



## COURSE DATA

### DATA SUBJECT

**Code:** 34464  
**Name:** Medical microbiology and parasitology  
**Cycle:** Undergraduate Studies  
**ECTS Credits:** 6  
**Academic year:** 2026-27

### STUDY (S)

Degree	Center	Acad. year	Period
1204 - Degree in Medicine	Facultat de Medicina i Odontologia	2	Second quarter
1204 - Degree in Medicine	Facultat de Medicina i Odontologia	2	Second quarter

### SUBJECT-MATTER

Degree	Subject-matter	Character
1204 - Degree in Medicine	Procedimientos diagnósticos y terapéuticos	BASIC
1204 - Degree in Medicine	Procedimientos diagnósticos y terapéuticos	BASIC

### COORDINATION

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## SUMMARY

The objectives of the subject "Microbiology and Medical Parasitology" are:

- To provide the scientific knowledge that a general doctor must have about: I) Biological and pathogenic aspects of the organisms producers of diseases in the human being; II) Laboratory diagnosis and the bases of etiological treatment of the infectious and parasitic diseases.
- To facilitate the acquisition of necessary basic practices for the study of the microorganisms and los parasites of medical interest.

## PREVIOUS KNOWLEDGE

### RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE



There are no specified enrollment restrictions with other subjects of the curriculum.

## OTHER REQUIREMENTS

To pursue this matter, is recommended to students having passed the following subjects:

1. Biology
2. Biochemistry

## COMPETENCES / LEARNING OUTCOMES

### 1204 - Degree in Medicine

Acknowledge diversity and multiculturality.

Be able to formulate hypothesis, gather information and evaluate it critically in order to solve problems by following the scientific method.

Capacity for communicating with professional circles from other domains.

Consideration of ethics as a fundamental value in the professional practise.

Criticism and self-criticism skills.

Establish a good interpersonal communication which may allow professionals show empathy and talk to the patients efficiently, as well as to their relatives, the media and other professionals.

Establish the diagnosis, prognosis and treatment, applying principles based on the best information available and on conditions of clinical safety.

Evaluate the risk-benefit balance of diagnostic and therapeutic procedures.

In the professional practise, take a point of view which is critical, creative, constructive and research-oriented.

Is able to interpret results of diagnostic tests in the laboratory.

Is aware of the indications in biochemical tests, as well as haematological, immunological, microbiological, anatomical and pathological, and image tests.

Is aware of the main techniques of microbiological and parasitological diagnosis and interprets the results.

Keep and use medical records which contain information about the patient for later analysis, preserving the confidentiality of personal data.

Know how to use IT in clinical, therapeutic and preventive activities, and those of research.

Know how to use the sources of clinical and biomedical information available, and value them critically in order to obtain, organise, interpret and communicate scientific and sanitary information.

Knows how to manage disinfection and sterilisation techniques.



Knows how to use medicines properly. Analgesic, antineoplastic, antimicrobial and anti-inflammatory drugs.

Knows the bases of microbiology and parasitology.

Proper organisation and planning of the workload and timing in professional activities.

Saber cómo obtener y procesar una muestra biológica para su estudio mediante los diferentes procedimientos diagnósticos.

Team-working skills and engaging with other people in the same line of work or different.

Understand and recognise source agents and risk factors which determine health status and the development of diseases.

Understand the importance and the limitations of scientific thinking in the study, prevention and management of diseases.

Working capacity to function in an international context.

## DESCRIPTION OF CONTENTS

### 1. SECTION I: MICROBES, PARASITES AND HUMANS (2 lessons)

Lesson 1.- Introduction to Medical Microbiology and Parasitology. Historical evolution. Differences between prokaryotic and eukaryotic cell organization. Kingdoms of nature and situation of pathogenic organisms for human being. Concepts of Microbiology, Parasitology and Medical Microbiology.

Lesson 2.- Host-parasite relationship. - Normal human microbiota. Colonization versus infection. Symbiosis: mutualism, commensalism and parasitism. Koch's postulates and Falkow's molecular postulates. Microbiome, disease and human health.

### 2. SECTION II: MEDICAL BACTERIOLOGY (12 lessons)

Lesson 3.- General bacteriology I.- Morphology, grouping and staining affinity of bacteria. Composition and function of external, superficial and internal bacterial structures. Plasmids and transposons. Bacterial division at cell and population level (growth curve). Bacterial metabolism: generalities, trophic types of bacteria. Bases for the classification of bacteria. Bacterial genetics.

