



ESCUELA TÉCNICA SUPERIOR DE INGENIERÍA  
AGRONÓMICA Y DE MONTES  
**GRADO DE INGENIERÍA  
AGROALIMENTARIA Y DEL MEDIO  
RURAL**



2024/25 YEAR

**MICROBIOLOGÍA Y BIOTECNOLOGÍA  
INDUSTRIAL**

### Course details

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**Course name:** MICROBIOLOGÍA Y BIOTECNOLOGÍA INDUSTRIAL

**Code:** 100974

**Degree/Master:** GRADO DE INGENIERÍA AGROALIMENTARIA Y DEL MEDIO  
RURAL

**Year:** 3

**Field:** MICROBIOLOGÍA Y BIOTECNOLOGÍA INDUSTRIAL

**Character:** OBLIGATORIA

**Duration:** SECOND TERM

**ECTS Credits:** 6.0

**Classroom hours:** 60

**Face-to-face classroom percentage:** 40.0%

**Study hours:** 90

**Online platform:** <https://moodle.uco.es/>

### Coordinating teacher

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### Brief description of the contents

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- Know the components of a fermentation system: microorganisms, bioreactor and raw material.
- Learn the implications of microorganisms in food.
- Study the transformations and products obtained: biomass, primary and secondary metabolites, enzymes, food and beverages.
- Know the fundamentals, methodology and applications of the use of enzymes in the agri-food industry.
- Seek information on other biotechnological applications in the agri-food sector.
- Know the basic fundamentals of enzyme biotechnology and its applications in the agri-food, forestry, environmental and energy sectors.

### Prerequisites

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#### Prerequisites established in the study plan

Nothing

#### Recommendations

- Basic knowledge of microbiology and enzymes, those taught in the subject "Biological Bases of Agricultural Production" and "Extension of Chemistry and Biochemistry", respectively, both in the

first year of the degree in Agri-Food and Rural Engineering.

- Ability to read and understand scientific and technical texts in English.
- Use of basic computer tools and Artificial Intelligence for the possible virtual monitoring of teaching and for the search for information and data management.

## Study programme

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### 1. Theory contents

Master classes:

INDUSTRIAL MICROBIOLOGY (I). Concept and historical development of Industrial Microbiology. Isolation of micro-organisms of industrial interest. Sources of nutrients for the growth of industrial microorganisms. Fermentative processes. Physico-chemical factors affecting fermentation processes. Preparation of industrial inoculums. Bioreactors. Continuous and discontinuous processes.

INDUSTRIAL MICROBIOLOGY (II). Biomass production. Primary and secondary metabolites. Alcoholic beverages: beer, wine, vinegar. Other foodstuffs. Implications of microorganisms in food. Use of agricultural and food waste in a bioeconomy context.

ENZYMATIC BIOTECHNOLOGY (III) Introduction and generalities. Enzymes, structural characteristics, as catalysts and kinetic properties. Nomenclature system and classification of enzymes. Methodological aspects of enzyme biotechnology: enzyme sources, enzyme assays, activity units, extraction and purification, obtaining commercial preparations. Enzyme immobilisation, methods and applications. Enzyme engineering. Historical development and current situation of the enzyme biotechnology sector, economic and multinational aspects of the sector. Applications in the agri-food sector. Biofuel production. Other applications.

### 2. Practical contents

#### 2. Practical content

##### *LABORATORY PRACTICES*

1. Preparation of culture media for micro-organisms. Sowing and culture of micro-organisms.
2. Isolation and preservation of micro-organisms.
3. Microscopic observation techniques for fungi and bacteria. Staining.
4. Counting of total and viable micro-organisms.
5. Identification of yeasts and bacteria.
6. Secondary screening of microorganisms of industrial interest.
7. Determination of enzyme activities. Invertase assays.
8. Immobilisation of enzymes. Immobilisation of invertase in alginate gels.

##### *CLASSROOM PRACTICES*

1. Search for information and bibliographic sources.
2. Lectures.
3. Seminars.

## Bibliography

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<style isBold="true">1. Bibliografía básica:</style>

<a href="https://www.google.com/url?q=https://www.sciencedirect.

com/topics/index&sa=D&ust=1589273810204000&usg=AFQjCNFU9kVOv-xGgbG3XjdwUJj5JfGNxA" type="Reference"><https://www.sciencedirect.com/topics/index></a>  
 <a href="https://www.google.com/url?q=https://www.nature.com/subjects&sa=D&ust=1589273810204000&usg=AFQjCNEGsZ1L48i\_6QFRtuWWLH9TiqE6fg" type="Reference"><https://www.nature.com/subjects></a>  
 BROWN CM, CAMPBELL I, PRIEST FG. (última ed.). Introducción a la Biotecnología. Ed. Acribia, Zaragoza.  
 CRUEGER W, CRUEGER A. (última ed.). Biotecnología. Manual de Microbiología Industrial. Ed. Acribia, Zaragoza. OKAFOR N. (2007). Modern Industrial and Biotechnology. CRC Press, New York.  
 WISEMAN, A. Manual de Biotecnología de los Enzimas. Editorial Acribia S.A., Zaragoza, 1991.  
 NOVO ZYMES. Enzymes at work. [http://www.novozymes.com/en/about-us/brochures/Documents/Enzymes\\_at\\_work.pdf](http://www.novozymes.com/en/about-us/brochures/Documents/Enzymes_at_work.pdf)  
 CHAPLIN, M.F.; BUCKE, C. Enzyme Technology. Cambridge University Press, Cambridge, 1990. (<http://www.lsbu.ac.uk/biology/enztech/>).  
 MARTÍN GIL, J. El Futuro de los Biocombustibles: Biorrefinerías Integradas. UVA - Lecc. inaugural curso 2009/10, 2009. (<http://uvadoc.uva.es/bitstream/10324/2017/1/Disc>.)  
 <style isBold="true">2. Bibliografía complementaria: </style>Bibliografía complementaria se le dará al alumnado a lo largo del curso.  
 <style isBold="true">3. Fuentes para la búsqueda bibliográfica: </style>PubMed (<https://pubmed.ncbi.nlm.nih.gov/>), WoS (<https://www.webofscience.com/wos/alldb/basic-search>), Perplexity (<https://www.perplexity.ai/>).

