

Degree	Type	Year
2500253 Biotechnology	OB	2

## Contact

Name: Escarlata Rodriguez Carmona

Email: [escarlata.rodriguez@uab.cat](mailto:escarlata.rodriguez@uab.cat)

## Teaching groups languages

You can view this information at the [end](#) of this document.

## Prerequisites

There are no official prerequisites to follow the course successfully, but it is assumed that the student has previously acquired basic knowledge on contents and concepts that refer to the microbial world, starting the course having revised them will prove useful.

It is also advisable to have a good knowledge of the subjects studied during the first year of the degree of biotechnology as well as the rest of the subjects to be studied simultaneously during the first semester.

## Objectives and Contextualisation

Objectives and Contextualization:

- It is a compulsory subject of the degree of Biotechnology that introduces students to the microbial world, giving an overview of microorganisms in connection with other living beings and the different environments in which microorganisms live.
- This subject, given its introductory nature, gives the most basic concepts and competencies referred to Microbiology, so that students can deepen the following courses in the other subjects that are part of the core of Biotechnology.

In this context, the educational objectives and specific learning outcomes (RAs) of the course are:

1. Describe the world of microorganisms:

- Understand the history, organization and classification of microorganisms, as well as the main differences between viruses and cellular organisms (RA: KM16, SM17).

2. Understand the characteristics of viruses:

- Analyze the structure, replication and diversity of viruses (RA: KM16).

3. Analyze the composition and function of the different structures of prokaryotic cells:

- Identify the cellular parts and the mechanisms of motility, transport and differentiation (RA: SM17).

4. Understand the genomic variability of microorganisms and know bacterial genetics:

- Study the bacterial genome, the mechanisms of mutation and the main mechanisms of genetic transfer (RA: KM16).

5. Examine microbial growth and control:

- Assess the cell cycle, influencing environmental factors and control methods of microorganisms (RA: KM18).

6. Explore bacterial physiology and metabolic versatility:

- Understand metabolic and respiratory processes, fermentation, chemolithotrophy and phototrophy (RA: CM16, SM17).

7. Broadly recognize microbial diversity:

- Know how to distinguish the characteristics that define the different microbial groups (RA: SM17).
- Classify and describe the diversity of prokaryotes, archaea and gram-positive and gram-negative bacteria (RA: SM17).

8. Apply knowledge of microbiology:

- Recognize the main relationships of microorganisms with living beings and with the physical environment they inhabit (RA: KM16, KM18, CM16, CM18).
- Know the role of microorganisms in the development of human societies, as well as their current and future applications (RA: KM16, KM18, CM16, CM18).
- Analyze the use of microorganisms in the food, health and biotechnology industry, taking into account the environmental impact and inequalities due to sex/gender (RA: KM16, KM18, CM16, CM18).

9. Know how to perform basic calculations to determine microbiological parameters (RA: KM16, SM17).

10. Understand basic laboratory techniques to work experimentally with microorganisms (RA: KM16, SM17).

## Learning Outcomes

1. CM16 (Competence) Compare microbial metabolic diversity and important processes for the manufacture and processing of foodstuffs.
2. CM18 (Competence) Judge sex/gender inequalities in the field of microbiology.
3. KM16 (Knowledge) Describe the genetic and metabolic potential of microorganisms in the generation of substances of industrial interest.
4. KM18 (Knowledge) Critically analyse the environmental impact of the use of microorganisms in biotechnological production.
5. SM16 (Skill) Apply the main techniques associated with the use of micro-organisms.
6. SM17 (Skill) Identify microbial groups and physiological processes responsible for transformation processes of industrial interest.

