

Academic Year/course: 2022/23

30804 - Microbiology

Syllabus Information

Academic Year: 2022/23

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

The general objective of this course is to learn general topics in Microbiology, virology, fungi and parasitology, which facilitates the understanding and construction of future knowledge in the disciplines of the degree. In addition, this course aims to stimulate students to actively participate in their learning process.

1.2. Context and importance of this course in the degree

Passing this discipline must enable students to follow advanced and specific courses of the degree.

It is advisable to have taken the biology courses in the bachelor (previous to the university).

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda (<https://www.un.org/sustainabledevelopment/es/>), in such a way that the acquisition of the subject learning goals provides training and competence to contribute to some extent to its achievement:

- Goal 3: Health and wellbeing.
- Goal 4: Quality Education
- Goal 5: Equality
- Goal 6: clean water
- Goal 8: work and economic growth
- Goal 9: Industry, innovation and infrastructures

2. Learning goals

2.1. Competences

By taking this course the student will achieve the following specific skills:

Manage information, search for sources, collection and analysis of information.

Use of ICTs.

Teamwork.

Think and reason critically.

Autonomous Work and carry out a self-evaluation.

Respect the diversity and plurality of ideas, people and situations.

Transmit information, orally and in writing.

Show environmental sensitivity, assuming an ethical commitment.

Negotiate both with specialists in the area and with non-experts in the field.

Adapt to new situations and solve problems.

Undertake and be motivated by quality.

Possess and understand knowledge in an area of ??study that starts from the base of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that involve knowledge from the avant-garde of your field of study.

Apply their knowledge to their job or vocation in a professional way and possess the skills they usually demonstrate through the development and defense of arguments and problem solving within their area of ??study.

To have the ability to gather and interpret relevant data (usually within their area of ??study) to make judgments that include reflection on relevant issues of a social, scientific or ethical nature.

Transmit information, ideas, problems and solutions to both specialized and non-specialized audiences.

To develop those learning skills necessary to undertake further studies with a high degree of autonomy.

2.2. Learning goals

The student must demonstrate the following results:

Knowledge about microorganisms studied in the course

Able to define and properly use the scientific terminology used in Microbiology and Parasitology

Able to reinforce basic knowledge about eukaryotic and prokaryotic microorganisms

It is capable of differentiating the various types of microorganisms that are the object of study in Microbiology and Parasitology, with special attention to those related to food.

Able to differentiating microbial and parasitic diversity from the systematic, physiological and ecological fields

Able of defining the mechanisms used in their metabolism to carry out their activities

Able to interpret by what mechanisms they exchange genetic information among themselves and what this exchange of information reports to them

Able to know the characteristics of microbial growth and the alternatives for its control

Able to know the importance of the pathogenicity mechanisms possessed by the various microorganisms and parasites, since food acts as a vehicle for them and can cause illness in consumers.

Able to differentiate and assess the most common sterilization and sanitization techniques

Able to work in a team, synthesize the information available on a topic, present and substantiate his opinion on the matter and present it publicly and orally

2.3. Importance of learning goals

Together with the rest of the competences acquired, students will have the requested knowledge for advanced Microbiology courses of the degree, and will contribute to the performance of their professional profile. On the other hand, the generic and transversal competences acquired in this course will contribute to the comprehensive training of future Graduates in Food Science and Technology.

3. Assessment (1st and 2nd call)

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

The student must demonstrate that he/she has achieved the intended learning outcomes through the following assessment activities:

ACTIVITY 1: WRITTEN TEST FOR THE THEORETICAL EVALUATION

A final written test will be undertaken based on the answer to 20 multiple choice questions. It will evaluate the acquisition of basic theoretical knowledge of the subject. The grade of this final written test will be between 0 and 10 and will represent 60% of the final grade of the course. The student can have the choice to examine in two halves. First half will be about 18

topics and the second the remaining topics. If the student pass the first exam only will be evaluated of the second half.

ACTIVITY 2: WRITTEN TEST FOR THE PRACTICE EVALUATION

At the end of course, the student will have to fill out a questionnaire to assess whether he or she has acquired the skills wanted.

The evaluation of the set of practices, will be between 0 and 10, will be 20% of the final mark.

ACTIVITY 3: THEORETICAL WORK AND WRITTEN PROJECTS

By groups, students will have to demonstrate their ability to make a bibliographic review. This theoretical work has to be presented in in the classroom in a session reserved for it and using a infography, comic, or video making use of different technologies for diffusion and communication of information. The grade for this activity will be between 0 and 10 and will represent 20% of the final grade of the course. This grade will take into account the following aspects:

Proven knowledge and understanding of the methodologies described (60%)

Oral and written presentation quality (40%).

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The course is structured in 35 lectures lasting one hour, 5 hours of seminars and 20 hours of laboratory practice.

