390351 - TURA - Treatment and Use of Waste and Water

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 AGRONOMIC SCIENCE ENGINEERING (Syllabus 2018). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: 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 desarrollo sostenible; Estrategias de mercado y del ejercicio profesional; Valoración de activos ambientales.

General:
CG8. (ENG) Capacidad de resolución de problemas con creatividad, iniciativa, metodología y razonamiento crítico.

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>Total learning time: 150h</th>
<th>Hours large group: 40h 26.67%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours small group: 20h 13.33%</td>
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<tr>
<td></td>
<td>Self study: 90h 60.00%</td>
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</tbody>
</table>
Organic waste: sustainability and social commitment

**Learning time:** 13h
- Theory classes: 4h
- Self study: 9h

**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

Wastewater treatment

**Learning time:** 23h 30m
- Theory classes: 6h
- Laboratory classes: 4h
- Self study: 13h 30m

**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
### Agricultural use of reclaimed water

**Learning time:** 23h 30m  
- Theory classes: 6h  
- Laboratory classes: 4h  
- Self study: 13h 30m

**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

### Organic waste treatment

**Learning time:** 43h  
- Theory classes: 12h  
- Laboratory classes: 4h  
- Self study: 27h

**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
### Agricultural use of organic waste

**Learning time:** 45h  
- Theory classes: 12h  
- Laboratory classes: 6h  
- Self study: 27h

**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
## Planning of activities

| Theoretical sessions | Hours: 95h  
| Theory classes: 38h  
| Self study: 57h  |
|---|---|
| **Description:** | It involves 19 two-hour classroom sessions in which teachers will explain the concepts of theory that students need to know. |

| Evaluation test | Hours: 2h  
| Theory classes: 2h  |
|---|---|
| **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 |

**Description of the assignments due and their relation to the assessment:**
Delivery of the test

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

| Practical classes | Hours: 11h  
| Self study: 1h  
| Laboratory classes: 10h  |
|---|---|

| Thematic visits | Hours: 25h  
| Laboratory classes: 10h  
| Self study: 15h  |
|---|---|

## Qualification system

The final qualification results from the following equation:

Final Note = 0.75 * N1 + 0.20 * N2 + 0.05 * N3

N1 = 0.25 * Pl.1 + 0.25 * Pl.2 + 0.25 * Pl.3 + 0.25 * Pl.4

Pl.1 is the qualification corresponding to wastewater treatments  
Pl.2 is the qualification corresponding to organic waste treatments  
Pl.3 is the qualification corresponding to the use of organic waste  
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
Regulations for carrying out activities

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


