

## 30804 - Microbiology

### Syllabus Information

**Academic Year:** 2020/21

**Subject:** 30804 - Microbiology

**Faculty / School:** 105 - Facultad de Veterinaria

**Degree:** 568 - Degree in Food Science and Technology

**ECTS:** 6.0

**Year:** 1

**Semester:** Second semester

**Subject Type:** Basic Education

**Module:** ---

### 1.General information

#### 1.1.Aims of the course

#### 1.2.Context and importance of this course in the degree

#### 1.3.Recommendations to take this course

### 2.Learning goals

#### 2.1.Competences

#### 2.2.Learning goals

#### 2.3.Importance of learning goals

### 3.Assessment (1st and 2nd call)

#### 3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

The student can decide about his/her assessment program. There are two types of assessments: continuous and global.

##### 1. Continuous assessment:

It comprises of the following activities:

1. **Short- Typing test at the end of each lecture.** Students will fill out an online typing test in 5 min about the lecture. The test will include about 4-5 questions. The final grade of this assessment will be calculated using the average grade of all test and the number of proposed test. The grade of this activity constitutes 10 % de final grade.
2. **Two exams about theoretical knowledge.** The first exam comprises the first section of the course (General Microbiology). The examination date will be fix during the course in agreement with students. The second exam will be the remaining sections and it will be done in an official data fixed by Institution. Both exams will be typing test questions
3. **Exam about technical skills.** The exam comprises typing test questions in combination with short-development questions about the practical lessons. The examen data will be fix by the institution. Those students that did not attend to the practical lessons must perform a additional test in the lab.
4. **Group Work** that consists in the preparation of a review in topics related with microbiology and applied microbiology and its oral presentation. The group will be formed by about 5 students. The presentation data of each work will be informed during the course.

Assesment criteria:

1. **Short- Typing test.** This activity will be graded only if the student will perform at least half of the proposed tests. The grade received of this activity will constitute 10% of the final grade. It is not necessary a minimal grade in this probe to pass the course.
2. **Exam about theoretical knowledge.** It will be required to be graded at least as 5 to pass both exams to pass the course. It is mandatory that each exam will be graded at least as 5 to pass the course. The average grade of both exams will constitute 50% of the final grade.
3. **Exam about technical skills.** It is mandatory be graded at least as 5 in this test to pass the course. The grade in this test will constitute 30% of the final grade. Students that do not attend to a practical session class should demonstrate that have all skills obtained during such session in an additional lab test.
4. **Group Work:** It is mandatory to be graded at least as 5 to pass the course. The grade of this activity will represent 10% of the final grade.

## 2. Global assessment

It comprises of the following activities:

1. **One exam about theoretical knowledge.** The exam will be about all theoretical lessons given during the course. The examination date will be fixed by Institution.It will be a typing test questions.
2. **Exam about technical skills.** The exam comprises typing test questions in combination with short-developmental questions about the practical lessons. The exam data will be fixed by the institution. Those students that did not attend to a practical lesson must perform an additional lab test in order to probe that the student got the technical skills.
3. **Group Work** that consists in a review about in a topic related to microbiology or applied microbiology. The group will be composed of about 5 students. The review will be orally presented in a data informed during the course.
4. **Exam about theoretical knowledge.** It is mandatory to be graded at least as 5 to pass the course will be required to pass the exams to pass the course. It is mandatory that each exam will be graded as 5 to pass the course. The average grade of both exams will constitute 60% of the final grade.
5. **Exam about technical skills.** It is mandatory be graded at least as 5 in this test to pass the course. The grade will constitute 30% of the final grade. Students that do not attend to a practical session class should demonstrate all skills taught during such session.
6. **Group Work:** It is mandatory be graded at least as 5 in this test to pass the course. The grade will be 10% of the final grade.

## 4.Methodology, learning tasks, syllabus and resources

### 4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, seminars and laboratory sessions.

The course is divided into 30 one-hour participatory lectures, 10 hours of seminars in which students prepare the topic in small groups, orally present and respond to questions, and 20 hours of laboratory sessions.

