COURSE: PLANT BIOTECHNOLOGY

SUBJECT MATTER: Biotechnology for Health / Bioprocess Engineering

MODULE: Optional Subjects

PROGRAM: Degree in Biotechnology

GENERAL FEATURES *

Type: ☐ Basic training, ☑ Compulsory, ☐ Elective
☐ Final Degree Project, ☐ Practicum

Duration: Semestral  Semester / s: 7

Number of ECTS credits: 5

Language / s: Spanish, Catalan, English

DESCRIPTION

SHORT DESCRIPTION AND JUSTIFICATION (of the meaning of the course in relation to the studies. Between 100 and 200 words)

Plant breeding was initiated thousands of years ago when human began the process of plant domestication and agriculture. However, the development of recombinant DNA technology coupled with new techniques of plant cell culture have accelerated the breeding process for the production of new crop varieties with desired characteristics. Plant biotechnology is defined as the introduction of desired characteristics through genetic modification and its impact transcends important areas such as agricultural productivity, human and animal nutrition, or human health.

The aim of the course is to provide students with basic knowledge of modern plant biotechnology, grouped around the following topics: (1) Biochemical and molecular principles that govern plant metabolism and development. These components are usually the molecular targets of the plant breeding process. (2) Basic concepts of classical plant breeding, and development of modern molecular techniques. (3) Methods of genetic manipulation and plant transgenesis, and their applications in improving the characteristics of crops. (4) Emerging biotechnological systems based on microalgae.

COMPETENCES (of the course placed in relation to the pre-assigned competences in the subject matter)

- That students develop those learning skills necessary to undertake further studies with a high degree of autonomy (CB5).
- Be able to assess the impact of their professional activity on the sustainable development of society (T3).
- Be able to incorporate contemporary aspects related to the exercise of their profession (T5).
- Be able to understand and apply advanced knowledge of Biosciences and Engineering to the field of Biotechnology (E3).

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• Be able to integrate the knowledge and tools of biotechnology for their application to different industrial sectors that use, develop or produce biotechnological products or processes (E6).

PREVIOUS REQUIREMENTS * (modules, subject matters, courses or knowledge necessary for the follow-up of the subject. State previous courses required to be completed)

Students must have knowledge of the basic module of the Degree in Biotechnology, related to the subjects Cell Biology and Genetics, Animal and Plant Biology and Microbiology. In addition, students must have completed the courses of the second year of the Degree in Biotechnology: Molecular Biology, Recombinant DNA technology, and Metabolism and regulation. Finally, students must have completed the course of third year Genomics, Proteomics and Metabolomics.

CONTENTS (List the content of the course, with up to two level detail)

• Introduction to plant breeding and plant biotechnology
• Genome structure and function
• Plant transformation methods and functional genomics
• Plant cell organization and function
• The cell wall
• Lipid metabolism
• Secondary metabolism
• Plant signalling and development
• Microalgae biotechnology
• Applications of plant biotechnology

METHODOLOGY

LEARNING ACTIVITIES * (Complete the table relating activities, workload in ECTS credits, and competences.)

<table>
<thead>
<tr>
<th>Learning Activities</th>
<th>ECTS Credits</th>
<th>Competences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>1,3</td>
<td>CB5, T3, T5, E3, E6</td>
</tr>
<tr>
<td>Case and Problem-Solving Sessions</td>
<td>0,1</td>
<td>CB5, T3, T5, E3, E6</td>
</tr>
<tr>
<td>Seminars</td>
<td>0,1</td>
<td>CB5, T3, T5, E3, E6</td>
</tr>
<tr>
<td>Practical and Lab Work</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Presentations</td>
<td>0,1</td>
<td>CB5, T3, T5, E3, E6</td>
</tr>
<tr>
<td>Personal Study</td>
<td>3,3</td>
<td>CB5, T3, T5, E3, E6</td>
</tr>
<tr>
<td>Assessment Tasks (Exams, Continuous Assessment...)</td>
<td>0,1</td>
<td>CB5, T3, T5, E3, E6</td>
</tr>
<tr>
<td>TOTAL</td>
<td>5,0</td>
<td>CB5, T3, T5, E3, E6</td>
</tr>
</tbody>
</table>

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TEACHING METHODOLOGY (justify the teaching methodology in relation to the competences and course contents. Between 100 and 200 words)

Attendance to classes is mandatory. Lectures include the presentation and explanation of contents by a teacher, and is combined with other class activities:

- Case and Problem-Solving Sessions: They mainly consist of discussion of cases by a teacher with the active participation of students (Journal club). The cases are drawn from scientific literature that students should read and prepare in advance.
- Seminars: Period of instruction carried out by a teacher with the aim of reviewing, discussing and resolving doubts about the materials and topics presented in the lectures, in the case and problem-solving sessions, and in relation to a practical work that students must present develop. This work consists of a proposal of a research project that addresses a problem related to plant biotechnology.
- Oral presentations by the student on the practical work.