Lesson 4.- Mechanisms of bacterial pathogenicity. Factors responsible for pathogenic power. Virulence. Infectious process: routes of entry, adherence, penetration, tissue damage. Bacterial toxins. Immunopathogenesis.

Lesson 5.- Gram-positive cocci. - Study of the biological characteristics, determinants of pathogenicity and pathogenic action of the genera *Staphylococcus*, *Streptococcus* and *Enterococcus*.



Lesson 6.- Gram-positive bacilli. - Study of the biological characteristics, determinants of pathogenicity and pathogenic action of the genera *Corynebacterium*, *Listeria*, *Bacillus*, *Clostridium* and *Clostridioides*.

Lesson 7.- Actinomycetales.- General biological characteristics and differentiation of Actinomycetales. Special study of the genus *Mycobacterium*. Other actinomycetales of medical interest: *Actinomyces*, *Actinomadura*, *Nocardia* and *Streptomyces*.

Lesson 8.- Gram-negative cocci and coccobacilli. - Study of the biological characteristics, determinants of pathogenicity and pathogenic action of the genera *Neisseria*, *Bordetella*, *Haemophilus*, *Legionella* and *Brucella*.

Lesson 9.- Gram-negative bacilli I.- Study of the biological characteristics, determinants of pathogenicity and pathogenic action of the species of the Enterobacteriaceae family.

Lesson 10.- Gram-negative bacilli II.- Study of the biological characteristics, determinants of pathogenicity and pathogenic action of the species of the Vibrionaceae and Aeromonadaceae families.

Lesson 11.- Gram-negative bacilli III.- Study of the biological characteristics, determinants of pathogenicity and pathogenic action of the genera *Pseudomonas*, *Burkholderia*, *Acinetobacter*, *Stenotrophomonas*, *Campylobacter*, *Helicobacter* and *Bacteroides*.

Lesson 12.- Spirochaetales.- Study of the biological characteristics, determinants of pathogenicity and pathogenic action of the genera *Treponema*, *Borrelia* and *Leptospira*.

Lesson 13.- Rickettsiales.- Study of the biological characteristics, determinants of pathogenicity and pathogenic action of the genera: *Rickettsia*, *Coxiella*, *Ehrlichia* and *Bartonella*.

Lesson 14.- Mycoplasmatales and Chlamydiales. *Mycoplasma* and *Ureaplasma*; *Chlamydia* and *Chlamydomphila*.

### **3. SECTION III: MEDICAL VIROLOGY (9 lessons)**

Lesson 15.- General virology. - Classification of viruses. Viroids and prions. Morphology and general structure of viruses: study of the various components. Multiplication of viruses: general phases and particularities of RNA and DNA viruses. Viral genetics.

Lesson 16.- Pathogenesis of viral infections. Viral tropism: receptors. Mechanisms of cell injury. Latent and persistent viral infections. Cell transformation and viral oncogenesis. Host susceptibility to viral infections.

Lesson 17.- Order Herpesvirales: Family Herpesviridae. Subfamily Alphaherpesvirinae: herpes simplex virus types 1 and 2, and varicella-zoster virus. Subfamily Betaherpesvirinae: Human cytomegalovirus and human herpes virus types 6 and 7. Subfamily Gammaherpesvirinae: Epstein-Barr virus and human herpes virus type 8.

Lesson 18. Family Poxviridae. Family Adenoviridae: genus Mastadenovirus. Family Parvoviridae: genera

Parvovirus, Erythrovirus (parvovirus B19). Family Papillomaviridae: genus Papillomavirus. Family Polyomaviridae: genus Polyomavirus (JC virus and BK virus). Viral oncogenesis: oncogenes and involved mechanisms.

Lesson 19.- Family Orthomyxoviridae: genus Influenzavirus: Influenza viruses A, B and C. Mononegaviral order: family Paramyxoviridae, subfamily Orthoparamyxovirinae, genus Respirivirus: parainfluenza viruses 1 and 3; subfamily Rubulavirinae: genus Orthorubulavirus: parainfluenza viruses 2 and 4, parotiditis virus; genus Morbillivirus: measles virus. Family Pneumoviridae: genus Orthopneumovirus: respiratory syncytial virus (RSV) and genus



Metapneumovirus: human metapneumovirus.

