## SUBJECT GUIDE 2020-2021

### Industrial Bioprocesses

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### LECTURER

- Javier Miguel Ochando Pulido
- Pedro J. García Moreno

**CONTACT ADDRESS FOR TUTORSHIP**

- Javier Miguel Ochando Pulido (jmochandop@ugr.es)
  - Office number 8
  - Department of Chemical Engineering
  - Faculty of Sciences
- Pedro J. García-Moreno (pjgarcia@ugr.es)
  - Office number 8
  - Department of Chemical Engineering
  - Faculty of Sciences

### TUTORING SCHEDULE

- Javier Miguel Ochando Pulido
  - [http://sl.ugr.es/jmochandop](http://sl.ugr.es/jmochandop)
- Pedro J. García Moreno
  - [http://sl.ugr.es/pjgarcia](http://sl.ugr.es/pjgarcia)

### DEGREE WHERE THE SUBJECT IS TAUGHT

- Food Science and Technology

### OTHER DEGREES WHERE THIS SUBJECT COULD BE TAUGHT

- Chemical Engineering

### REQUERIMENTS AND RECOMENDATIONS (if needed)

- It is advisable to have completed the module in Food Technology. This subject can be taken in 3rd or 4th year

### BRIEF DESCRIPTION OF THE CONTENTS

- Kinetics of enzymatic reactions.
- Kinetics of the microbial growth.
- Immobilized Biocatalysts.
- Bioreactors.
- Enzymatic reactors.
- Batch fermenters.
- Continuous fermenters.
- Stirring, aeration and sterilization.
- Separation
SPECIFIC AND GENERAL SKILLS (Please refer to the report “Memoria de Verificación del Grado CTA”)

General skills: CG.01 – CG and CB1 to CB5.
Specific skills: CE.1, CE.2, CE.3, CE.6 and CE.15

OBJETIVES (REPORTED AS EXPECTED CAPABILITIES ACQUIRED FROM THE LEARNING PROCESS)

After completing this subject, the student should be able to:

- Develop phenomenological models for enzymatic and fermentation processes and estimate their reaction parameters.
- Set experimental designs for the study of an enzymatic or microbiological kinetics.
- Develop models to optimize the performance of a bioreactor.
- Develop the separation operations needed for the concentration and purification of a given product.

DETAILED SYLLABUS OF THE SUBJECT

THEORETICAL PROGRAM:

1. **Introduction to Industrial bioprocesses.** Enzymatic and fermentation processes. Industrial applications.


9. **Stirring, aeration and sterilization.** Heat transfer. Oxygen transfer. Sterilization of culture media.

**PRACTICAL PROGRAM:** Computer-aided simulation activities related to enzymatic and fermentation kinetics.


**FURTHER READING**

- Dunn IJ. Y cols. Biological reaction engineering. Ed VCH. 1992
- Ghose TK. Bioprocess computations in biotechnology. Ellis Horwood. 1990

**WEB LINKS**

www.sciencedirect.com
www.scopus.com

**TEACHING METHODOLOGY**

- Theoretical lectures. Skills: CG 1, 2, 4, 7, 11 y 13; CB 1, 2 y 3; CE 1, 2, 6 y 15
- Practical lectures. Skills: CG 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 y 14; CB 1, 2, 3, 4 y 5; CT 2; CE 1, 2 y 6.
- Computer-aided activities. Skills: CG 1, 2, 3, 4, 7, 8, 11 y 12; CB 1, 2, 3 y 5; CT 2; CE 1, 2 y 6.
- Specialized tutoring.
CONTINUOUS ASSESSMENT

- 60% Written exam on theoretical and practical contents (SE1). Skills: CG 1, 2, 4, 5, 7 y 8; CB 1-3; CE 1, 2 y 6
- 10% Exam on computer activities (SE2). Skills: CG 1, 2, 4, 5, 7 y 8; CB 1-3; CT 2; CE 1, 2 y 6
- 25% Team work activities (SE3). Skills: CG 3, 4, 5, 7, 8, 10, 11 y 14; CB 1-5; CT 2; CE 1, 2, 6 y 15.
- 5% Classroom active participation (SE4). Skills: CG 1, 2, 3, 6 y 10

FINAL EVALUATION

Comprising a single examination. Those students interested in being evaluated by this procedure should request the approval of the director of the department two weeks after the course registration, according to the Evaluating Regulations for the students of the University of Granada (approved by the Council 20/05/2013). This request should provide and certify the reasons for not attending regular lectures.

- 80% Written exam on the theory and practice program (SE1). Skills: CG 1, 2, 4, 5, 7 y 8; CB 1-3; CE 1, 2 and 6. It is mandatory to obtain a minimal mark of 5 over 10.
- 20% Exam on computer skills (SE2). Skills: CG 1, 2, 4, 5, 7 y 8; CB 1-3; CT 2; CE 1, 2 and 6. It is mandatory to obtain a minimal mark of 5 over 10.

REMEDIAL EVALUATION

Comprising a single examination, for those students who have not passed the subject in the June evaluation period.

- 80% Written exam on the theory and practice program (SE1). Skills: CG 1, 2, 4, 5, 7 y 8; CB 1-3; CE 1, 2 and 6. It is mandatory to obtain a minimal mark of 5 over 10.
- 20% Exam on computer skills (SE2). Skills: CG 1, 2, 4, 5, 7 y 8; CB 1-3; CT 2; CE 1, 2 and 6. It is mandatory to obtain a minimal mark of 5 over 10.