Personal study activities by the student serve to (i) prepare other activities; (ii) acquire the competences of each subject matter; and (iii) assimilate the knowledge exposed in lectures and case and problem-solving sessions, using the recommended reference materials.

The IQS virtual campus is used to provide students with teaching materials (presentations, articles and quizzes) and to maintain ongoing communication.

ASSESSMENT

ASSESSMENT METHODS * (Complete the table relating assessment methods, competences, and weight percentage in the course qualification)

<table>
<thead>
<tr>
<th>Assessment methods</th>
<th>Weight</th>
<th>Competences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Exam</td>
<td>35%</td>
<td>CB5, T3, T5, E3, E6</td>
</tr>
<tr>
<td>Midterm Exam/s</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Continuous Assessment Activities</td>
<td>30%</td>
<td>E3, E6</td>
</tr>
<tr>
<td>Reports and Presentations</td>
<td>30%</td>
<td>E3, E6</td>
</tr>
<tr>
<td>Lab or Field Work</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Projects</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Host Student Evaluation</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Participation</td>
<td>5%</td>
<td>E3, E6</td>
</tr>
</tbody>
</table>

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LEARNING OUTCOMES  (Explanation of the student's achievements that allow the assessment of competences, relating them to the competences and the assessment methods)

- The student must demonstrate the learning skills necessary to undertake further studies with a high degree of autonomy (CB5).
- The student must understand basic principles of plant biology and biotechnology, and thus be able to assess the impact of their professional activity on the sustainable development of society (T3).
- The student must incorporate contemporary aspects of plant biotechnology related to the exercise of their profession (T5)
- The student must understand the fundamentals of plant biotechnology, including the plant metabolism, the molecular basis of plant growth and development, and the methods for breeding and genetic engineering of plant systems. The student must be able to apply this advanced knowledge of Bioscience and Engineering in conducting activities in the field of biotechnology (E3).
- The student must be able to integrate the acquired knowledge and tools of plant breeding and biotechnology, for their application to different industrial sectors that use, develop or produce biotechnological products or processes (E6).

QUALIFICATION  (Explanation of the qualification system)

The qualification of the course (final grade, CF) will consider the marks obtained in the final exam (EF), the continuous assessment (AS), the reports and presentations (TP), and the participation (P). Each of these grades will be over 10 and have a maximum value of 10.

The final exam (EF) evaluates the synthesis of the subject. The qualification of the continuous assessment activities (AS) is calculated as a weighted average of the various activities. The qualification of the reports and presentations (TP) is calculated as a weighted average of the various activities. The participation grade (P) is assigned at the end of the course after assessing the level of student participation in global activities.

In order to pass the course, the grades of the final exam (EF), the continuous assessment (AS), and the reports and presentations (TP) must be equal to or greater than 4,5. Should one of these marks be less than 4,5, then this grade will be the final grade (CF) of the course. It is also required a minimum of 3 oral participations in the Journal Club.

If the grade of the EF, the AS and the TP are equal to or greater than 4,5, then the final grade (CF) of the course is calculated as a weighted average of the marks obtained in the final exam (EF, 35%), the continuous assessment (AS, 30%), the reports and presentations (TP, 30%), and the participation (P, 5%):

\[
CF = 0,35 \times EF + 0,3 \times AS + 0,3 \times TP + 0,05 \times P
\]

The course is passed when this final grade (CF) is equal to or greater than 5.

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ASSESSMENT OF THE COMPETENCES (Describe the grading system for each competence in relation with the assessment tasks)

For evaluation of competences CB5, T3 and T5, the grade of the final exam (EF) will be used as indicator.
For evaluation of competences E3 and E6, it will be used as indicator the grade of the EF, the AS, the TP, and the P.

BIBLIOGRAPHY (Recommended and accessible to the student.)


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**DOCUMENT HISTORY**

**PREVIOUS REVISIONS** (Indicate date and author / s, first the most recent one)

**CURRENT REVISION** (Indicate date and author / s)  
Mars 22nd 2019, Dr. Pablo Leivar