1. OVERVIEW

Subject Area	General Microbiology Module/ Diagnostic and Therapeutic Procedures
Degree	Bachelor's Degree in Medicine
School/Faculty	FACULTY OF EXERCISE, SPORTS SCIENCES AND PHYSIOTHERAPY
Ac. Year	THREE
ECTS	8 ECTS
Type	COMPULSORY
Language(s)	SPANISH
Delivery Mode	ON CAMPUS
Semester	Six-monthly

2. INTRODUCTION

General Microbiology belongs to the Diagnostic and Therapeutic Procedures module which is worth a total of 43 ECTS. It is a compulsory subject worth 8 ECTS and is taught over the course of the third year.

By the end of the course students will understand the main microorganisms subdivided into the following areas: Bacteriology, virology, mycology and parasitology, as well as the main implications these microbiological agents have for the onset of infectious diseases.

3. SKILLS AND LEARNING OUTCOMES

Basic Skills (CB, by the acronym in Spanish):

CB2: Students can apply their knowledge to their work professionally and possess the necessary skills, usually demonstrated by forming and defending opinions, as well as resolving problems within their study area.

CB3: Students have the ability to gather and interpret relevant information (usually within their study area) to form opinions which include reflecting on relevant social, scientific or ethical matters.

CB4: Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences.

General skills (CG, by the acronym in Spanish):

B10: Understand and recognise the causal agents and risk factors which determine health conditions and the development of a disease.

B12: Understand the principles of action, indications and effectiveness of therapeutic interventions, based on the available scientific evidence.

C15: Have the ability to carry out an initial diagnosis and establish a well-founded approach to making a diagnosis.

C17: Establish the diagnosis, prognosis and treatment, applying the principles based on the most reliable information possible.

D24: Establish good interpersonal communication which allows you to efficiently and empathetically connect with patients, family members, media and other professionals.
F30: Understand, critically assess and know how to use clinical and biomedical information sources to obtain, organise, interpret and communicate scientific and health information.

Cross-curricular skills (CT, by the acronym in Spanish):

• CT3: Teamwork: ability to integrate and collaborate actively with other people, areas and/or organisations to reach common goals, evaluate and integrate contributions from the rest of the group members and create a good working environment.
• CT6: Problem solving: ability to solve an unclear or complex issue or situation which has no established solution and requires skill to reach a conclusion.
• CT7: Decision making: ability to choose between different options or methods to effectively solve different problems or situations.

Specific skills (CE, by the acronym in Spanish):

CE42: Understand the indications of the biochemical, haematological, immunological, microbiological, and anatomical pathology and image tests.
CE47: Understand the principles of microbiology and parasitology.
CE48: Understand the main diagnostic techniques of microbiology and parasitology and interpret the results.
CE60: Know how to obtain and process a biological sample to study it using the different diagnostic procedures.
CE61: Know how to interpret the results of diagnostic laboratory tests.

Learning outcomes (RA, by the acronym in Spanish):

RA1: Understand the principles of microbiology and parasitology.
RA2: Understand the normal human microbiota and the characteristics of the host-parasite relationship.
RA3: Understand the general characteristics of microorganisms, pathogens and parasites in humans.
RA4: Connect the most prevalent infectious syndromes with the main pathogens.
RA5: Understand the procedures for obtaining and processing samples for microbiological study.
RA6: Know how to use an optical microscope for microbiological diagnostics.
RA7: Understand the main diagnostic techniques of microbiology, parasitology and serology and interpret the results.
RA9: Underpin the microbiological bases of the clinical use of antimicrobials, their mechanisms of action, and mechanisms of resistance together with sensitivity tests to antimicrobials and how to interpret them.
RA10: Understand the procedures for the prevention and control of infectious diseases.
RA11: Know how to perform simple microbiological diagnosis techniques.

