Course guide
250MEA008 - 250MEA008 - Recovery of Bioproducts and Bioenergy

Last modified: 26/06/2024

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.

Degree: MASTER'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2024). (Optional subject).

Academic year: 2024 **ECTS Credits:** 5.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: IVET FERRER MARTI

Others: Fabiana Passos
Estel Rueda Hernández

TEACHING METHODOLOGY

The teaching methodologies used are as follows:
- Lectures and conferences: contents exposed by lecturers or guest speakers.
- Practical sessions: resolution of exercises, debates and group dynamics with the lecturer and other students in the classroom; classroom presentation of an activity individually or in small groups.
- Laboratory / Workshop: field trip.
- Theoretical / practical supervised work: classroom activity, carried out individually or in small groups, with the advice and supervision of the teacher.
- Homework assignment of reduced extension: to carry out homework of reduced extension, individually or in groups.
- Homework assignment of broad extension (PA): design, planning and implementation of a project or homework assignment of broad extension to be performed by a group of students, and writing of a report that should include the approach followed, the main results obtained and the conclusions reached.
- Evaluation activities.

The training activities used are as follows:
Face to face activities
- Lectures and conferences: learning based on understanding and synthesizing the knowledge presented by the teacher or by invited speakers.
- Participatory sessions: learning based on participating in the collective resolution of exercises, as well as in discussions and group dynamics with the lecturer and other students in the classroom.
- Presentations: learning based on the presentation of an activity in the classroom, individually or in small groups.
- Laboratory / Workshop: field trip.
- Theoretical-practical supervised work: learning based on performing an activity in the classroom with the advice of the teacher.

Study activities
- Homework assignment of reduced extension: learning based on applying the gained knowledge and presenting results, individually or in small groups.
- Homework assignment of broad extension: learning based on applying and extending knowledge gained in class, individually or in group.
- Self-study: learning based on studying or extending the contents of the class material, individually or in groups, understanding, assimilating, analyzing and synthesizing concepts.

LEARNING OBJECTIVES OF THE SUBJECT

Objective: To build a solid foundation of knowledge and skills to face the design of biofuels / bioproducts facilities.
At the end of the course, the student:
- Understands the role of bioenergy in the global and regional energy system; is aware of economic, social and environmental impacts; understands the impact of associated technologies in a local and global context.
- Knows relevant organizations and major projects at regional and international scale; along with the main information sources and regulations.
- Has criteria for the analysis and knowledge to carry out a basic engineering project on the production of biofuels / bioproducts.
- Is able to transfer knowldedge related to the implementation of technologies for the production of biofuels / bioproducts by developing innovative ideas.

STUDY LOAD

Type	Hours	Percentage
Hours medium group	9,8	7.83
Hours large group	25,5	20.38
Hours small group	9,8	7.83
Self study	80,0	63.95

Total learning time: 125.1 h

CONTENTS

INTRODUCTION

Description:
1. Biomass and bioenergy
2. Sources of biomass
3. Types of biofuels and production processes
4. Biorefineries. Circular bioeconomy. Case studies
5. Energy transition. National and international regulations

Specific objectives:
- To define the concepts of biomass, bioernergy, biorefinery, and circular bioeconomy.
- To identify the different types of biofuels and biomass sources.
- To describe the current situation in the field of biofuels.

Full-or-part-time: 8h 20m
Theory classes: 3h
Self study : 5h 20m

BIOGAS

Description:
1. Anaerobic digestion
2. Anaerobic technologies
3. Low-tech digesters
4. Biogas upgrading

Specific objectives:
- To describe the anaerobic digestion process.
- To identify and design anaerobic technologies.
- To show sustainability aspects related to low-tech digesters.
- To describe biogas upgrading processes.

Full-or-part-time: 41h 40m
Theory classes: 8h 30m
Practical classes: 2h 45m
Laboratory classes: 3h 45m
Self study : 26h 40m

BIOFUELS

Description:
1. Biohidrogen
2. Bioethanol
3. Biodiesel

Specific objectives:
- To describe production processes for gaseous and liquid biofuels.

Full-or-part-time: 25h
Theory classes: 3h
Practical classes: 3h
Laboratory classes: 3h
Self study : 16h

(BIO)PRODUCTS

Description:
1. Nutrients
2. Biopolymers
3. Bioplastics
4. Metals

Specific objectives:
- To describe processes for resource recovery from waste materials and water.

Full-or-part-time: 50h
Theory classes: 11h
Practical classes: 4h
Laboratory classes: 3h
Self study : 32h

GRADING SYSTEM

Written test of knowledge (PE): 70%
Assignments done individually or in groups (TR): 30%

EXAMINATION RULES.

The examination will be held individually and consists of two parts: theory and exercises. During the exam, it will not be allowed the accession to the internet nor the use of mobile phones.
TR: The evaluation will be done based on two kinds of activities: oral presentation of an assignement; and a report on a biogas project. Both activities will be conducted in groups of no more than three people.

BIBLIOGRAPHY

Basic:
- Feliu, A.; Flotats, X. Los gases renovables: un vector energético emergente [on line]. Madrid: Fundación Naturgy, 2019 [Consultation: 11/11/2024]. Available on: https://upcommons.upc.edu/handle/2117/191063. ISBN 9788409152704.
- Solera del Río, R. Aspectos biológicos de la digestión anaeróbica. Madrid: Mundi-Prensa, 2014. ISBN 9788484767008.
- Flotats i Ripoll, Xavier. Ingeniería y aspectos técnicos de la digestión anaeróbica. Madrid: Mundi-Prensa, 2016. ISBN 9788484766292.
- Mata Álvarez, J. Digestió anaeròbica de residus sòlids urbans. Barcelona: Diputació de Barcelona, Àrea de Medi Ambient, 2002. ISBN 8477948658.

Complementary:
- Lema, J.M.; Suárez, S. (eds.). Innovative wastewater treatment & resource recovery technologies: impacts on energy, economy and environment [on line]. London: IWA Publishing, 2017 [Consultation: 13/09/2024]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=4939114. ISBN 9781780407876.