The documentation of each topic is housed in the virtual campus of the university, i.e. Moodle 2 platform. Therefore, the student can have access during the academic year. The available material includes the presentations of the concepts reviewed in class. In general, the professor will stimulate students to participate through question-based learning.

The practices will be carried out in the laboratory in sessions of two hours. As in the theoretical part, the virtual course with the same name of the subject (open in the virtual campus of the university, in the Moodle 2 platform) will house the scripts and help on the realization of the practices.

For both the theoretical and practical sessions, the messaging and news system offered by the virtual course is used to maintain permanent contact with the students.

For individual and group work, all available information is provided to the student.

During the development of the classes, students will have to take into account all the procedures and rules included in the following documents:

- "Guía Preventiva para el Estudiante de la Universidad de Zaragoza":
<http://uprl.unizar.es/publicaciones/estudiantes.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>

4.2. Learning tasks

Theory program

SECTION I. GENERAL BACTERIOLOGY

Microorganisms. Bacterial structures (cell envelope and intracellular structures). Techniques in Microbiology. Identification and clasiffication of bacteria. Bacteria Phisiology. Bacteria nutrition. Bacteria reproduction. Genetic, variation, and horizontal gene transfer. Virulence and pathogenicity. Control of bacteria populations: Physical agents, chemical and antibiotics.

Competences:

The objective of this first block is to introduce the student to the fundamentals of microbiology, including the general characteristics of bacteria and the bases of the techniques used in microbiology.

Teaching activities:

Lectures: 18 hours.

Practical Teaching in the laboratory: 13 hours dedicated to the manipulation of bacteria.

SECTION II. SPECIFIC BACTERIOLOGY: FOODBORNE AND APPLIED MICROBIOLOGY

Bacteria Taxonomy. Bacteria of interest in Science and food technology, focused on those involved on food contamination and food Infection and applied microorganisms:

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*.

The objective of this block is to provide knowledge about those bacteria related to foodborne and applied Microbiology and the mechanisms that each one of them develops to act on food and / or humans. The taxonomy of the microorganisms and the relationships between them is also considered in this block.

Teaching activities:

Lectures: 7 hours

Practical teaching: 3 h dedicated to bacteria identification

SECTION III. GENERAL FUNGI, FOODBORNE AND APPLIED MICOLOGY

General features of fungi. Methods of fungi culture and growth. Micotoxins

Competences:

The objective of this block is to introduce the student to the general characteristics of fungi within the microbial world, their constitution, their observation, their culture, their metabolism, their mechanisms for exchanging information between them and their role in relation to food. and the man

Teaching Activities

Lectures: 2 hours

Practices teaching: 2 h dedicated to fungi identification

SECTION IV. GENERAL VIROLOGY AND FOODBORNE

Virology and concepts. Virus Structure. General Features of virus replication. Destruction of virus. Culture, cuantification and identification. Classification of virus. Food and waterborne viruses. Bacteriophages. Other infective agents.

Competences:

The objective of this block is to learn general characteristics of viruses within the microbial world, their constitution, their observation, their culture, their replication, and their role in foodborne diseases.

Teaching Activities:

Lectures: 2 hours.

SECTION V. GENERAL PARASITOLOGY AND FOODBORNE

Biological relationship of Parasitism. Parasites Spread of parasites. Biological cycles. Parasite / host relationship. Systematics and taxonomy. Classification of parasites. Protozoa, helminths and arthropods: General characters, classification, study of the most important genera in relation to food and human.

Competences:

The objective of this fourth block is to introduce the student to the general characteristics of the biological relationship of parasitism within the microbial world, morphology and biology of parasites, the parasite-host-environment relationships and their role in relation to food and the man.

Teaching Activities:

Lectures: 4 hours

Practical teaching: 2 hours dedicated to parasite identification.

SECTION VI. INDUSTRIAL MICROBIOLOGY

Descriptores:

Concepts about Industrial Microbiology and use of microorganisms.

Competencias:

El objective is to introduce the basic concepts of industrial Microbiology that will be develop in coming courses.

Actividades enseñanza - aprendizaje

Lectures: 2 hours.

PRACTICE PROGRAM:

It involves 5 sessions of about 4 hours each, through out the semester. The content of the practical sessions is as follows:

1. Working rules in the Microbiology laboratory. Material and appliances of normal use. Sterilization systems, preparation of culture media. Observation of samples. Simple staining.
2. Preparation of samples. Culture of microorganisms: Aerobic and anaerobic. Types of cultures. Gram staining.
3. Quantitative study of bacterial populations. Biochemical study of microbial activity for the identification of bacteria.
4. Immunological Reactions for the identification of microorganisms.
5. Identification of fungi, yeasts and parasites.