The following table shows how the skills developed in the subject area match up with the intended learning outcomes:

Skills	Learning outcomes

CB2, CB3, CB4, CE47	**RA1**. Understand the principles of microbiology and parasitology.
B10, C15, D24, CE42	**RA2**. Understand the normal human microbiota and the characteristics of the host-parasite relationship.
B12, C17, D24, F30, CT7	**RA3**. Understand the general characteristics of microorganisms, pathogens and parasites in humans.
CT3, CT6	**RA4**. Connect the most prevalent infectious syndromes with the main pathogens.
GB2, CE60	**RA5**. Understand the procedures for obtaining and processing samples for microbiological study.
GB3, CE48	**RA6**. Know how to use an optical microscope for microbiological diagnostics.
B10, C15, CT3, CT6, CE48, CE61	**RA7**. Understand the main diagnostic techniques of microbiology, parasitology and serology and interpret the results.
CB2, CB3, CT3, CT6, CE61	**RA9**. Underpin the microbiological bases of the clinical use of antimicrobials, their mechanisms of action, and mechanisms of resistance together with sensitivity tests to antimicrobials and how to interpret them.
CB2, CB3, CT3, CT6, CE61	**RA10**. Understand the procedures for the prevention and control of infectious diseases.
CB2, CB3, CT3, CT6, CE48, CE61	**RA11**. Know how to perform simple microbiological diagnosis techniques.

4. CONTENTS

This subject consists of 5 units (UA) and 16 topics, as described below:

Topic	
	UA 1: GENERAL ASPECTS
TOPIC 1	Clinical microbiology: Introduction, concept and content. Historical perspective.
TOPIC 2	Host-micro-organism relationship. The human microbiome. Microbiological diagnosis techniques.
	UA2. BACTERIOLOGY
TOPIC 3	Bacterial morphology and structure. Microbial metabolism and genetics.
TOPIC 4	Antibiotics: Classification, mechanisms of action and resistance. Epidemiology of the resistance in the main bacterial pathogens.
TOPIC 5	*Staphylococcus*, *Streptococcus*, *Enterococcus* and other gram-positive cocci. Aerobic or facultative gram-positive bacilli.

	Neisseria.
TOPIC 6	Enterobacteriaceae. *Pseudomonas aeruginosa* and other aerobic or opportunistic facultative gram-negative bacilli.
TOPIC 7	*Vibrio, Campylobacter* and *Helicobacter*. *Haemophilus, Bordetella, Legionella, Brucella* and *Francisella*.
TOPIC 8	Strict anaerobes - gram-positive and gram-negative.
TOPIC 9	*Mycobacterium*, *Nocardia* and *Actinomyces*.
TOPIC 10	*Mycoplasma* and *Ureaplasma*. Spirochetes. *Rickettsia, Coxiella* and *Chlamydia*.
	UA3. MYCOLOGY
TOPIC 11	Fungi: General characteristics and classification. Anti-fungal drugs. Fungi as a cause for superficial, cutaneous and subcutaneous mycoses. Fungi as a cause for systemic infections. Fungi as a cause for opportunistic mycoses.
	UA4. VIROLOGY
TOPIC 12	Viruses of medical interest: general characteristics and classification. Antiviral drugs. Herpes virus and respiratory viruses.
TOPIC 13	Enterovirus. Viruses which cause gastroenteritis. Viral hepatitis.
TOPIC 14	Mumps and viral exanthema. Rabies virus, arbovirus and other viruses which cause zoonotic disease. Retrovirus. Oncogenic DNA viruses. Prions.
	UA5. PARASITOLOGY
TOPIC 15	Parasites of medical interest: general characteristics and classification. Anti-parasites. Intestinal protozoa. Haematic protozoa. Tissue protozoa and of other locations.
TOPIC 16	Trematoda and cestoda. Intestinal and tissue nematodes. Arthropods of medical interest.

5. TEACHING/LEARNING METHODS

The types of teaching/learning methods are as follows:

1. Problem-based learning: Presentation of problems, reorganising into small groups, literature analysis, analysis of scientific texts and documents, symposiums and presentations, directed debates, specialised individual and collective tutorials, and reaching a consensus.
2. Problem-based learning geared towards clinical reasoning: Presentation of problems, reorganising into small groups, literature analysis, analysis of scientific texts and documents, symposiums and presentations, directed debates, specialised individual and collective tutorials, and reaching a consensus.
3. Case studies and problem solving: approach and solving cases and problems either as an individual or in small groups.
4. Specialised seminars: literature research and debate on scientific data in small groups.
5. Lectures: Classroom presentations by the professor on basic theory, encouraging debate and student participation.
6. Case study method: presentation and discussion of clinical cases in small groups.

