject of Molecular Biology and Biotechnological Tools (BMEBT) or equivalent.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Transversal:

1. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

04 COE. EFFICIENT ORAL AND WRITTEN COMMUNICATION. Communicating verbally and in writing about learning outcomes, thought-building and decision-making. Taking part in debates about issues related to the own field of specialization.

03 TLG. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

TEACHING METHODOLOGY

The teaching methodology varies depending on whether it is theoretical (large group) or practical (small group) classes. In the theoretical classes, teachers will introduce the general topics related to the basic matter. They will try to motivate and involve the students to actively participate in their learning. Support material can be found in ATENEA.

The practical classes (Small groups) have as a main objective that students learn by doing the basic techniques applied in biotechnology.

LEARNING OBJECTIVES OF THE SUBJECT

It is intended that students acquire all the necessary knowledge and skills in those biological techniques that allow: Learning and in some cases expanding the theoretical bases of plant tissue culture, genetic engineering and other biotechnological techniques.

Applying the technology of micropropagation of plant species, DNA extraction, PCR determination and electrophoresis technique, so that later professionally she/he could be engaged in public or private projects that involve these biotechnological techniques.



STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours large group	40,0	26.67
Hours small group	20,0	13.33

Total learning time: 150 h

CONTENTS

MICROPROPAGATION OF COMMERCIAL PLANT SPECIES AND IN VITRO CULTURE TECHNIQUES

Description:

History of plant tissue culture
Cell culture media
Phases and cell culture methodology
Production of pathogen-free plants
Somatic embryogenesis
Haploid production
Protoplasts culture
Conservation of plant material

Related activities:

Activity 1: Theoretical classes.
Activity 2: Individual evaluation.
Activity 3: Laboratory training.
Activity 4: Visit to a company.

Full-or-part-time: 60h

Theory classes: 20h
Laboratory classes: 10h
Self study : 30h

BIOTECHNOLOGY APPLIED TO GENETIC ENGINEERING

Description:

Genetic Engineering: Biotechnological methods used in genetic improvement and production. Theoretical explanations accompanied by practical examples. The classes will cover techniques related to the analysis of variability (molecular biology, bioinformatics for sequence analysis ...) as well as techniques related to the generation of new variability (transgenesis, Tilling, CRISPR / Cas9 ...). Legislation.

Related activities:

Activity 1: Theoretical classes.
Activity 2: Individual evaluation.
Activity 3: Laboratory training.
Activity 4: Visit to a company.

Full-or-part-time: 60h

Theory classes: 20h
Laboratory classes: 10h
Self study : 30h

OTHER BIOTECHNOLOGY TECHNIQUES

Description:

In this section we will study different technologies and methodologies related, mainly, to applications in biotechnology.

Full-or-part-time: 30h

Self study : 30h

ACTIVITIES

ACTIVITAT 1: THEORETICAL LECTURES

Description:

The teachers, by using all the methods available in the classroom, expose the general knowledge related to the basic concepts of the subject. In half of the cases the sessions last two hours. Therefore it is necessary to seek motivation and participation involving students in actively participating in their learning. The subject is a topical and changing issue, not free from controversy, ethics and / or morality, which in no case should be avoided.

Material:

All material available in the classroom, such as computer connected to projector, Internet connection, audiovisual material, blackboard, etc.

Full-or-part-time: 80h

Self study: 40h

Theory classes: 40h

ACTIVITY 3: LABORATORI PRACTICES

Description:

There will be 8 sessions of laboratory practices. 4 of them will be related to in vitro culture and other 4 will be related to molecular genetics.

Specific objectives:

To learn applied biotechnology techniques. At the end of the activity, the student will be able to know the factors involved in plant tissue culture, and to know how to perform and interpret a PCR and characterize the conditions in which they have carried out the practices.

Material:

Stereoscope. Laminar flow chamber. Environment controlled chamber. Thermocycler. Transilluminator. Disposable tips in a biotechnology laboratory.