Lesson 20.- Order Picornvirales: family Picornaviridae: genus Enterovirus. Family Caliciviridae: genera Norovirus and Sapovirus. Family Astroviridae: genus Mamastrovirus. Family Sedoreoviridae: genus Rotavirus. Family Matonaviridae: genus Rubivirus.

Lesson 21.- Family Rhabdoviridae: genus Lyssavirus: rabies virus. Family Coronaviridae: genera Alphacoronavirus and Betacoronavirus: SARS, MERS, SARS-CoV2 viruses. Family Filoviridae: Ebola and Marburg viruses.

Lesson 22. Family Retroviridae: genus Lentivirus. Human immunodeficiency viruses: HIV-1 and HIV-2. Genomic organization. Biological cycle. Antigenic structure: subtypes. Pathogeny and natural history of AIDS. Diagnosis, therapeutic bases and prophylaxis. Genus Deltaretrovirus: human T-lymphotropic viruses HTLV-I and HTLV-II.

Lesson 23. Hepatitis virus. Genus Hepatovirus: hepatitis A virus. Family Hepeviridae: genus Orthohepevirus: hepatitis E virus. Family Hepadnaviridae: genus Orthohepadnavirus: hepatitis B virus. Family Kolmioviridae: genus Deltavirus: Delta virus. Family Flaviviridae: genus Hepacivirus: hepatitis C virus.

#### **4. SECTION IV: MEDICAL MYCOLOGY AND PARASITOLOGY (8 lessons)**

Lesson 24.- General mycology. - Morphofunctional characteristics of fungi. Fungal organography. Asexual propagation and sexual reproduction. Bases of its classification. Pathogenesis and diagnosis of fungal infections.

Lesson 25.- Medical mycology I.- Study of the biological characteristics, determinants of pathogenicity and pathogenic action of fungi that produce superficial, cutaneous and subcutaneous mycoses.

Lesson 26.- Medical mycology II.- Study of the biological characteristics, determinants of pathogenicity and pathogenic action of fungi that produce opportunistic and exotic mucocutaneous mycosis, microsporidiosis, pneumocystosis, hyalomycosis and phaeohyphomycosis.

Lesson 27.- General Parasitology. - Morphofunctional characteristics of protozoa and metazoans of medical interest. Bases of their classification. Pathogenesis of parasitosis.

Lesson 28.- Medical Protozoology I.- Study of the biological characteristics, determinants of pathogenicity and pathogenic action of intestinal (*Entamoeba histolytica*, *Dientamoeba fragilis*, *Giardia duodenalis*, *Balantidium coli* and intestinal coccidia) and genitourinary (*Trichomonas vaginalis*) protozoa. Medical interest of *Blastocystis* spp.

Lesson 29.- Medical Protozoology II.- Study of the biological characteristics, determinants of pathogenicity and pathogenic action of tissue protozoa (*Toxoplasma gondii*) and blood and tissue protozoa (*Leishmania* spp., *Trypanosoma* spp., *Plasmodium* spp.).

Lesson 30.- Medical Helminthology I.- Study of the biological characteristics, determinants of pathogenicity and pathogenic action of the species of the phylum Platyhelminthes (cestodes, distomas and schistosomes) of medical interest.

Lesson 31.- Medical Helminthology II.- Study of the biological characteristics, determinants of pathogenicity and pathogenic action of the species of the phylum Nematoda.



## 5. SEMINAR PRACTICES (5 seminars of 2 hours and 1 seminar of 1 hour)

Attendance is mandatory.

Seminar 1.- Host response to microbes and parasites. - Immunological aspects of viral, bacterial, fungal and parasitic infections. Parasite survival and effector mechanisms. Non-specific and specific defense mechanisms. (2 hours)

Seminar 2.- Antimicrobials: general concepts and classification. Resistance mechanisms. (2 hours)

Seminar 3.- Methods for the study of infections. - Direct microbiological diagnosis. Molecular microbiology. Diagnosis by means of antibody detection and applications in clinical microbiology (2 hours).

