VNIVERSITAT DE VALÈNCIA

Course Guide
33196 Environmental biotechnology processes engineering

COURSE DATA

Data Subject	
Code	33196
Name	Environmental biotechnology processes engineering
Cycle	Grade
ECTS Credits	4.5
Academic year	2021 - 2022

Study (s)

Degree	Center	Acad. year	Period
1102 - Degree in Biotechnology	Faculty of Biological Sciences	4	First term

Subject-matter

Degree	Subject-matter	Character
1102 - Degree in Biotechnology	106 - Environmental biotechnology process engineering	Optional

Coordination

Name	Department
GIMENEZ GARCIA, JUAN BAUTISTA	245 - Chemical Engineering
SAN VALERO TORNERO, PAU	245 - Chemical Engineering

SUMMARY

Engineering Processes in Environmental Biotechnology is a 4,5 credits optional course that is taught in the first semester of the fourth year of the Biotechnology Degree of the University of Valencia.

The main objective is that the students acquire knowledge on the application of Biotechnology in the field of Environmental Engineering. In this sense, the contents of this course provide, from a practical approach, the fundamentals required to design and operate the main biological processes used for the treatment of wastewaters, solid wastes and air emissions.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

It is suggested to pass previously the next subjects in order to affront with guaranties the matter: Introduction to Biochemical Engineering, Bioreactors, and Basic operations on biotechnological processes.

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

1102 - Degree in Biotechnology

- Conocer los diferentes tipos de procesos biotecnológicos asociados a la producción industrial.
- Diseñar procesos de manipulación y obtención de productos biotecnológicos.
- Aplicar soluciones biotecnológicas a problemas medioambientales.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

At the end of the course, the student must have acquired the following skills:

- Know the main applications of Biotechnology in Environmental Engineering
- Understand the environmental problems related to wastewaters, solid wastes and air emissions.
- Be able to interpret the parameters that characterize wastewaters, solid wastes and air emissions.
- Acquire basic knowledge about the treatment scheme of wastewater and solid waste treatment plants.
- Control the technical principles available in the design and operation of the biological processes of wastewater treatment.
- Control the technical principles available in the design and operation of the biological processes of solid wastes.
- Control the technical principles available in the design and operation of the biological processes of polluted air
- Be able to work in a multilingual and multidisciplinary environment.

DESCRIPTION OF CONTENTS

1. Biotechnological processes in environmental engineering

Introduction

2. Biological wastewater treatments

Introduction to wastewater problems. Characterization parameters.
Wastewater treatment scheme. Material flow
Suspended-growth biological treatment: process design and operational parameters. Equipment, instrumentation and control.
Attached-growth biological treatment: process design and operational parameters. Equipment, instrumentation and control.
Sludge treatment: process design and operational parameters. Equipment, instrumentation and control.

3. Biological treatments of solid wastes

Introduction to solid wastes problems. Characterization parameters.
Composting plants for solid wastes treatment. Material flow. Mixing and aeration equipments
Anaerobic digestion plants for solid wastes treatment. Material flow. Energetic use of biogas
Anaerobic digestion plants for solid wastes treatment. Material flow. Energetic use of biogas
Technologies for energy production from solid wastes

4. Biological treatments of polluted air

Introduction to odors and organic volatile compounds problems.
Reaction schemes. Equipment, instrumentation and control.
Process design and operational parameters

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	28,00	100
Laboratory practices	15,00	100
Tutorials	2,00	100
Development of group work	5,00	0
Development of individual work	7,50	0
Study and independent work	15,00	0
Readings supplementary material	2,00	0
Preparation of evaluation activities	10,00	0
Preparing lectures	5,00	0
Preparation of practical classes and problem	10,00	0
Resolution of case studies	10,00	0
Resolution of online questionnaires	3,00	0
TOTAL	**112,50**	

TEACHING METHODOLOGY

The methodology used in the course will consider the following aspects:

Lecture sessions: Single group to introduce the theoretical and practical principles of the course.

Practical lessons: Practical questions and problems will be solved in groups of 40 students (max) in a regular classroom. Also, resolution of problems will be proposed to the students who will individually solve.

Laboratory sessions: Students will work with wastewater treatment plants at pilot scale. Then, the students will submit a report about the work carried out at the lab. These sessions are mandatory for all the students.

Multidisciplinary and multilingual Seminar: Students will participate in a mandatory seminar in order to analyze and discuss in public a current scientific work.

Tutorials: Students will be divided into small groups and participate in mandatory sessions to solve any question they have.

EVALUATION

The evaluation of the course is based in two methods:

Method A:

1. Practice work (40% of grade), which are divided into:

- On-line question lists (10% of grade)

- Resolution of design problems (15% of grade). Students will be evaluated by the submission of several problems related to the design of any of the biological processes studied.

- Multidisciplinary and multilingual seminar (7.5% of grade). Students will be evaluated by an oral presentation. The work carried out, the ability to expose in public and the capability to discuss the subject will be evaluated.

-Laboratory (7.5% of grade). Students will be evaluated by the submission of a report about the work carried out. Students which fail the laboratory practices by the not attendance to the laboratory session, will not have another opportunity to do the laboratory practices during the same course.

2. Objective test (60% of grade): Based on a written test with theoretical and practical questions. It is mandatory to obtain in the objective test a grade equal or greater than 4.0 (out of 10).

The course will be over passed when the weighted average grade is equal to or greater than 5 (out of 10), being mandatory to obtain in the objective test a grade equal or greater than 4.5 (out of 10) and to assist to the mandatory sessions (lab and seminar). If the objective test grade is lower than 4, the final qualification will be the one obtained in the objective test.

Method B: The students that cannot follow Method A (only due to justified reasons as work, Erasmus o similar), will carry out the objective test.

REFERENCES

Basic

- Ferrer, J., Seco, A. (2007) Tratamientos Biológicos de de Aguas Residuales. Editorial Universidad Politécnica de Valencia.
- Metcalf & Eddy (2003) Wastewater Engineering. Treatment and Reuse, 4ª Ed., McGraw-Hill, New York.
- Tchobanoglous, G., Theisen, H., Vigil, S.A. (1996) Gestión Integral de Residuos Sólidos. McGraw-Hill Interamericana de España, Madrid.
- Z. Shareefdeen, A.S. Biotechnology for odor and air pollution control (2005) Springer, Berlin

Additional

- Leslie Grady Jr. C.P., Daigger G.T., Lim, H.C. (1999) Biological Wastewater Treatment. Marcel Dekker, Inc. New York.
- Castells, X.E. (2005) Tratamiento y valorización energética de residuos. Díaz de Santos, Madrid
- de Nevers, N. (1998) Ingeniería de Control de la Contaminación del Aire. McGraw-Hill Interamericana, México.

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

1. Contents

All the contents initially programmed in the teaching guide will be maintained.

Only in the case that the sanitary situation does not allow face-to-face attendance to the laboratory sessions, these will be replaced by virtual tasks with analogous content.

2. Workload

The workload will be maintained according to the original teaching guide.

3. Teaching methodology

In the exceptional case that the sanitary situation does not allow the usual development of the classes, these will be carried out according to how the competent authorities dictate (partial presence, or 100% virtual), adapting the methodology to the situation.

Therefore, the distribution of teaching and the relationship between face-to-face and non-face-to-face activities may be modified throughout the course if health conditions require it.

4. Evaluation

The evaluation will be developed according to the teaching guide. In the exceptional case that the sanitary situation does not allow the corresponding tests to be performed in person, these will be replaced by similar tests virtually.