Full-or-part-time: 40h

Self study: 20h

Laboratory classes: 20h

ACTIVITAT 2: INDIVIDUAL EVALUATIONS

Description:

The evaluation will be related to the theoretical and practical contents. The capacities of the students to learn by themselves will be also evaluated.

Specific objectives:

Assessment of the achievement of the learning objectives of the theoretical and practical contents of the subject.

Full-or-part-time: 4h

Theory classes: 4h

(ENG) ACTIVITAT 4: VISITA A UNA EMPRESA DEL SECTOR

Description:

A private company will be visited where biotechnology is routinely applied in plant production and improvement.

Specific objectives:

The aim is for students to observe first hand one of the techniques and applications that have emerged from "in vitro" culture systems or micropropagation.

Delivery:

The evaluation of this visit will be included in the evaluation questionnaires of the subject.

Full-or-part-time: 14h

Self study: 10h

Laboratory classes: 4h

ACTIVITY 5: PRESENTATION OF AN ARTICLE / PROJECT

Description:

Students will have to present an article or research project related to biotechnology

Specific objectives:

Learning to communicate science to an expert audience

Material:

powerpoint presentation

Full-or-part-time: 30h

Self study: 30h

GRADING SYSTEM

N1: Qualification of the examination of half term

N2: Qualification of the end-of-term exam

N3: Qualification of practical training

N4: Qualification of the article / project

Final grade: $0.35 N1 + 0.35 N2 + 0.20 N3 + 0.10 N4$

EXAMINATION RULES.

Assistance and development of the proposed activities is mandatory. Tasks must be delivered by the deadline.

BIBLIOGRAPHY

Basic:

- Augé, R. La Culture in vitro et ses applications horticoles. 3ème. éd. rev.,correg., augm. Paris: Lavoisier, 1989. ISBN 2852065045.
- Bhojwani, S. S.; Razdan, M. K. Plant tissue culture : theory and practice. Amsterdam [etc.]: Elsevier, 1983. ISBN 0444425268.
- Smith, Roberta H. Plant tissue culture : techniques and experiments. San Diego [etc.]: Academic Press, 1992. ISBN 0126503400.
- Pierik, R. L. M. Cultivo in vitro de las plantas superiores. Madrid: Munid-Prensa, 1990. ISBN 8471142678.
- Pallàs, Vicente. Herramientas biotecnológicas en fitopatología. Madrid: Mundi-Prensa, 2008. ISBN 9788484763192.
- Luque Cabrera, José; Herráez Sánchez, Ángel. Texto ilustrado de biología molecular e ingeniería genética : conceptos, técnicas y aplicaciones en ciencias de la salud. Madrid [etc.]: Harcourt, 2001. ISBN 8481745057.
- Martínez, Xavier; Cañameras, Núria. El Cultiu "in vitro" i l'agricultura. Barcelona: Fundació Caixa de Pensions, 1988. ISBN 8476641699.
- Montoliu i José, Lluís; Martínez Mojica, Francisco J. Editando genes : recorta, pega y colorea : las maravillosas herramientas CRISPR. Primera edición. Pamplona: Next Door Publishers, febrero 2019. ISBN 9788494924514.
- Stadler, Tanja. Decoding genomes : from sequences to phylodynamics [on line]. First edition. [Lloc de publicació no identificat]: [editor no identificat], 2024 [Consultation: 10/01/2025]. Available on: <https://decodinggenomes.org/>. ISBN 9783907363522.

Complementary:

- SEBIOT. La biotecnología aplicada a la agricultura. Madrid: Eumedia, 2000. ISBN 8493073822.
- Castillo Rodríguez, F. Biotecnología ambiental. Madrid: Tébar, 2005. ISBN 8473602110.
- Montoliu, Lluís. ¿Por qué mi hijo tiene una enfermedad rara?. Primera edición. Pamplona: Next Door Publishers, febrero 2023. ISBN 9788412630008.
- Montoliu, Lluís; Romero Márquez, Jesús. Genes de colores. Primera edición. Pamplona: Next Door Publishers, abril 2022. ISBN 9788412489422.

RESOURCES

Hyperlink:

- FAO 2010
- FAO (document de l'estat de la biotecnologia)
- Frontiers. Resource