Seminar 4.- Antivirals: mechanisms of action. Emerging and exotic viral infections: Togaviridae family. Flaviviridae family. Order Bunyvirales: Peribunyaviridae, Nairoviridae, Hantaviridae, and Arenaviridae. Families. (2 hours)

Seminar 5.- Emerging and exotic mycoses. Antifungals: mechanism of action. Major exotic parasitic endemics and emerging parasitosis. Antiprotozoa and anthelmintics: Action mechanisms. (2 hours)

Seminar 6. Medical Entomology. One Health approach (1 hour).

## 6. TUTORIALS (4 hours)

The regulated tutorial sessions are intended to guide the study and resolve any doubts generated. For this reason, the active participation of the students is required in order to facilitate communication with the PDI and the approach of specific conceptual difficulties and their resolution by the teaching staff.

Different sessions will be held in each theory group, on days agreed with the students. Attendance is voluntary and is a non-assessable activity.

## 7. LABORATORY PRACTICES (6 sessions of 2 hours)

Session 1.- Introduction to the medical Microbiology laboratory and its working methods. Explanation of basic safety standards, handling of basic instruments and aseptic technique. Microscopic examination: realization and observation of microorganisms through fresh examinations, simple staining and/or differential staining. Gram stain. Cultures: types of microbial culture and isolates by sowing in solid culture media.- Study of human saprophytic flora: examples from sowing pharyngeal swabs and/or isolates from finger prints in culture media.

Session 2.- Medical bacteriology I. Gram stain and observation of different bacterial morphotypes. Reading and interpretation of the results of the pharyngeal exudate and/or culture of skin imprint.- Introduction to the study of biochemical characteristics in bacterial diagnosis (I): performance of rapid identification tests: catalase and oxidase. Study of biochemical characteristics in bacterial diagnosis (II): explanation and observations of biochemical identification tests according to the metabolic characteristics of different groups of bacteria.



Session 3.- Medical bacteriology II. General explanation of antimicrobial susceptibility tests (disk-plaque diffusion methods, determination of minimum inhibitory concentrations (MIC) by diffusion in Epsilon and/or dilution methods. Performance of antibiotic susceptibility testing (antibiogram) by diffusion in disc-plaque (Kirby-Bauer technique).

Session 4.- Bacteriology III. Microscopic observation of Mycobacterium spp. by performing Ziehl-Neelsen staining.- Description of anaerobic microorganism culture techniques. Reading and interpretation of antibiogram results.

Session 5.- Medical Mycology: explanation and macroscopic and microscopic observation of the structure and morphology of different yeast-like and filamentous fungi: fresh microscopic examination and/or calcofluor white stain. Explanation and description of identification methods in medical mycology: observation of the early filamentation test and a negative staining of capsules.

Session 6.- Medical Parasitology: protozoa, helminths and arthropods. Explanation and macroscopic and microscopic observations of helminth adults and eggs. Explanation and microscopic observation of hematic, tissue and intestinal protozoa.- Basic explanation and macroscopic and microscopic observations of arthropods. Observation of clinical samples for parasitological diagnosis.

## WORKLOAD

### PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	4,00
Theory	33,00
Seminar	11,00
Laboratory	12,00
<b>Total hours</b>	<b>60,00</b>

### NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	50,00
Preparation of lessons	30,00
Preparation for assessment activities	10,00
Resolution of case studies	0,00
<b>Total hours</b>	<b>90,00</b>

## TEACHING METHODOLOGY

The attendance hours (theoretical lessons, practices and seminars) will be the 40% of the hours of one ECTS credit, while the 60% of the remaining hours will be focused on the study and autonomous work, individual or in group, by the student.



Thus, in this subject the cognitive content (theoretical lessons, seminars, participation in tutored groups and study by the student himself) with procedural content (practices) will be combined.

In the **theoretical lessons** (31 hours of lessons), the teacher will expose by a master class, the content, methods and procedures to obtain the knowledge and the skills that the students must acquire. With the aim of making the lessons dynamic and trigger the students' participation, they can download the didactic material used by the teacher in the development of each topic from the Aula Virtual.

In the **seminars** (11 hours with 5 seminars of 2 hours and 1 seminar of 1 hour), specific topics will be discussed that will be useful for the students' continuous assessment. For each seminar, the didactic materials and the appropriate bibliography for the preparation will be given to the students.

In the **tutorials** (4 hours), small groups of students will set questions and discuss about the topics proposed by the teacher, previously prepared and developed by the student.

