

# **COURSES DESCRIPTION** *MICROBIOLOGY AND IMMUNOLOGY COURSE 2<sup>ND</sup> SEMESTER 1<sup>ST</sup> DENTISTRY DEGREE MODALITY: ON CAMPUS ACADEMIC YEAR 2022/2023 MEDICINE SCHOOL*



# **1. COURSE/SUBJECT IDENTIFICATION**

### 1.- COURSE/SUBJECT:

Name: Microbiology and Immunology			
Code: 19696			
Year(s) course when is taught: 2nd	Semester (s) when the course is taught: 1 <sup>st</sup>		
Type: Mandatory	<b>ECTS</b> : 3	Horas ECTS: 30	
Language: English	Modality: On campus		
Degree (s) in which the course is taught: Dentistry			
School which the course is taught: Medicine School			

### 2.- ORGANIZATION OF THE COURSE:

Department: Department of Pharmaceutical and Health Science.

Area of knowledge: Microbiology, Parasitology and Immunilogy.

# 2. LECTURERS OF THE COURSE/SUBJECT

### **1.- LECTURERS:**

### 1.1. Theory

Responsible of Microbiology	CONTACT
Name:	Dra. Dª. Marina Robas Mora
Phone (ext):	91 372 47 55
Email:	marina.robasmora@ceu.es
Office:	B 2.18
Teaching and Research profile	Associate Professor
Research Lines	Antibiotic Resistance. Bacteriology.

Responsible of Immunology	CONTACT
Nombre:	Dra. Dª. Carolina Hurtado Marcos
Tlfno (ext):	91 372 52 76 (Ext. 15276)
Despacho	C. 2.19 / Laboratorio 101 Edificio A
Email:	carolina.hurtadomarcos@ceu.es
Perfil Docente e Investigador	Doctor en Biología Molecular (esp Inmunología) por UAM/ Acreditación ANECA/ 2 Sexenio investigación
Líneas de Investigación:	Mecanismos de Evasión sistema inmunitario, patógenos inductores de cáncer y autoinmunidad



Course Description / Academic year 2022-2023

Lecturer	CONTACT
Name:	Dra. Dª. Carmen de Mendoza Fernández
Phone (ext):	91 372 47 55
Email:	carmen.fernandez5@ceu.es
Office:	B 2.18

Lecturer	CONTACT
Name:	Dr. Fernando Izquierdo Arias
Phone (ext):	91 372 47 00 ext 15275
Email:	ferizqui@ceu.es

Lecturer	CONTACT
Name:	Dra. Dª. Ángela Magnet Dávila
Phone (ext):	91 372 47 00 ext 15277
Email:	angela.magnetdavila@ceu.es
Office:	C219
Office:	219

### 1.2. Profesorado de prácticas

Lecturer	CONTACT
Name:	Dr. Sergiu Padure
Phone (ext):	91 372 47 00 ext 15276
Email:	sergiu.padure@ceu.es
Office:	C219

Lecturer	DATOS DE CONTACTO
Name:	Mr. Daniel González Reguero
Phone (ext):	91 372 52 76 (Ext. 14755)
Email:	Daniel.gonzalezreguero@ceu.es

Lecturer	DATOS DE CONTACTO
Name:	Mrs. Carla Huarte Fernández
Phone (ext):	91 372 47 00
Email:	carla.huartefernandez@ceu.es

### 2.- TUTORIALS:

For any queries students can contact lecturers by e-mail, phone or visiting their office during the teacher's tutorial times published on the students' Virtual Campus.

# **3. COURSE DESCRIPTION**



Basic theoretical-practical subject in which the following knowledge is taught:

- Morphological, genetic and physiological characteristics of the main groups of microorganisms (bacteria, fungi, viruses) and parasites found naturally in the oral cavity: commensal and pathogenic microorganisms at this level.
- Fundamentals of antimicrobial treatment. Main groups of antibacterials, antiviral and antifungal agents.
- Use of sterilization and disinfection methods for their application to dental practice.
- Microorganism-host interactions: mechanisms of microbial pathogenicity and their relationship with the immune system.
- Main infections caused by pathogenic/commensal microorganisms of the oral cavity: caries, periodontal disease and systemic diseases.
- Methods of microbiological diagnosis of oral pathogens.
- Professional infectious diseases in dental practice.
- Precise understanding of the basic foundations of the immune system, emphasizing the interconnections between innate and acquired immunity and its repercussions on health and disease.
- Knowledge of the possible immunological pathologies such as allergies, autoimmunities, immunodeficiencies and infections important for the correct performance of the dental practice in the diagnosis.

# 4. COMPETENCIES

#### 1.- COMPETENCIES

Code	Basic and General Competencies
CG.07	Promote autonomous learning of new knowledge and techniques, as well as motivation for quality.
CG.11	Understand the basic biomedical sciences in which Dentistry is fundamental to ensure proper dental care.
CG.12	Understand and recognize the normal structure and function of the stomatognathic apparatus, at the molecular, cellular, tissue and organic levels, in the different stages of life.