Materials for each topic are available online in the Moodle platform, under the name of the course. Thus, the student can access to it whenever she / he wants along the academic year. The available material consists of a comprehensive set of PowerPoint notes including all the basic concepts reviewed during the lecture. Student participation will be encouraged during the lecture through problem-based learning activities.

Laboratory sessions will be carried out in two-hour sessions. Supporting laboratory material will be available in Moodle, platform.

In order to maintain permanent contact with students, both the use of electronic mail and personal tutorials are available. In addition, all available supporting material either for individual or group work (seminars) will be provided to the students.

Students must follow the regulations described in:

- Prevention: A guide for students at the University of Zaragoza:  
[http://uprl.unizar.es/publicaciones/estudiantes\\_ingles.pdf](http://uprl.unizar.es/publicaciones/estudiantes_ingles.pdf)
- Manual de seguridad en los laboratorios de la Universidad de Zaragoza y normas marcadas por la Unidad de Prevención de Riesgos Laborales:  
<http://uprl.unizar.es/seguridad/pdfs/seglaborUZ.pdf>  
<http://uprl.unizar.es/seguridad/pdfs/laboratorios.pdf>

In addition, students will follow as well any instructions related to biosecurity given by the professor

## 4.2.Learning tasks

This course is organized as follows:

### SECTION I. GENERAL BACTERIOLOGY

#### Descriptor:

Procariotic and eucariotic microorganisms. Bacterial structures: cell envelope and intracellular environment. Chemical bacterial composition. Bacterial physiology. Bacterial nutrition. Bacterial reproduction. Bacterial genetics. Virulence and Pathogenicity. The control of bacterial populations.

#### Competences:

The aim of this first block is to obtain knowledge about the fundamental aspects of bacteriology, including general basis of bacteriology and the techniques in manipulation and identification of bacteria.

#### Teaching activities:

- 15 hours lectures (theoretical content)
- 13 hours of laboratory work (bacterial manipulation and identification)

### SECTIONII. SPECIAL BACTERIOLOGY

#### Descriptors

**Taxonomy. Bacterial groups of interest in CTA.** *Acetobacter y Gluconobacter. Pseudomonas. Coliformes. Salmonella, Shigella, Yersinia enterocolitica. Plesiomonas. Campylobacter. Aeromonas. Vibrio. Carnobacterium, Lactobacillus, Lactococcus y Leuconostoc. Bacillus. Clostridium. Listeria. Staphylococcus. Micrococcus. Streptococcus. Enterococcus.*

#### Competences

**The main aim is to get knowledge about the most important microorganisms involved in food-borne diseases and industrial microbiology.**

#### Teaching activities:

**7 hours lectures**

**3 h Practical sessions**

### SECTIONIII. MICOLOGY

Descriptors: General characteristics of fungi. Methods of study of fungi.

**Competences:** The aim of this second block is to acquaint the student with the general characteristics of fungi, its constitution, methods of observation, management, metabolism, mechanisms for exchanging information and their role in relation to the food and man

**Teaching-learning activities:** 1 one-hour lecture (theoretical content) and 2 hours of laboratory work (fungi management and identification)

### SECTIONIV. VIROLOGY

Descriptors: Concepts about virology. Structure and composition of virions. General characteristics of viral replication. Control and culture of virus. Virus classification. Virus foodborne diseases. Bacteriophages and other agents.

**Competences:** The aim of this third block is to acquaint the student with the general characteristics of the virus, its constitution, methods of observation, management, replication, mechanisms for exchanging information and their role in relation to the food and man

**Teaching-learning activities:** 2 one-hour lectures (theoretical content)

### SECTIONV. PARASITOLOGY

Descriptors: Biological relationship of parasitism. Parasites. Spread of parasites. Biological cycles.

Parasite/host relationship. Systematics and taxonomy. Parasites classification. Protozoa, helminths and arthropods: general characteristics, classification, study of the most important genera in relation to food and man.