## Content

### I. Theory

#### 1. INTROCUDDCTION

- The world of microorganisms

#### 2. THE VIRUSES

- Introductory overview and general characteristics of viruses

#### 3. STRUCTURES AND FUNCTION OF PROKARIOTES

- Prokaryotic cells

- Prokaryotic cell envelopes

- Flagella and main motility mechanisms

- Intracellular inclusions and differentiation mechanisms

#### 4. BACTERIAL GENETICS

- Prokaryotic genome
- . Mutagenesis
- Genetic transfer mechanisms

#### 5. MICROBIAL GROWTH AND CONTROL

- Cell cycle in prokaryotic cells
- Microbial growth and continuous culture of microorganisms
- Influence of environmental factors on microbial growth
- Microbial growth control using physical and chemical agents

#### 6. BACTERIAL PHYSIOLOGY AND METABOLISM

- Global metabolism outline
- Respiration
- Fermentation
- Chemolithotrophy
- Phototrophy

#### 7. MICROBIAL DIVERSITY

- Prokaryote diversity
- **Archaea**
- Gram-negative bacteria I
- Gram-negative bacteria II
- Gram-positive bacteria and mycoplasmas

#### 8. APPLIED MICROBIOLOGY

- Microbiology in the food industry
- Microbiology in the healthcare industry
- Biotechnology

#### II. Problems

- Microscopic technique
- Seeding and isolation techniques
- Problems on basic microbiology
- Problems about growth and microbial control
- Problems about basic virology

- Presentation, assessment, resolution, individual and/or collective critical discussion and presentation of proposed problems.
- Introduction to active learning activities, definition of key ideas, assessment and group activity presentations.

## Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Active learning activities and scientific problems seminars	15	0.6	CM16, CM18, KM16, KM18, SM16, SM17
Lectures	30	1.2	CM16, CM18, KM16, KM18, SM16, SM17
Type: Supervised			
Personal tutorial guidance sessions	3	0.12	CM16, CM18, KM16, KM18, SM16, SM17
Type: Autonomous			
Literature search, text reading	24	0.96	CM16, CM18, KM16, KM18, SM16, SM17
Personal study	50	2	CM16, CM18, KM16, KM18, SM16, SM17
Scientific problem resolution	20	0.8	CM16, CM18, KM16, KM18, SM16, SM17

The subject of Microbiology consists of three modules, which have been programmed in an integrated way to reach the competencies indicated in section 5 of this guide.

The modules are as follows:

**Participatory classroom lectures:** Lectures will address the main ideas of the different topics. Students should expand and confront autonomously as a personal work. At the beginning of the course the content of the different topics will be explained by the professor, as well as the bibliography that should be consulted to prepare each theory lecture and for personal study of the topics explained.

**Scientific problem seminars:** These seminars are sessions with the mission of: a) working methodological aspects, b) training the student to design basic microbiology experiments and to propose experimental approaches, c) designing strategies for solving and interpreting scientific problems, d) acquiring the skills necessary to perform literature research, text reading and oral presentations, e) to facilitate the understanding of the knowledge presented in the theory lectures and f) to bridge the gap between theory lectures and laboratory practices, with the objective of integrating the theoretical and the practical knowledge. The student will receive proposals for problems and/or scientific cases that will be developed during the course in class both individually and in a group.

**Active learning activities:** These activities are sessions with the mission of: a) facilitating the understanding of the knowledge presented in the theory lectures, b) acquiring the necessary skills to perform literature research, text reading and active self-study learning and c) encourage cooperative teamwork, coordination of activities and rational presentation of work plans and results. The student will perform oral, written and/or visual presentation of an issue, activity or scientific case. The professor will indicate the bibliography to be consulted and the relationship of each session with the topics discussed in the theory lectures.

### Additional Information

In those sessions, students will have the opportunity to have individual guidance according to their needs. To follow adequately the course, the student will have access to all the materials used in the Campus Virtual.

As supervised activities of the subject, the students will be able to carry out tutorials in the teachers' office and / or through TICs. At the beginning of the course the procedure for conducting tutorials will be communicated.

