Course guide
390351 - TURA - Waste and Water Treatment and Use

Last modified: 15/01/2024

Unit in charge: Barcelona School of Agri-Food and Biosystems 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: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: López Martínez, Marga

Others: Pastor Zegarra, Rosario Margarita
López Martínez, Marga

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

Type	Hours	Percentage
Hours large group	40,0	26.67
Self study	90,0	60.00
Hours small group	20,0	13.33

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.

Specific objectives:
- To achieve the knowledge to decide the use of diferent organic waste produced in agriculture, livestock, municipal and industrial

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

Full-or-part-time: 14h
Theory classes: 4h
Self study : 10h

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: 34h
Theory classes: 9h
Laboratory classes: 5h
Self study : 20h

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: 34h
Theory classes: 9h
Laboratory classes: 5h
Self study : 20h

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, suchs as composting and anaerobic digestion

Specific objectives:
- To identify the bological and environmental aspects of the biological treatments
- To identify the main characteristics of the products of the biological treatments

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

Full-or-part-time: 34h
Theory classes: 9h
Laboratory classes: 5h
Self study : 20h

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.

Specific objectives:
- To understand the main features of the use of organic waste and products
- To be able to program the fertilisation

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

Full-or-part-time: 34h
Theory classes: 9h
Laboratory classes: 5h
Self study : 20h

ACTIVITIES

Theory sessions

Description:
40 h classroom sessions. Items for this activity are described in the contents section.

Specific objectives:
Indicated in the contents of each topic.

Material:
Slides, bibliography. Calculator

Delivery:
Tasks in Atenea

Full-or-part-time: 94h
Theory classes: 38h
Self study: 56h

Projects

Description:
These are oral presentations in the middle of the course and at the end of the course. They will contain questions about the concepts and skills related to the learning objectives of the subject. Presentations will be assessed by teachers and students.

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

Delivery:
Delivery of presentations in PPT format

Full-or-part-time: 22h
Theory classes: 2h
Self study: 20h

Practical classes

Description:
2 h sessions. The teachers will propose problems related to use of regenerated water and treatement and use of organic waste.
The class will split in groups 3-4 people to promote assitance as well as participation and discusion.
Before srtarting, the main contents of the theory necessary to the development of the session will be explained.
The exercices will be returned to the students once marked.

Specific objectives:
At the end of the course, the student will be able to:
- Assess the composition of a regenerated water to be used in agriculture or other purpose
- Design watering programs with regenerated waters
- Assess the composition of organic waste and products of their treatment to be use with fertilising or amending purposes
- Desing fertilisation programs

Material:
Documents available in ATENEA, paper, calculator

Delivery:
The students will deliver the reports when proposed.

Full-or-part-time: 12h
Laboratory classes: 6h
Self study: 6h

Thematic visits

Description:
Different visits related to the subject will be performed:
- Waste water treatment plant
- Solid organic waste treatment plant

Full-or-part-time: 20h
Laboratory classes: 12h
Self study: 8h

Exam

Description:
Individual test at the end of each part.
The assistance is compulsory.

Specific objectives:
To assess the maturity of the knowledge and skills acquired in the sessions of lectures and in the resolution of problems and applied cases.

Material:
Test, calculator.

Delivery:
Solved exam.

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

GRADING SYSTEM

The evaluable sections of the subject are the following:

N1: treatment and use of water
N2: treatment and use of waste
N3: participation and delivery of reports
N4: technical visits

Final score: 0.35N1 + 0.35N2 + 0.20N3 + 0.10N4

EXAMINATION RULES.

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

BIBLIOGRAPHY

Basic:

- Bernal Calderón, M. Pilar. Guía de utilización agrícola de los materiales digeridos por biometanización [Recurs electrònic] [on line]. [Madrid]: CSIC, 2011 [Consultation: 15/04/2020]. Available on: http://213.229.136.11/bases/ainia_probiogas.nsf/0/89A368DD73F7282DC125753F00587325/$FILE/PROBIOGAS_GuiaDigerido.pdf. ISBN 9788469418680.
- Haug, Roger Tim. The Practical handbook of compost engineering. Boca Raton [etc.]: Lewis, 1993. ISBN 0873713737.
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- Soliva Torrentó, Montserrat. Compostatge i gestió de residus orgànics. Barcelona: Diputació de Barcelona, 2001. ISBN 8477948038.
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Complementary:

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- Hoitink, Harry A. J; Keener, Harold M. Science and engineering of composting : design, environmental, microbiological and utilization aspects. Worthington [Ohio]: Renaissance, cop. 1993. ISBN 0936645156.
- Polprasert, Chongrak. Organic waste recycling : technology and management. 3rd ed. London: IWA, 2007. ISBN 9781843391210.
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