In the **laboratory practices** (12 hours, 6 sessions of 2 hours), the students, distributed in small groups, will fulfill and discuss essential activities of the microbiological diagnosis, previously explained by the teacher. The monitoring of these activities will be made, by the teacher, through the continuous assessment of the compulsory attendance and the student's appropriate degree of participation.

The gender perspective, the respect for diversity, and the sustainable development goals (SDGs) will be incorporated into teaching, whenever possible.

## EVALUATION

In the evaluation of the students' learning, the acquired knowledge of both the cognitive and procedural contents, in which this matter is organized, will be valued, by means of the corresponding theoretical and practical exams, respectively.

The mark corresponding to the theoretical exam represents 60% (6 points) of the final maximum mark, and the one corresponding to the practical the remaining 40% (4 points). It is necessary to pass both types of tests (theoretical exam  $\geq 3$  points and practical exam  $\geq 2$  points) to obtain the marks of: Pass,  $\geq 5$  points; Notable,  $\geq 7$  points; Excellent,  $\geq 9$  points; With highest honours, among the best excellent.

**A.- The theoretical exam (6 points)** is carried out through an exercise consisting of 40 multiple-choice questions with four possible options and a single correct answer. For every four wrong answers the value of a correct answer will be subtracted. Maximum score: six (6) points; Minimum qualification necessary to be added with the one obtained in the practical part:  $\geq 3$  points (PASS).

The PASS grade obtained in the first call, in case of not passing the practical exam, will be kept until the second call of the same academic year.

**B.- The practical exam (subject of Seminars and laboratory practices) (4 points)** is carried out through an



exercise composed of 20 multiple-choice questions with four possible options and a single correct answer. For every four wrong answers the value of a correct answer will be subtracted. Maximum score: four (4) points; Minimum qualification necessary to be added with the one obtained in the theoretical part:  $\geq 2$  points (APTO).

The PASS grade obtained in the first call, in case of not passing the theoretical exam, will be kept until the second call of the same academic year. Attendance at practical activities is mandatory; in case of failing the course, it will be kept for the following year.

Attendance at practical activities is mandatory. The student is considered to meet this requirement if he or she has attended a minimum of 80% of these activities and has adequately justified the impossibility of attending the remaining sessions due to the occurrence of a cause of force majeure. It will be essential to comply with this requirement to pass the subject.

Students are reminded of the importance of carrying out evaluation surveys on all the teaching staff of the degree subjects.

## REFERENCES

### BASIC:

- Murray PR, Rosenthal KS y Pfaller MA. (2021). Microbiología médica 9ª ed. Elsevier España SL. ISBN 9788491138082
- Ryan KJ, Ray CG. (2017). Sherris Microbiología Médica. 7ª ed. Editorial McGraw Hill. ISBN 9781264268719
- Recursos e-Salut: ClinicalKey Student Medicina, Odontologia y Enfermería [<https://uv-es.libguides.com/RecursosSalut>] Acces Medicina [[https://uv-es.libguides.com/Access\\_Medicina](https://uv-es.libguides.com/Access_Medicina)] Médica Panamericana [[https://uv-es.libguides.com/Medica\\_Panamericana](https://uv-es.libguides.com/Medica_Panamericana)]

### COMPLEMENTARY:

- Bennett JE, Dolin R y Blaser MJ. (2020) Mandell, Douglas y Bennett. Enfermedades Infecciosas. Principios y Práctica. 9ª ed. Elsevier España SL. Vol I. ISBN 9780443065811
- Carroll KC et al. Manual of Clinical Microbiology (2019). 12th Edition. ASM Press. Washington DC. ISBN 978-1-555-81983-5
- On line Manual general: <https://www.microbiologybook.org/book/bact-sta.htm> Bacteriología: <http://textbookofbacteriology.net/> Virología: <https://ictv.global/> <https://viralzone.expasy.org/> <https://virology.ws/about/> Micología: Mycology | University of Adelaide Home - Doctor Fungus ([drfungus.org](http://drfungus.org)) Parasitología: CDC - DPDx - Parasites A-Z Index Prácticas de laboratorio: [https://bio.libretexts.org/Bookshelves/Microbiology/Microbiology\\_Laboratory\\_Manual\\_\(Hartline\)](https://bio.libretexts.org/Bookshelves/Microbiology/Microbiology_Laboratory_Manual_(Hartline))