The autonomous activities of this subject are: personal study, literature searching, reading of texts and resolution of problems.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

## Assessment

### Continuous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evaluation public oral presentations of reports	20 %	2	0.08	CM16, CM18, KM16, KM18, SM16, SM17
Evaluation scientific problems and seminars	20%	2	0.08	CM16, CM18, KM16, KM18, SM16, SM17
Evaluation theory I	30 %	2	0.08	CM16, CM18, KM16, KM18, SM16, SM17
Evaluation theory II	30%	2	0.08	CM16, CM18, KM16, KM18, SM16, SM17

The evaluation of the course will be done individual and continued or single through the following tests:

#### I. Continuous evaluation

##### 1. Evaluation of classroom lectures competencies

During the course two midterm exams will be scheduled. Each midterm exam will have a weight of 30% of the overall grade. The final mark of this evaluation form will be average of the two midterm exams. To pass this part of the subject, the notes obtained in each written tests must be equal to or greater than 5 points. If the average of the midterm exams is equal to or greater than 5 students will not have to do the final exam (or Remedial exam) of the subject. In the case of obtaining a lower mark of 5 in one or both midterm exams, students will be presented at the Final exam (or Remedial exam) on the date scheduled for the final evaluation of the course.

##### 2. Evaluation of scientific problem and seminars

The evaluation of this activity will be done separately from evaluation of classroom lectures competencies considering the attendance at the seminars, the resolution of problems and practical cases or activities and the realization of a written exam at the end of the course. All of that will have a weight of 20% of the overall grade. Students who fail the evaluation of scientific problems and seminars can retrieve it on the date scheduled for the final exam of the course.

##### 3. Evaluation of active learning activities

This activity is assessed separately from evaluation of classroom lectures competencies and seminars and scientific problems evaluation considering oral presentations of the proposed activities and will have a weight of 20% of the final mark. Students will present the reports of the assigned active learning activities in classroom sessions. Oral presentations will be evaluated on content, organization and communicative skills. Students who fail the evaluation of the group activities can retrieve the active learning activities on the date scheduled for the final exam of the course.

To pass the course, students must obtain a mark of 5 or greater than 5 in each module.

Students who do not pass any of the written and/or oral tests may retrieve them at the scheduled date at the end of the semester. Likewise, on the same date, students who have passed the subject and want to improve their mark may submit to a global examination of the subject, which will include questions from the three evaluation modules. The presentation of the student to the examination of improvement of note implies the renunciation of the qualification obtained previously.

To be eligible for the retake process, the student should have been previously evaluated in a set of activities equaling at least two thirds of the final score of the course or module.

Thus, the student will be graded as "No Avaluable" if the weighthin of all conducted evaluation activities is less than 67% of the final score.

On the other hand, according to the regulations of the UAB, those enrolled in the subject for the second time, do not have to do again activities for modules 2 and 3, if they have passed those modules in previous years. This exemption will be valid for a period of three additional enrolments.

## II. Unique assessment

The unique assessment consists of a single synthesis test in which the contents of the entire program of the subject will be evaluated. This will consist of three parts:

1. Evaluation of the theory module: It will consist of a summary test of all the contents of the theory module. The grade obtained in this test will account for 60% of the final grade for the subject.
2. Evaluation of the problems and techniques module: The same avaluation system will be applied as for the continuous assessment. Attendance at the seminars is mandatory. To pass the seminar part, a grade equal to or higher than 5 must be obtained, the grade obtained in this part will be 20% of the final grade.
3. Evaluation of the active learning module: This last part will be assessed by delivering a report of the assigned active learning activities similar of those done in classroom sessions. The grade obtained in this part will be 20% of the final grade.

The grade obtained in this synthesis test is 100% of the final grade of the subject.

The single assessment test will coincide with the same date fixed in the calendar for the last continuous assessment test and the same recovery system will be applied as for the continuous assessment. To pass the subject, it will be necessary to pass each of the parts of the test separately with a score equal to or greater than 5 out of 10. In case of not passing the subject, the student will be able to opt for a recovery evaluation, with the same characteristics as the one described and where it will be necessary to obtain a grade equal to or greater than 5 in the parts that had not been achieved on the first attempt to pass the subject.