## Methodology

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### General clarifications on the methodology (optional)

MASTER CLASSES: Lectures with presentations and audiovisual support. The active participation of students will be encouraged. Seminars given by the students, under the guidance and supervision of the lecturer.

PRACTICAL CLASSES: Presentation of the objectives of each practice and the instrumental means and techniques available. Practical work under the supervision of the lecturer. Establishment of working groups. Presentation of the results, comments and conclusions.

In relation to the development and evaluation of the subject, the lecturer may implement special measures in a justified and motivated manner, especially with regard to the evaluation of students, including the possible non-approval of the subject, in cases of exceptional situations such as plagiarism, use of fraudulent methods in assignments or exams, as well as other circumstances that may affect the principle of proportionality, such as repeated absences or any violation of the basic rules of coexistence established in the Coexistence Regulations of the University of Cordoba (approved by the Governing Council on 1 July 2016).

### Methodological adaptations for part-time students and students with disabilities and special educational needs

The methodological strategies and the evaluation system contemplated in this Teaching Guide will be adapted according to the needs presented by students with disabilities and special educational needs when required.

**Face-to-face activities**

Activity	Large group	Small group	Total
<i>Information processing activities</i>	5	-	5
<i>Oral communication activities</i>	5	-	5
<i>Practical experimentation activities</i>	-	15	15
<i>Projects based on the course contents</i>	30	-	30
<i>Reading comprehension, listening, visual, etc. activities</i>	3	-	3
<i>Tutorial action activities</i>	2	-	2
<b>Total hours:</b>	<b>45</b>	<b>15</b>	<b>60</b>

**Off-site activities**

Activity	Total
<i>Exercise and problem solving activities</i>	15
<i>Information processing activities</i>	60
<i>Information search activities</i>	15
<b>Total hours</b>	<b>90</b>

**outcomes of the learning process****Knowledge, skills and abilities**

CB1	Knowledge of basic, scientific, and technical materials that allow for ongoing learning as well as an ability to adapt to new situations or outside factors/changes
CB2	Creative problem solving. Using initiative, methodology, and critical thinking.
CU2	Improving user-level skills in ICT
CEIAA1	Ability to recognise, understand and use the principles of engineering and food basic operations. Food technology. Agro-food industry processes. Modeling and optimization.
CEIAA2	Demonstrating the ability to recognise, understand and use the principles of food technology and engineering, managing food quality and safety, analysing and tracking food
CEIAA5	Ability to recognise, understand and use the principles of Agro-food industry engineering. Waste management and use.

## Assessment methods and instruments

Intended learning outcomes	Examination	Means of practical execution	Oral means	Students assignments
CB1	X	X	X	X
CB2	X			
CEIAA1	X	X	X	X
CEIAA2	X	X	X	X
CEIAA5	X	X	X	X
CU2			X	X
<b>Total (100%)</b>	<b>40%</b>	<b>20%</b>	<b>20%</b>	<b>20%</b>
<b>Minimum grade (*)</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>

(\*)The minimum grade that students must obtain in each of the evaluable activities in order to pass the course shall not exceed 5,0.

### General clarifications on instruments for evaluation:

As an alternative to the exam, the possibility of continuous assessment is considered, based on the writing of the contents of the theory classes, questions about them and weekly exercises of practical content. Students who do not achieve the minimum mark of 5 in the continuous assessment in each of the selected instruments will have to take a final exam. The completion of the laboratory practicals as well as the preparation of a seminar are compulsory requirements for passing the course. The grades of the selected assessment instruments will be maintained during the current academic year.

### Clarifications on the methodology for part-time students and students with disabilities and special educational needs:

The methodological strategies and the evaluation system contemplated in this Teaching Guide will be adapted according to the needs presented by students with disabilities and special educational needs when required.

### Clarifications on the evaluation of the extraordinary call and extra-ordinary call for completion studies:

Exam (80%) and practicals (20%)

### Qualifying criteria for obtaining honors:

*The student with a grade of 9 or higher, without exceeding 20% of the students will be awarded an honours degree (20%).*

## Sustainable development goals

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No poverty  
Zero hunger  
Good health and well-being  
Quality education  
Gender equality  
Clean water and sanitation  
Affordable and clean energy  
Decent work and economic growth  
Industry, innovation and infrastructure  
Reduced inequalities  
Sustainable cities and communities  
Responsible consumption and production  
Climate action  
Peace, justice and strong institutions  
Partnerships for the goals

## Other Faculty

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*The methodological strategies and the evaluation system contemplated in this Teaching Guide will respond to the principles of equality and non-discrimination and must be adapted according to the needs presented by students with disabilities and special educational needs in the cases that are required. Students must be informed of the risks and measures that affect them, especially those that may have serious or very serious consequences (article 6 of the Safety, Health and Welfare Policy; BOUCO 23-02-23).*

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