**Use of languages**

- Principal working language: catalan (cat)
- Some groups entirely in English: No
- Some groups entirely in Catalan: Yes
- Some groups entirely in Spanish: No

**Contact**

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**Prerequisites**

It is recommendable to have studied or are studying Microbiology, Genetics, Molecular Biology and Genetics, Molecular Microbiology and Virology.

**Objectives and Contextualisation**

The main objective of this course is that the student will be able to design procedures for the genetic manipulation of microorganisms.

Therefore during the development of the subject, the student must reach the following capacities:

- Know how to identify different types of microbial vectors, recognize their applications and design new ones
- Know how to apply methodologies and strategies of cloning
- Recognize the implication of the characteristics of each microorganism (immunity systems, recombination capacity, codon usage, etc.) in the proposed experimental design
- Know how to choose the most appropriate genetic transfer technique in each proposed case
- Be able to design efficient strategies for obtaining, enriching and selecting mutants
- Know how to build gene fusions and recognize their possible applications
- Recognize the main characteristics of potential bacterial targets for drugs, vaccines, and diagnostic reagents development.

**Skills**

- Apply the principal techniques for the use of biological systems: recombinant DNA and cloning, cell cultures, manipulation of viruses, bacteria and animal and plant cells, immunological techniques, microscopy techniques, recombinant proteins and methods of separation and characterisation of biomolecules.
- Comply with ethical principles and legislation in the manipulation of biological systems.
- Identify the genetic, physiological and metabolic properties of microorganisms with potential for application to biotechnological processes and the possibility of manipulating microorganisms.
- Interpret experimental results and identify consistent and inconsistent elements.
- Read specialised texts both in English and ones own language.
- Reason in a critical manner
- Search for and manage information from various sources.
Learning outcomes

1. Comply with ethical principles and legislation in the manipulation of microorganisms.
2. Describe the principal techniques associated with the genetic manipulation of microorganisms.
3. Identify the potential for manipulation of microorganisms.
4. Interpret experimental results and identify consistent and inconsistent elements.
5. Read specialised texts both in English and one's own language.
6. Reason in a critical manner.
7. Search for and manage information from various sources.
8. Think in an integrated manner and approach problems from different perspectives.
9. Work individually and in teams.

Content

The content of the course consists of the following topics:


Methodology

Genetic Engineering of Prokaryotes course is organized in two modules:
Theoretical module: where participatory master classes are combined with problem-based learning sessions where theoretical concepts are worked through the resolution of practical cases.

Case study module: in which through collaborative learning, students work on different aspects of actual experimental designs present in recent scientific articles. At the beginning of the course, students choose, following the guidelines set by the teaching staff, a scientific article related to the field of genetic engineering of microorganisms from which they make a poster. The schedule of activities as classroom work sessions, exhibition and discussions, as well as the delivery dates of the proposed activities will be defined at the beginning of the course by the teachers.

Activities

<table>
<thead>
<tr>
<th>Type: Directed</th>
<th>Hours</th>
<th>ECTS</th>
<th>Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participatory master classes</td>
<td>30</td>
<td>1.2</td>
<td>1, 2, 3, 6</td>
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<tr>
<td>Seminars</td>
<td>12</td>
<td>0.48</td>
<td>1, 7, 4, 5, 8, 6, 9</td>
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<table>
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<tr>
<th>Type: Supervised</th>
<th>Hours</th>
<th>ECTS</th>
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<tbody>
<tr>
<td>Tutorship</td>
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<td>0.04</td>
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<table>
<thead>
<tr>
<th>Type: Autonomous</th>
<th>Hours</th>
<th>ECTS</th>
<th>Learning outcomes</th>
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</thead>
<tbody>
<tr>
<td>Preparation of posters and questionnaires</td>
<td>30</td>
<td>1.2</td>
<td>1, 7, 3, 4, 5, 8, 6, 9</td>
</tr>
<tr>
<td>Reading recommended texts</td>
<td>20</td>
<td>0.8</td>
<td>5</td>
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<tr>
<td>Study and other autolearning activities</td>
<td>50</td>
<td>2</td>
<td>1, 7, 3, 4, 5, 8, 6, 9</td>
</tr>
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</table>

Evaluation

Theoretical module evaluation
The evaluation of this activity is done through an individual written exam. The maximum rating of this section is 10 points out of 10.
To overcome this module it is necessary to obtain a score equal to or greater than 5 points.
If the grade obtained is less than 5, the student must take the second chance examination. This test will have a maximum score of 8 points out of 10 and a score equal to or greater than 4 will be necessary to pass.

Students who have passed the module may submit to a grade improvement test waiving the grade obtained previously in the individual written exam. The scheduled date for the second chance test is that of the second chance examination. Students wishing to take the grade improvement test must communicate it by mail to the teacher responsible for the subject at least 72 hours before the day scheduled for the second chance examination.

Seminar module evaluation
The evaluation of the seminars is done through the evaluation of different activities related to a scientific article: A) Autonomous deliveries that will be delivered through the Moodle classroom and deliveries in the classroom work sessions. With a maximum rating of 2 points out of 10.

B) The poster and questionnaire associated with the chosen scientific article. With a maximum rating of 5 points out of 10.

C) The defense of the poster during its classroom exhibition. With a maximum rating of 1 point out of 10.
D) The resolution of the questionnaires related to the presented seminars. With a maximum rating of 1.5 points out of 10.

E) Individual and workgroup self-evaluation. With a maximum rating of 0.5 points out of 10.

To pass this module the student must obtain a grade equal or superior to 5.

The final grade of the course will be the average of the grades obtained in both modules, being necessary to have passed separately each of them.

A student who has participated in less than 50% of the scheduled assessment activities will receive a grade of Not Evaluable.

**Evaluation activities**

<table>
<thead>
<tr>
<th>Title</th>
<th>Weighting</th>
<th>Hours</th>
<th>ECTS</th>
<th>Learning outcomes</th>
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<tr>
<td>Seminar module evaluation</td>
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**Bibliography**

As reference bibliography of basic concepts it is recommended:


Other recommended texts as well as links of interest will be available to the student in the Moodle classroom of the course.