## **Bibliography**

Textbooks

Martín A., Béjar V., Gutierrez J.C., Llagostera M. y Quesada E. 2019. Microbiología Esencial. 1ª edición. Editorial Médica Panamericana. ISBN: 9788491102427 (en línea)  
[https://bibcercador.uab.cat/permalink/34CSUC\\_UAB/cugbhl/alma991009862179706709](https://bibcercador.uab.cat/permalink/34CSUC_UAB/cugbhl/alma991009862179706709)

Madigan, M, KS Bender, DH Buckely, WM Sattley, DA Stahl. 2019. Brock Biology of Microorganisms: Pearson Education Limited. ISBN: 9781292235103 (paperback)

Madigan, M, JM Martinko, K. Bender, D. Buckely, DA Stahl. 2015. Brock Biología de los Microorganismos. 14ª ed. Pearson. ISBN: 9788490352793 [Recurs electrònic]  
[https://bibcercador.uab.cat/permalink/34CSUC\\_UAB/cugbhl/alma991006425619706709](https://bibcercador.uab.cat/permalink/34CSUC_UAB/cugbhl/alma991006425619706709)

Willey, J, LM Sherwood, CJ Woolverton. 2021. Prescott's principles of microbiology. McGraw-Hil.  
[https://bibcercador.uab.cat/permalink/34CSUC\\_UAB/1eqfv2p/alma991010703421206709](https://bibcercador.uab.cat/permalink/34CSUC_UAB/1eqfv2p/alma991010703421206709)

Willey, J, LM Sherwood, CJ Woolverton. 2016. Prescott's microbiology. McGraw-Hil. ISBN: 9781259281594

Willey, J, LM Sherwood, CJ Woolverton. 2013. Prescott, Harley y Klein microbiología. 7ª ed. McGraw-Hil. ISBN: 9788448191207 [Recurs electrònic [https://cataleg.uab.cat/iii/encore/record/C\\_\\_Rb1986657](https://cataleg.uab.cat/iii/encore/record/C__Rb1986657)]

Wiley, J, LM Sherwood, CJ Woolverton. 2009. Microbiología de Prescott, Harley y Klein. 7ª ed. MacGraw-Hill. ISBN: 978-8448168278.

Glazer, AN, H Nikaido. 2007. Microbial Biotechnology: Fundamentals of Applied Microbiology. 2nd edition. Cambridge University Press. ISBN: 9780521842105 (cart.)

Lee Yuan Kun. 2006. Microbial Biotechnology: Principles and Applications. 2nd edition. New Jersey. World Scientific. ISBN: 9789814366816 (cart.)

#### Recommended readings

De Kruif, P. 1926. Los cazadores de microbios. Ediciones Nueva Fénix. ISBN: 9789700768045

#### Recommended blogs

Esos pequeños bichitos

<http://weblogs.madrimasd.org/microbiologia/>

Blog *Small things considered*

<http://schaechter.asmblog.org/schaechter/>

#### Recommended websites

<http://www.microbeworld.org/>

<http://weblogs.madrimasd.org/microbiologia/archive/2007/12/23/81281.aspx>

<http://microbewiki.kenyon.edu/index.php/MicrobeWiki>

<http://serc.carleton.edu/microbelife/>

<http://web.mst.edu/~microbio/Bio221.html>

<http://curiosidadesdelamicrobiologia.blogspot.com/>

<http://weblogs.madrimasd.org/microbiologia/>

<http://www.topix.com/science/microbiology>

<http://microbiologybytes.wordpress.com/>



<http://www.cellsalive.com/>

<http://commtechlab.msu.edu/sites/dlc-me/>

<http://commtechlab.msu.edu/sites/dlc-me/zoo/>

<http://www.microbiologia.com.ar/>

## Software

To follow adequately the course, the student will have access to all the materials used in the Campus Virtual.

There is no specific software.

## Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	421	Catalan	first semester	afternoon
(PAUL) Classroom practices	422	Catalan	first semester	afternoon
(TE) Theory	42	Catalan	first semester	afternoon