Course guides
390351 - TURA - Treatment and Use of Waste and Water

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

Degree: BACHELOR’S DEGREE IN AGRONOMIC SCIENCE ENGINEERING (Syllabus 2018). (Compulsory subject).

Academic year: 2020 ECTS Credits: 6.0 Languages: Catalan, Spanish

LECTURER

Coordinating lecturer: Nuria Cañameras Riba

Others: Rosario M. Pastor Zegarra

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CE-CA-22HJ. (ENG) Ingeniería del medio ambiente y del paisaje. Legislación y gestión medioambiental. Principios del de desarrollo sostenible; Estrategias de mercado y del ejercicio profesional; Valoración de activos ambientales.

Generical:
CG8. (ENG) Capacidad de resolución de problemas con creatividad, iniciativa, metodología y razonamiento crítico.
CG10. (ENG) Capacidad para la búsqueda y utilización de la normativa y reglamentación relativa a su ámbito de actuación.

Transversal:
CT5. (ENG) Uso solvente de los recursos de información. Gestionar la adquisición, la estructuración, el análisis y la visualización de datos e información en el ámbito de especialidad y valorar de forma crítica los resultados de dicha gestión.
CT6. (ENG) Aprendizaje autónomo. Detectar deficiencias en el propio conocimiento y superarlas mediante la reflexión crítica y la elección de la mejor actuación para ampliar dicho conocimiento.

TEACHING METHODOLOGY

Learning without an inescapable determination and personal effort is not possible. From the first day of class, students will have support material that they will find in ATENEA. Therefore, they can begin to learn autonomously the basic concepts. In this way, students can participate more actively during classes. They will be able to take advantage of the concepts explained by the teaching staff. The student must understand that classes are complementary elements, and they have to work hard.

The classes will be participatory. During theory classes, teachers will raise questions to encourage student participation. The support material will be located in ATENEA. The small group activities will allow a closer interaction between students and teachers and between the students themselves. In these sessions, students will have a more relevant weight. The teaching staff will act as a facilitating agent to guide student activities.

LEARNING OBJECTIVES OF THE SUBJECT

Students must be able to demonstrate that they acquired the scientific and technical foundations that determine the use of wastewater and organic waste. However, they should be able to project an irrigation program for a farm, when using reclaimed water, and a good fertilization program using organic waste, taking into account agronomic, environmental and regulatory aspects.
STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>40,0</td>
<td>26.67</td>
</tr>
<tr>
<td>Hours small group</td>
<td>20,0</td>
<td>13.33</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

**Organic waste: sustainability and social commitment**

**Description:**
This content shows the origin of waste and organic products. These products can be at the same time, just like with reclaimed waters, a resource if they are used appropriately or be an environmental problem if they are not managed correctly. The importance of the main waste (FORM, sludge, livestock manure, etc.) will be analyzed based on official statistics.

**Related activities:**
Activity 1: Theory classes
Activity 2: Individual evaluation test
Activity 4: Directed sessions of exercises
Activity 5: Visits

**Full-or-part-time:** 13h
Theory classes: 4h
Self study: 9h

**Wastewater treatment**

**Description:**
This content is about the origin of wastewater. It is noted that wastewater represents both a resource and an environmental problem if they are not managed correctly. They are characterized from a physico-chemical and microbiological point of view, taking into account their possible reutilization in agriculture. The main treatment technologies to reclaim wastewater are announced. The main physical, chemical and biological processes are described. Highlights include aerobic and anaerobic biological treatments.

**Related activities:**
Activity 1: Theory classes
Activity 2: Individual assessment test
Activity 4: Classroom practices
Activity 5: Visits

**Full-or-part-time:** 23h 30m
Theory classes: 6h
Laboratory classes: 4h
Self study: 13h 30m
Agricultural use of reclaimed water

Description:
Once the wastewater treated has been characterized, an assessment is made about the ability to be used as non-conventional irrigation water. State regulations that determine its use will be studied. The agronomic criteria, that allow to use these waters in agriculture or gardening, will be presented. The bases for the programming of irrigation with reclaimed water will be established.

Related activities:
Activity 1: Theory classes
Activity 2: Individual assessment test
Activity 4: Classroom practices
Activity 5: Visits

Full-or-part-time: 23h 30m
Theory classes: 6h
Laboratory classes: 4h
Self study: 13h 30m

Organic waste treatment

Description:
In this content, the organic waste is characterized physically, chemically and microbiologically according its treatment. The main treatment technologies are evaluated in relation to their use in agriculture, such as composting and anaerobic digestion

Related activities:
Activity 1: Theory classes
Activity 2: Individual evaluation test
Activity 4: Classroom practices
Activity 5: Visits

Full-or-part-time: 43h
Theory classes: 12h
Laboratory classes: 4h
Self study: 27h

Agricultural use of organic waste

Description:
The regulations that determine the use, as fertilizers and/or organic amendments, of the main products and treated organic waste organically are considered. The agronomic criteria that must be considered for its application in agriculture will be examined. There will be examples of programming of the fertilization of an operation with by-products and organic waste treated.

Related activities:
Activity 1: Theory classes
Activity 2: Individual evaluation test
Activity 4: Classroom practices
Activity 5: Visits

Full-or-part-time: 45h
Theory classes: 12h
Laboratory classes: 6h
Self study: 27h
## ACTIVITIES

### Theory sessions

**Description:**
It involves 19 two-hour classroom sessions in which teachers will explain the concepts of theory that students need to know.

**Full-or-part-time:** 95h  
Theory classes: 38h  
Self study: 57h

### Evaluation test

**Description:**
These are two individual tests of 2 hour duration. One will be done in the middle of the course and the other at the end of the course. They will contain questions and exercises about the concepts and abilities related to the learning objectives of the subject.

**Specific objectives:**
Ensure that the student has acquired the concepts, knowledge and skills that are the object of the subject.

**Delivery:**
Delivery of the test

**Full-or-part-time:** 2h  
Theory classes: 2h

### Practical classes

**Full-or-part-time:** 11h  
Laboratory classes: 10h  
Self study: 1h

### Thematic visits

**Full-or-part-time:** 25h  
Laboratory classes: 10h  
Self study: 15h

## GRADING SYSTEM

The final qualification results from the following equation:

$$\text{Final Note} = 0.75 \times N1 + 0.20 \times N2 + 0.05 \times N3$$

$$N1 = 0.25 \times \text{Pl.1} + 0.25 \times \text{Pl.2} + 0.25 \times \text{Pl.3} + 0.25 \times \text{Pl.4}$$

- \text{Pl.1} is the qualification corresponding to wastewater treatments
- \text{Pl.2} is the qualification corresponding to organic waste treatments
- \text{Pl.3} is the qualification corresponding to the use of organic waste
- \text{Pl.4} is the qualification corresponding to the use of reclaimed water

- N2: results from the attendance and delivery of reports and / or exercises of the practical classes
- N3: results from assistance to established departures
EXAMINATION RULES.

The assistance and implementation of the proposed activities is mandatory. Reports and exercises must be delivered within the established deadline.

BIBLIOGRAPHY

Basic:
- Stoffella, Peter J; Kahn, Brian A. Utilización de compost en los sistemas de cultivo hortícola. Madrid [etc.]: Mundi-Prensa, 2005. ISBN 848476186X.

Complementary: