

## COURSE DESCRIPTION

### COURSE DETAILS

Title (of the course): **QUÍMICA BIOORGÁNICA**

Code: 101866

Degree/Master: **GRADO DE BIOQUÍMICA**

Year: 4

Field: QUÍMICA BIOORGÁNICA

Character: OPTATIVA

Duration: FIRST TERM

ECTS Credits: 6.0

Classroom hours: 60

Face-to-face classroom percentage: 40.0%

Study hours: 90

Online platform: <http://moodle.uco.es/m2122/>

### LECTURER INFORMATION

Name: ROMERO REYES, ANTONIO ANGEL (Coordinator)

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### PREREQUISITES AND RECOMMENDATIONS

#### Prerequisites established in the study plan

The student can enroll in elective subjects/courses once he/she has passed the 60 credits corresponding to basic training and, at least, 60 additional compulsory credits.

To have at least a B1 level in English (this requirement is mandatory for the recognition of having taken the subject in English according to the Plurilingualism Programme of the University of Córdoba).

#### Recommendations

To have a basic understanding of Chemistry and particularly of Organic Chemistry.

English level B2 is highly recommended.

## COURSE DESCRIPTION

### INTENDED LEARNING OUTCOMES

CB1	Ability for critical and self-critical thinking.
CB2	To know how to work in cooperation collaboratively and with shared responsibility.
CB4	To have learning and autonomous work capacity
CB5	To be able to employ principles of the scientific method.
CB7	To know how to use basic tools for communication, search for information and data processing in their professional activity.
CE1	To understand the physical and chemical bases of biological processes and the main physical, chemical and mathematical tools used to investigate them.
CE3	To understand the basic principles that determine molecular structure and chemical reactivity of simple biomolecules.
CE4	To understand the principles that determine the structure of the biological macromolecules (including proteins and nucleic acids), as well as the biological supramolecular complexes, and to be able to explain the relationships between the structure and its function.
CE22	To know how to work appropriately in a biochemical laboratory with biological and chemical material, including safety, handling, removal of biological and chemical wastes and inscribed record of activities.

### OBJECTIVES

- To know some families of organic compounds of interest in Biochemistry.
- To understand the basic principles of Biocatalysis.
- To apply methods and techniques from Organic Chemistry to solve biological problems

### CONTENT

#### 1. Theory contents

**Unit 1.** Introduction to Bioorganic Chemistry and Natural Products.

**Unit 2.** Terpenes and steroids. Structure and classification. Compounds of biological importance.

**Unit 3.** Heterocyclic compounds of biological interest. Alkaloids. Structure and classification. Biochemical significance.

**Unit 4.** Application of biocatalysts in chemical synthesis. Enzymes. Hydrolytic reactions, redox processes and formation of C-C bonds. Other reactions catalyzed by enzymes. Use of enzymes in organic solvents. Immobilization of enzymes. Antibodies. Catalysis with antibodies. Applications of catalytic antibodies.

**Unit 5.** Supramolecular chemistry. Introduction to supramolecular chemistry: molecular recognition, self-assembly and self-organization. Artificial enzymes. Coronands and cavitands.

**Unit 6.** Combinatorial chemistry. Application to drug discovery.

#### 2. Practical contents

PRACTICE 1. ISOLATION OF EUGENOL FROM THE NAIL.

PRACTICE 2. SYNTHESIS OF ETHANOL BY SACROSE FERMENTATION.

PRACTICE 3. ISOLATION OF ESSENTIAL OILS OF LAVENDER.

PRACTICE 4. HYDROALCOHOLIC GEL SYNTHESIS.

PRACTICES 5 and 6. OPTICAL RESOLUTION THROUGH NATURAL AND OPTICALLY ACTIVE TARTARIC ACID.



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### SUSTAINABLE DEVELOPMENT GOALS RELATED TO THE CONTENT

Industry, innovation and infrastructure

### METHODOLOGY

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

Their availability will be taken into account. Some agreements between the lecturer and the students will be needed.

#### Face-to-face activities

Activity	Large group	Medium group	Total
<i>Assessment activities</i>	3	-	3
<i>Lab practice</i>	-	18	18
<i>Lectures</i>	30	-	30
<i>Seminar</i>	-	6	6
<i>Text analysis</i>	-	3	3
<b>Total hours:</b>	<b>33</b>	<b>27</b>	<b>60</b>

#### Off-site activities

Activity	Total
<i>Analysis</i>	20
<i>Exercises</i>	10
<i>Information search</i>	5
<i>Reference search</i>	5
<i>Self-study</i>	50
<b>Total hours</b>	<b>90</b>

### WORK MATERIALS FOR STUDENTS

Exercises and activities  
Oral presentations  
Placement booklet

## COURSE DESCRIPTION

## EVALUATION

Intended learning	Exams	Laboratory Practice	Oral Presentation	Placement reports	Practice Book
CB1	X	X	X	X	X
CB2	X		X		
CB4	X		X		
CB5		X			X
CB7			X		
CE1	X	X	X	X	X
CE22	X		X		
CE3		X			X
CE4	X		X		
<b>Total (100%)</b>	<b>50%</b>	<b>10%</b>	<b>20%</b>	<b>10%</b>	<b>10%</b>
<b>Minimum grade</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>4</b>

(\*)Minimum mark (out of 10) needed for the assessment tool to be weighted in the course final mark. In any case, final mark must be 5,0 or higher to pass the course.

**Method of assessment of attendance:**

Attendance and active participation will constitute 10% of the final grade.

**General clarifications on instruments for evaluation:**

Minimum score to eliminate content and period of validity for partial qualifications: Minimum grade of 4 to pass the subject. Valid for the present academic year.

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

Their availability will be taken into account. Some agreements between the lecturer and the students will be needed.

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

In the evaluation, the same criteria will be applied as in the ordinary evaluation, that is, the qualifications of attendance to classes, seminars and practices of the previous year are maintained.

**Qualifying criteria for obtaining honors:**

*It can be given to students with a grade equal to or greater than 9. This mention can not exceed 5% of the students.*

## COURSE DESCRIPTION

### BIBLIOGRAPHY

#### 1. Basic Bibliography

1. *Modern Biocatalysis. Advances Towards Synthetic Biological Systems*. Eds. Gavin Williams and Mélanie Hall. RSC. 2018.
2. *Industrial Biotransformations. Second Completely Revised and Extended Edition*. Eds. Adreas Liese, Karsten Seelbach and Christian Wandrey. Wiley-VCH Verlag GmbH & Co. KGaA. 2006.
3. *Biorganic Chemistry. A Chemical Approach to Enzyme Action. Third Edition*. Ed. Hermann Dugas. Springer. 1999.
4. *Química Biorgánica y Productos Naturales*. Autores: Rosa M<sup>a</sup> Claramunt Vallespi, M<sup>a</sup>. de los Ángeles Farrán Morales, Concepción López García, Marta Pérez Torralba and Dolores Santa María Gutiérrez. UNED. 2019.
5. *Química de los Productos Naturales*. Autor: J. Alberto Marco. Editorial Síntesis.
6. *Combinatorial Chemistry. Synthesis, Analysis, Screening*. Ed. Günther Jung. Wiley-VCH. 2001
7. *Combinatorial Synthesis of Natural Product-Based Libraries*. Ed. Armen M. Boldi. CRC Taylor & Francis. 2006.
8. *Dynamic Combinatorial Chemistry. In Drug Discovery, Bioorganic Chemistry, and Materials Science*. Ed. Benjamin L. Miller. 2010.
9. *Methods in Enzymology*. Eds. John N. Abelson y Melvin I. Simon. Elsevier Inc. 2003.
10. *Incorporation of Heterocycles into Combinatorial Chemistry*. Ed. Eugene V. Babaev. Springer. 2017.
11. *Supramolecular Chemistry-Fundamentals and Applications*. Eds. Katsuhiko Ariga and Toyoki Kunitake. Springer. 2006.
12. *Supramolecular Chemistry*. Eds. Jonathan W. Steed and Jerry L. Atwood. Wiley. 2009.
13. *Supramolecular Chemistry. From Biological Inspiration to Biomedical Applications*. Ed. Peter J. Cragg. 2010.
14. *Hydrolases in Organic Synthesis. Regio- and Stereoselective Biotransformation*. Eds. Uwe T. Bornscheuer and Romas J. Kazlauskas. Wiley-VCH. 2006.
15. *Biocatalysts and Enzyme Technology*. Eds. Klaus Buchholz, Volker Kasche y Uwe T. Bornscheuer. Wiley-Blackwell. 2012.
16. *Practical Methods for Biocatalysis and Biotransformations 3*. Eds. John Whittall, Peter W. Sutton and Wolfgang Kroutil. Wiley. 2016.

#### 2. Further reading

None

### COORDINATION CRITERIA

Tasks deadlines

### SCHEDULE

Period	Assessment activities	Lab practice	Lectures	Seminar	Text analysis
1# Fortnight	0,0	0,0	4,0	0,0	0,0
2# Fortnight	0,0	0,0	4,0	3,0	0,0



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Period	Assessment activities	Lab practice	Lectures	Seminar	Text analysis
3# Fortnight	0,0	0,0	4,0	0,0	3,0
4# Fortnight	0,0	0,0	4,0	0,0	0,0
5# Fortnight	0,0	6,0	4,0	0,0	0,0
6# Fortnight	0,0	6,0	4,0	0,0	0,0
7# Fortnight	0,0	6,0	4,0	3,0	0,0
8# Fortnight	3,0	0,0	2,0	0,0	0,0
<b>Total hours:</b>	<b>3,0</b>	<b>18,0</b>	<b>30,0</b>	<b>6,0</b>	<b>3,0</b>

The methodological strategies and the evaluation system contemplated in this Course Description will be adapted according to the needs presented by students with disabilities and special educational needs in the cases that are required.