**Competences:** The aim of this fourth block is to acquaint the student with the general characteristics of the biological relationship of parasitism in the microbial world, morphology and biology of parasites, parasite/host/environment relationships and their role in relation to food and man.

**Teaching-learning activities:**

4 one-hour lectures (theoretical content)

2 hours of laboratory work (parasite identification)

**SECTIONVI. APPLIED MICROBIOLOGY**

**Descriptors:** Microorganisms involved in health and food hygiene. Microorganisms of interest in the food industry. Mycelial fungi and yeasts. Major food-related virus. Industrial microbiology. Fundamentals. Industrial uses of bacterial and fungal microorganisms.

**Competences:** The objective of this fifth block is to acquaint the student with those microorganisms that are related to food and the effects they have on them, either favourable or unfavourable, as well as pathogenic microorganisms conveyed by food that produce disease in man, and mechanisms they develop to act on the food and/or man. In this block it is also considered the taxonomic position of microorganisms and the relationships between them. The importance of microorganisms in different industry fields is also included.

**Teaching-learning activities:** Seminars: 10 hours devoted to the development of these issues with active student participation. Individual work: 5 hours spent reviewing the different topics in the seminars.

**PERSONAL TUTORIALS**

A fixed schedule for personal tutorials is not set, however professors will be available to students by appointment and through email.

**PRACTICAL PROGRAMME**

It has 5 sessions of compulsory student attendance which will last for approximately 4 hours each. The content of the practical sessions is as follows:

1. Standards for working at microbiology laboratories. Equipment sterilization and preparation of culture media. The handling of the optical microscope. Simple staining.
2. Sampling. Culture of aerobic and anaerobic microorganisms on solid medium and broth. Plating techniques. Gram staining. Microscopic observation of bacteria.
3. Quantitative study of bacterial populations. Biochemical study of microbial activity for bacterial identification.
4. Microorganism identification through immunological reactions. This practice will be taught in English.
5. Identification of fungi, yeasts and parasites.

**4.3.Syllabus**

The course will address the following topics:

**Topic s**

Section I. MICROBIOLOGY

- Topic 1. Introduction to Microbiology for CTA.
- Topic 2. Prokaryotic and eukaryotic organisms.
- Topic 3. Constant elements of bacteria.
- Topic 4. Inconstant elements of bacteria.
- Topic 5. Microscopic examination of bacteria.
- Topic 6. Chemical constitution of bacteria.
- Topic 7. Bacterial physiology.

- Topic 8. Bacterial metabolism for synthesis.
- Topic 9. Bacterial nutrition.
- Topic 10. Bacterial reproduction.
- Topic 11. Criteria for classification and identification of bacteria.
- Topic 12. Bacterial genetics.
- Topic 13. The genetic transfer phenomena.
- Topic 14. Bacterial factors.
- Topic 15. Physical and chemical agents that act on the life of microorganisms.
- Topic 16. Bacterial taxonomy.
- Topic 17. *Acetobacter* and *Gluconobacter*. *Pseudomonas* (*P. aeruginosa*).
- Topic 18. Coliforms.
- Topic 19. *Salmonella*, *Shigella*, *Yersinia enterocolitica*. *Plesiomonas* (*P. shigelloides*).
- Topic 20. *Campylobacter* (*C. coli*, *C. jejuni*). *Aeromonas* (*A. hydrophila*). *Vibrio* (*V. cholerae*, *V. parahaemolyticus*).
- Topic 21. *Carnobacterium*, *Lactobacillus*, *Lactococcus* and *Leuconostoc*.
- Topic 22. *Bacillus cereus*. *Clostridium* (*C. perfringens*, *C. botulinum*). *Listeria monocytogenes*.
- Topic 23. *Staphylococcus aureus* (*S. coagulase* +). *Micrococcus*. *Streptococcus*. *Enterococcus*.

#### Section II. MYCOLOGY

- Topic 24. Mycology. General characteristics of fungi.