6. LEARNING ACTIVITIES

The types of learning activities, plus the amount of time spent on each activity, are as follows:

On campus:

Learning activity	Number of hours
Theory/practical learning activities on-campus	92 h
Directed learning activities	22 h
Independent working	60 h
Tutorials	24 h
Knowledge tests	2 h

7. ASSESSMENT

The assessment methods, plus their weighting in the final grade for the subject area, are as follows:

On campus:

Assessment system	Weighting
2 knowledge tests and laboratory work	70%
Active methods	30%

On the Virtual Campus, when you open the subject area, you can see all the details of your assessment activities and the deadlines and assessment procedures for each activity.

Each semester, students will study the following content:

- **First semester: General aspects and bacteriology.**
- **Second semester: Mycology, virology and parasitology.**

The content corresponding to each of the two semesters will be assessed in the following way:

1/ Objective tests, make up 70% of the final subject grade (35% the first test and 35% the second test) and consist of:
a. TWO knowledge tests, one each semester, in accordance with the assessment schedule for all subjects which is provided to all students.
b. Each of the knowledge tests will be performed by means of 2 tests:

i. **Test 1**, consists of 50 questions with 4 possible answers, only 1 of which is correct. This includes 5 back-up questions (if necessary, in case one of the questions is invalid). In this test, we will ask questions regarding the knowledge acquired in the laboratory work, as well as the content corresponding to each semester.
This test 1 **makes up 60% of the grade for the knowledge test**.

ii. **Test 2**, consists of 30 questions with 4 possible answers, only 1 of which is correct. This includes 2 back-up questions. This test is about clinical cases of microbiology.
This test 2 **makes up 40% of the grade for the knowledge test**.

Incorrect answers in both tests will lead to points deduction in accordance with the error subtraction formula for random answers.

c. Students must obtain in each of the knowledge tests a grade equal to or greater than 5.0 out of 10.0 once the average has been taken of Test 1 and Test 2. If students do not pass the first test, they must retake the test in the extraordinary examination period in JULY. If students do not pass the second test, they must retake the test in the extraordinary examination period in JULY.
d. The knowledge tests will assess the following: cognitive objectives, laboratory skills, and clinical knowledge of the subject.

2/ Laboratory work.

a. Attendance and realisation of laboratory practice work is **compulsory**.
b. There will be no practical exam. However, the content and skills assessed in this laboratory practice will be assessed in the knowledge tests.
c. When students do not attend the laboratory practice and/or do not submit any of the work set by the teacher, they must do a recovery exam in the extraordinary examination period which they must pass with a grade equal to or greater than 5.0 out of 10.0.
d. If students do not pass the practical work, the grade in the ORDINARY examination period in JUNE will be a **FAIL**, regardless of the grade obtained in the rest of the assessed activities. In the EXTRAORDINARY examination period in JULY, students must pass the practical work with the practical exam referred to above.

3/ Clinical cases make up 25% of the final grade.

- 2 clinical cases will be presented and resolved during the semester, with each being on a different day. The professor will publish beforehand on the virtual campus the dates the resolution of these cases will take place in the classroom.
- The resolution of these cases will be performed in-person in the classroom. Students must respond to questionnaires on the clinical cases in the classroom individually through the virtual campus. There will be one questionnaire for each clinical case.

Students must obtain a grade equal to our greater than 5.0 out of 10.0 in each of the four questionnaires. Each case will be graded independently with its corresponding questionnaire.

- The arithmetic average of the grade in the four questionnaires will make up 25% of the subject grade.
- Students who do not pass any of the questionnaires (scoring lower than 5.0 out of 10.0) must retake them in the extraordinary examination period. The professor will set a date for the resolution of the cases in the extraordinary examination period (resit).

4/ Student attitude makes up 5% of the subject grade.

- This will be assessed based on a rubric (detailed below) which takes into account punctuality, interest and behaviour during the laboratory and clinical cases practicals.

STUDENT ATTITUDE SCORE

2.5 points	2.5 points	2.5 points	2.5 points
- The student is punctual when called to laboratory and clinical cases practical work.	- The student pays attention, keeps the laboratory tidy, and in the classroom is not distracted by electronic devices.	- The student helps with the realisation of laboratory and clinical cases practical work, responds to questions and collaborates with colleagues in solving tasks.	- The student completes all tasks set. - The student submits all activities on time and correctly.

8. BIBLIOGRAPHY

The bibliographic material used in each of the topics will correspond to the most appropriate books, articles, consensuses and other sources of information in each case. The teacher will provide the origin of the explained information in class, when necessary.
In general, the subject can be followed with the following reference work:

- Microbiología médica, 9ª edición. 2021. Murray P., Rosenthal K., Pfaller M.