## CONTINGENCY PLAN: CASE SCENARIO A

Case scenario A will correspond to a diminished on-site academic activity due to social distancing measures affecting the permitted capacity of classrooms.

## METHODOLOGY

### General clarifications on the methodology on case scenario A

A multimodal (hybrid) teaching system will be adopted, combining both on-site and remote classes via videoconference (synchronous) that will be held in the timetable approved by the corresponding Faculty or School. The time distribution of teaching activities (both on-site and remote) will be decided by the aforementioned Faculties and Schools bearing in mind the permitted capacity of classrooms and social distancing measures as established at that time.

## COURSE DESCRIPTION

## EVALUATION

Intended learnig	Exams	Laboratory Practice	Oral Presentation	Placement reports	Practice Book
CB1	X	X	X	X	X
CB2	X		X		
CB4	X		X		
CB5		X			X
CB7	X		X		
CE1	X	X	X	X	X
CE22			X		
CE3		X			X
CE4	X		X		
<b>Total (100%)</b>	<b>50%</b>	<b>10%</b>	<b>20%</b>	<b>10%</b>	<b>10%</b>
<b>Minimum grade</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>4</b>

(\*)Minimum mark (out of 10) needed for the assessment tool to be weighted in the course final mark. In any case, final mark must be 5,0 or higher to pass the course.

**Method of assessment of attendance (Scenario A):**

Attendance and active participation will constitute 10% of the final grade.

**General clarifications on instruments for evaluation (Scenario A):**

The contribution of each activity in the evaluation to the final grade will be:

50% -> Knowledge acquired in the master classes and evaluated in a final exam

20% -> Oral Presentation

10% -> Placement report

10% -> Laboratory Practice

10% -> Memory

Minimum score to remove content: 4

In the extraordinary calls of the 2021-2022 academic year for students of second registration or higher, the student must take an exam (50%). Likewise, the qualifications obtained in the 2019-2020 academic year in the work carried out in the laboratory (10%), the practice report (10%), oral presentation (20%) and memory (10%) will be kept.

**Clarifications on the methodology for part-time students and students with disabilities and special educational needs (Scenario A):**

Their availability will be taken into account. Some agreements between the lecturer and the students will be needed.

## COURSE DESCRIPTION

### CONTINGENCY PLAN: CASE SCENARIO B

Case scenario B will bring about a suspension of all on-site academic activities as a consequence of health measures.

### METHODOLOGY

#### General clarifications on the methodology on case scenario B

On-site teaching activities will be held via videoconference (synchronous) in the timetable approved by the corresponding Faculty or School. Alternative activities will be proposed for reduced groups in order to guarantee the acquisition of course competences.

### EVALUATION

Intended learnig	Exams	Laboratory Practice	Oral Presentation	Placement reports	Practice Book
CB1	X	X	X	X	X
CB2	X		X		
CB4	X		X		
CB5		X			X
CB7			X		
CE1	X	X	X	X	X
CE22	X		X		X
CE3	X	X	X		
CE4			X	X	
<b>Total (100%)</b>	<b>50%</b>	<b>10%</b>	<b>20%</b>	<b>10%</b>	<b>10%</b>
<b>Minimum grade</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>4</b>

(\*)Minimum mark (out of 10) needed for the assessment tool to be weighted in the course final mark. In any case, final mark must be 5,0 or higher to pass the course.

Moodle Tools	Cuaderno de prácticas	Exposición oral	Exámenes	Informes/memorias de prácticas	Prácticas de laboratorio
Asistencia	X	X	X	X	X
Cuestionario	X		X	X	X
Participación		X		X	X



## COURSE DESCRIPTION

Moodle Tools	Cuaderno de prácticas	Exposición oral	Exámenes	Informes/memorias de prácticas	Prácticas de laboratorio
<i>Rúbrica de evaluación</i>			X		
<i>Talleres</i>	X				
<i>Videoconferencia</i>		X			

**Attendance will be assessed (Scenario B)?:**

No

**General clarifications on instruments for evaluation (Scenario B):**

The contribution of each activity in the evaluation to the final grade will be:

50% -> Knowledge acquired in the master classes and evaluated in a final exam

20% -> Oral Presentation

10% -> Placement report

10% -> Laboratory Practice

10% -> Memory

Minimum score to remove content: 4

In the extraordinary calls of the 2021-2022 academic year for students of second registration or higher, the student must take an exam (50%). Likewise, the qualifications obtained in the 2019-2020 academic year in the work carried out in the laboratory (10%), the practice report (10%), oral presentation (20%) and memory (10%) will be kept.

**Clarifications on the methodology for part-time students and students with disabilities and special educational needs (Scenario B):**

Their availability will be taken into account. Some agreements between the lecturer and the students will be needed.