# COURSE DATA

## DATA SUBJECT

**Code:** 33196
**Name:** Environmental biotechnology processes engineering
**Cycle:** Undergraduate Studies
**ECTS Credits:** 4.5
**Academic year:** 2025-26

## STUDY (S)

| Degree | Center | Acad. year | Period |
|---|---|---|---|
| 1111 - Grado en Biotecnología | Facultat de Ciències Biològiques | 4 | First quarter |

## SUBJECT-MATTER

| Degree | Subject-matter | Character |
|---|---|---|
| 1111 - Grado en Biotecnología | Optability | ELECTIVES |

## COORDINATION

GIMENEZ GARCIA JUAN BAUTISTA

SAN VALERO TORNERO PAU

# 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 / LEARNING OUTCOMES

**-**

Actuar con autonomía en el aprendizaje, tomando decisiones fundamentadas en diferentes contextos, emitiendo juicios en base a la experimentación y el análisis y transfiriendo el conocimiento a nuevas situaciones

Aplicar soluciones biotecnológicas a problemas medioambientales.

Colaborar eficazmente en equipos de trabajo, asumiendo responsabilidades y funciones de liderazgo y contribuyendo a la mejora y desarrollo colectivo

Conocer los diferentes tipos de procesos biotecnológicos asociados a la producción industrial.

Contribuir en el diseño, desarrollo y ejecución de soluciones que den respuesta a demandas sociales, teniendo en cuenta como referente los Objetivos de Desarrollo Sostenible

Demostrar razonamiento crítico y autocrítico en el ámbito de la titulación, considerando aspectos tales como la ética profesional, los valores morales y las implicaciones sociales de las diferentes actividades realizadas

Diseñar procesos de manipulación y obtención de productos biotecnológicos.

Propose creative and innovative solutions to complex situations or problems, typical of the area of ¿¿¿¿connection, to donate responses to the various professional and social needs

Saber comunicarse de manera efectiva, tanto de forma oral como escrita, adaptándose a las características de la situación y de la audiencia

## DESCRIPTION OF CONTENTS

### 1. Biotechnological processes in environmental engineering

Introduction

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,

## 2. Biological wastewater treatments

Introduction to wastewater problems. Characterization parameters.
Wastewater treatment scheme. Material flowinstrumentation 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

### PRESENCIAL ACTIVITIES

| Activity | Hours |
|---|---|
| Tutorials | 2,00 |
| Theory | 28,00 |
| Laboratory | 15,00 |
| **Total hours** | **45,00** |

### NON PRESENCIAL ACTIVITIES

| Activity | Hours |
|---|---|
| Attendance at other activities | 0,00 |
| Individual or group project | 12,50 |
| Independent study and work | 17,00 |
| Preparation of lessons | 15,00 |
| Preparation for assessment activities | 13,00 |
| Resolution of case studies | 10,00 |
| **Total hours** | **67,50** |

# 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


- Leslie Grady Jr. C.P., Daigger G.T., Lim, H.C. (1999) Biological Wastewater Treatment. Marcel Dekker, Inc. New York.
- 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
- 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.