#### Section III. VIROLOGY

- Topic 25. General virology.
- Topic 26. Bacteriophages.

#### Section IV PARASITOLOGY

- Topic 27. General considerations on the study of parasites.
- Topic 28. Overview protozoa.
- Topic 29. Overview of helminths.
- Topic 30. Overview of arthropods as contaminants of animal- and vegetable-derived foods.

#### Practical sessions

- Session 1: The laboratory of microbiology. Culture media. Optical microscopy. Basic stains.
- Session 2: Sampling, plating techniques, interpretation of bacterial growth. Specific stains.
- Session 3: Quantitative study of bacterial populations and identification of bacteria.
- Session 4: Serological diagnostic techniques.
- Session 5: Characterization and identification of fungi and parasites.

### 4.4. Course planning and calendar

#### Schedule of lectures, paper presentations and exams

The dates and key milestones of this subject are described in detail, along with the other subjects of the second semester of the first year in the "Programme for the 2<sup>nd</sup> quarter of the 1<sup>st</sup> year of CTA" held in the Faculty of Veterinary Medicine website.

#### Planning MICROBIOLOGÍA subject in ECTS

Credits: 6 ECTS (150 hours of student work)

Students and groups: 60 students, one group of theoretical teaching and 6 of practical teaching.

Experimentality factor: 3

### 4.5. Bibliography and recommended resources

- Acha, Pedro N. Zoonosis y enfermedades transmisibles comunes al hombre y a los animales. Volumen III, Parasitosis / Pedro N. Acha, Boris Szyfres. 3a ed. Washington, D.C.: Organización Panamericana de la Salud, 2003
- Brock: Biología de los microorganismos / Michael T. Madigan... [et al.]; coordinación Ricardo Guerrero ; traducción Coral Barrachina ... [et al.]; revisión técnica, Francisco Ruiz Berraquero. - 12<sup>a</sup> ed., reimp. Madrid [etc.]: Pearson Education, D. L. 2011
- Euzéby, Jacques. Los parásitos de las carnes: epidemiología, fisiopatología, incidencias zoonóticas / Jacques Euzéby ; traducido por, Caridad Sánchez Acedo [ et al.] . Zaragoza: Acribia, 2001
- Gállego Berenguer, Jaime. Manual de parasitología: morfología y biología de los parásitos de interés sanitario /

Jaime Gállego Berenguer. [2a. ed.] Barcelona: Edicions Universitat de Barcelona, D.L. 2003.

- Meaney, Peter. Insect pests of food premises /by Peter Meaney. Caerphilly: National Britannia Ltd., 1998
- Mossel, David Alexander Antonius. Microbiología de los alimentos: Fundamentos ecológicos para garantizar y comprobar la integridad (inocuidad y calidad) microbiológica de los alimentos / D.A.A. Mossel, B. Moreno García y Corry B. Struijk . 2ª ed. Zaragoza: Acribia, 2003
- Parasitism: the diversity and ecology of animal parasites / Albert O. Bush. Cambridge : Cambridge University Press, 2001
- Prescott, Lansing M.. Microbiología / Lansing M. Prescott, John P. Harley, Donald A. Klein ; [traducción, Carlos Gamazo de la Rasilla , Iñigo Lasa Uzcudum]. 5a. ed., [traducción de la 5a ed. inglesa] Madrid [etc.] : McGraw-Hill , 2004
- Roberts, Larry S. Gerald D. Schmidt & Larry S. Roberts' foundations of parasitology /Larry S. Roberts, John Janovy. 9th New York : McGraw Hill, 2012
- Tortora, Gerard J. Introducción a la microbiología / Gerard J. Tortora, Berdell R. Funke, Christine L. Case. - 9ª ed. Buenos Aires [etc.] : Editorial Médica Panamericana, cop. 2007
- Willey, Joanne M.. Microbiología / Joanne M. Willey, Linda M. Serwood, Christopher J. Woolverton. 7ª ed. (3ª ed. en español) Madrid [etc.]: McGraw-Hill, cop. 2009