390212 - MMM - Microbiology and Microbial Metabolism

Coordinating unit: 390 - ESAB - Barcelona School of Agricultural Engineering
Teaching unit: 745 - DEAB - Department of Agri-Food Engineering and Biotechnology
Academic year: 2019
Degree: BACHELOR'S DEGREE IN BIOSYSTEMS ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan, Spanish

Coordinator: ROSA CARBÓ MOLINER

Degree competences to which the subject contributes

Specific:
1. Biochemistry: Microbiology and microbial metabolism.

Teaching methodology

The matter learning consists of lectures (large group) in which the teacher makes a speech to introduce the learning objectives related to the basic concepts of the subject. These sessions incorporate spaces for participation and involvement of students through questions and exposure of some technical-scientific topic published in the press, etc. The students participation is required in lab also. In the practical sessions the students develop typical skills of a microbiology lab, such as learning microbiological techniques, and they improve the group work learning.

Learning objectives of the subject

Students must acquire knowledge related to general and metabolic characteristics of microorganisms. Besides, they must know classify microorganisms into categories according to their specific metabolic characteristics and assess its ecological role, its geochemistry function and its usefulness in industrial processes. At the end of the course, the student must demonstrate an overview of the importance of microorganisms in the production of industrial products and in environmental sustainability.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 40h</th>
<th>26.67%</th>
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<tr>
<td></td>
<td>Hours medium group: 0h</td>
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<tr>
<td></td>
<td>Hours small group: 20h</td>
<td>13.33%</td>
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<td></td>
<td>Guided activities: 0h</td>
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<td>Self study: 90h</td>
<td>60.00%</td>
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## Content

### GENERAL MICROBIOLOGY

**Learning time:** 50h  
Theory classes: 12h  
Laboratory classes: 10h  
Self study: 28h

**Description:**
- Introduction to Microbiology. Classification and main characteristics of the microorganisms.  
- Environmental effects on microbial growth: nutrients, temperature, pH, osmotic pressure and oxygen effects.  

**Related activities:**
- Activity 1. Theory classes  
- Activity 2. Individual assessment test  
- Activity 3. Laboratory work

### METABOLIC DIVERSITY

**Learning time:** 50h  
Theory classes: 14h  
Laboratory classes: 10h  
Self study: 26h

**Description:**
- Catabolic and anabolic reactions. Obtaining precursor metabolites and energy.  
- Metabolism of microorganisms linked to cycles of matter with agricultural applications, in regeneration of water and environment. Oxidation and reduction of carbon, nitrogen and sulfur.  
- Aerobic and fermentative metabolism applied to industrial microbiology. Oxidation of different carbon sources (hexoses, polysaccharides, hydrocarbons ...), acids and lipids. Fermentative Diversity.  
- Photosynthetic microorganisms: importance in the environment and in obtaining metabolites of industrial interest. Photosynthetic Pigments.

**Related activities:**
- Activity 1. Theory classes  
- Activity 2. Individual assessment test  
- Activity 3. Laboratory work
### APPLICATION OF METABOLIC DIVERSITY

<table>
<thead>
<tr>
<th>Learning time: 50h</th>
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<tbody>
<tr>
<td>Theory classes: 10h</td>
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<td>Guided activities: 2h</td>
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<td>Self study : 38h</td>
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#### Description:
- Selection of microorganisms and the improved of the strains (industrial microbiology, food industry, environmental microbiology, pharmaceuticals etc.)
- Use of microbial metabolic activity: starter used, biochemistry and application technology

#### Related activities:
- Activity 1. Theory classes
- Activity 2. Individual assessment test
- Activity 3. Laboratory work

### Qualification system

The final qualification, Nfinal, is the sum of the partial marks:

- N1: 1st mid-term exam
- N2: 2nd mid-term exam
- N3: mark of lab

\[
N_{final} = 0.4 \times N1 + 0.4 \times N2 + 0.2 \times N3
\]

### Regulations for carrying out activities

Attendance at lab practices is mandatory. It must bring the material indicated in the script and to be on time to the practical sessions.
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Bibliography

**Basic:**


**Others resources:**

**Hyperlink**

Presentacions de classe
http://atenea.upc.edu/moodle/

Guió de pràctiques
http://atenea.upc.edu/moodle/

Lists of Bacterial Names Washington (DC): American Society for Microbiology

Todar's Online textbook of Bacteriology
http://www.textbookbacteriology.net/

Colección Española de Cultivos Tipo (CECT)
http://www.cect.org