390335 - BRA - Environmental Bioremediation

**Coordinating unit:** 390 - ESAB - Barcelona School of Agricultural Engineering  
**Teaching unit:** 745 - EAB - Department of Agri-Food Engineering and Biotechnology  
**Academic year:** 2018  
**Degree:** BACHELOR'S DEGREE IN BIOSYSTEMS ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)  
**ECTS credits:** 6  
**Teaching languages:** Catalan

### Teaching staff

**Coordinator:** Hereter Quintana, Agnès  
**Others:** Carbó Moliner, Rosa  
Mas Serra, Maria Teresa

### Degree competences to which the subject contributes

**Specific:**  
1. Techniques of environmental bioremediation.

### Teaching methodology

The teaching methodology combines participatory lectures (large group), practical classes (small group) and individual and work group, promoting the involvement of students in their learning process at all times. Studies of cases related to the various topics will be raised in practical classes. Material support through Athena and material in other support will be used.

### Learning objectives of the subject

Students will be able to acquire knowledge of environmental, agricultural and landscape issues, and plant bioremediation technologies. It will be deepen knowledge of natural techniques and useful engineering in the treatment of environmental decontamination of soil and water mainly with an important part of describing the microbial degradation of contaminants.

### Study load

| Total learning time: 150h | Hours large group: 40h | 26.67%  
|--------------------------|-----------------------|----------  
| Hours medium group: 0h   | 0.00%                 |           
| Hours small group: 20h   | 13.33%                |           
| Guided activities: 0h    | 0.00%                 |           
| Self study: 90h          | 60.00%                |          |
# Content

## 1-INTRODUCTION

<table>
<thead>
<tr>
<th><strong>Description:</strong></th>
<th><strong>Learning time:</strong> 8h</th>
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</table>
| La bioremediation as a tool of environmental bioengineering. General objectives of the course. Areas of activity: soil, water, air, environmental restoration in general. Sources of pollution. | Theory classes: 3h  
Self study : 5h |

| **Related activities:** | |
|-------------------------| |
| (ENG) Activitat 1 classes d'explicació teòrica | |
| Activity 2: Individual test | |

## 2-Microorganisms and Xenobiotic pollutants

<table>
<thead>
<tr>
<th><strong>Description:</strong></th>
<th><strong>Learning time:</strong> 35h</th>
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</table>
| Biodegradability and ecological effects. Trials of biodegradability and biomagnification. Microbial planting and bioengineering for the bioremediation of pollutants. Microbial metabolic processes involved in the removal of different pollutants. Marine oil pollution. | Theory classes: 10h  
Laboratory classes: 4h  
Self study : 21h |

| **Related activities:** | |
|-------------------------| |
| Activity 1: theory classes | |
| Activity 2: individual tests | |
| Activity 3: case studies | |
### 3 - Soil degradation. Contamination of soils and groundwater

**Description:**
- The degradation of soils. General types and processes.
- Restoration ecology extractive activities, mines and landfills.
- The contaminated soils. Definiciones.
- Origin and effects of the contamination of soils and groundwater. Applicable law.
- Principles of soil decontamination. Most common technologies.
- Bioremediation of the saturated zone technologies

**Related activities:**
- Activity 1: theory classes
- Activity 2: individual tests
- Activity 3: case studies

**Learning time:** 51h
- Theory classes: 14h
- Laboratory classes: 6h
- Self study: 31h

### 4 - Phytoremediation

**Description:**
- General concepts.
- Performances and use in different areas: agronomic, contaminated soils...
- Bioprospection of biological systems with potential capabilities of bioremediation.

**Related activities:**
- Activity 1: theory classes
- Activity 2: individual tests
- Activity 3: case studies

**Learning time:** 56h
- Theory classes: 13h
- Laboratory classes: 10h
- Self study: 33h
Planning of activities

<table>
<thead>
<tr>
<th>Activity 1: THEORY CLASSES</th>
<th>Hours: 101h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 38h</td>
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<tr>
<td></td>
<td>Self study: 63h</td>
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</tbody>
</table>

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<thead>
<tr>
<th>ACTIVITY 2: INDIVIDUAL TEST</th>
<th>Hours: 2h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
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</table>

Description:
Individual test in the classroom about the theoretical concepts and application of the subject related to the learning objectives of all the contents of the subject.

<table>
<thead>
<tr>
<th>ACTIVITY 3: CASE STUDY</th>
<th>Hours: 49h</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Laboratory classes: 20h</td>
</tr>
<tr>
<td></td>
<td>Self study: 29h</td>
</tr>
</tbody>
</table>

Description:
There will be different types of activities that include:
- a) Assay of microencapsulació of yeasts in spheres of calcium alginate and verification of the fermentative activity in the laboratory
- b) approaches and works with cases related content 1 and 3 using problem solving in the classroom.
- c) approach, monitoring and processing of results of different laboratory tests of the potential bioremediador of vegetables. Preparation of a document with a format of scientific work based on this activity.

Qualification system

N1: evaluation by individual tests
N2: Qualifications of the evaluation of case studies (activitat3). Related content 2 and 3: 0.10; related content 4: 0.25.

N: 0.65N1+ 0.35N2.

Regulations for carrying out activities

The tasks must be delivered by the deadline.
Group work:
- the size of the groups will not be never larger indicating the Professor, and the composition of the same shall be notified at the beginning of the activity and it can not be modified.
- in the work of all the members of the group have to have participated in the activities and have have learnt any aspect of exercise that is signed.
Bibliography

Basic:


Complementary:


Others resources:

Hyperlink

Associazione italiana per la ingegneria naturalistica