Code	Specific Competencies
CE.1	To know the biomedical sciences in which the Dentistry is fundamental to assure a proper care of the mouth. These sciences should include appropriate contents of: Embryology, anatomy, histology and physiology of the human body, genetics, biochemistry, cell and molecular biology, Microbiology and immunology.
CE.2	To know the morphology and function of the stomatognathic apparatus, including appropriate contents of specific embryology, anatomy, histology and physiology.

#### 2.- LEARNING OUTCOMES:

Know the structure, function and metabolism of microorganisms.

To know the organization and general mechanisms of the inflammatory response and the immunological response.

To know the main microorganisms of oral interest.

## **5. LEARNING ACTIVITIES**



90

#### 1.- DISTRIBUTION OF STUDENTS` ASSIGNMENT:

Total hours of the course

Name	On-Campus Hours
AF 1 - Clase Teórico-Práctica	
Theory classes:	
Microbiology and Parasitology	17 + 5.5
Immunology	22.5
TOTAL attendance hours of theory	45
AF 2 – Laboratory sessions	
Integrated Practices:	
Microbiology and Parasitology sessions	6 + 2
Immunology sessions	8
TOTAL attendance hours of practice	16

Name	Not on- campus hours
AF 3 - Student's autonomous work	83

### 2.- LEARNING ACTIVITIES:

ID	Name	Presentiality	Definition
AF1	Theoretical- Practical Class	100%	Training activity that combines the transmission of theoretical information by the teacher for the acquisition of knowledge and the performing of practical activities in the classroom that involve the application of the theoretical knowledge acquired. It can include theoretical class, information search, resolution of practical cases, reasoned interpretation of study sources, resolution of exercises, expositions of topics by students, etc., always under the teacher's supervision.
AF2	Laboratory practices	100%	Training activity that prioritizes the performance by the student of practical activities in the laboratory involving the application of theoretical knowledge and the acquisition and development of practical knowledge and skills. This activity may include work among peers, learning of basic and specific techniques and methods, workbooks, use of ICTs, simulation with typodons, phantoms and virtual simulation in three dimensions, etc.
AF8	Student's autonomous work	0%	Training activity in which the student autonomously manages their learning through the study of training materials. It is understood as the work time that the student needs and uses, outside class hours, to acquire the skills and abilities required by the degree curriculum



# 6. ASSESMENT OF LEARNING

#### **1.- CLASS ATTENDANCE:**

- In order to be eligible for examination by continuous assessment students must attend at least 75% of scheduled class time (attendance sheets will be used). As students may be absent 25% of the classes, no attenuating circumstances will be accepted for absences.
- 100% attendance at practical classes is required. There is not contemplated the practical sessions between the ordinary examination and the re-take extraordinary examination, for that reason the non-realization of these in the months scheduled carries the failure of both examinations.

#### 2.ASSESMENT METHOD AND CRITERIA:

ORDINARY ASSESMENT (Continous assessment) <sup>1</sup>		
Name	Minimum score <sup>4</sup>	Weight (%)
SE1 - Theoretical assessment:		60
Ordinary examination <sup>2</sup>	5	30 + 30
SE2 - Practical assessment <sup>3</sup> :		20
Microbiology and Immunology laboratory book	-	1 + 1
Microbiology and Immunology written practice exam	5	8 + 8
Attitude and participation in the Microbiology and Immunology laboratory	5	1 + 1
SE3 - Student's individual work:		20
Microbiology and Immunology self-assessment test	5	10 + 10

- (1) In the exceptional case that a student cannot attend class, this absence must be justified by means of a prior written request to the professor. Otherwise, the student must take the extraordinary exam.
- (2) The ordinary exam is made up of two parts: a Microbiology exam and an Immunology exam. Both will be done in the same session, independently. It is an essential requirement for the calculation of the final grade for theory that both exams are passed (grade ≥ 5.0/10). If one of the exams has a lower grade, the maximum grade that the student will receive is 4.0/10.
- (3) Passing the practical part is an essential requirement to pass the subject. To do this, the student must complete (100% attendance and evaluation) the practices of the Microbiology module and the Immunology module. The final grade for the practices results from the weighted average of both modules, as long as each one is independently approved with a grade of ≥ 5.0/10. If one of the modules has a lower grade, the maximum grade that the student will receive is 4.0/10.

EXTRAORDINARY ASSESMENT		
Name	Minimum score <sup>4,5</sup>	Weight (%)
SE1 - Theoretical assessment:		



Exam	5	80	
SE2 - Practical assessment:			
Microbiology and Immunology written practice exam	5	20	

- (4) Minimum mark to apply the percentages.
- (5) The passing of the practices with a minimum grade of 5 is the necessary condition to pass the subject.

The student who does not attend the final exam in ordinary or extraordinary call will be qualified with "Not Presented", regardless of whether he/ she has carried out any academic activity of the continuous evaluation.

#### **3.- ASSESMENT METHOD DESCRIPTION**

ID	EVALUATION SYSTEM	DEFINITION
SE1	Theoretical assessment	Written test in which the totality of the contents of the subjects is evaluated, as well as the degree of acquisition of the competences linked to them. Exams (or evaluation tests) will be carried out with theoretical-practical questions and resolution of assumptions that include the contents of the subject studied.
SE2	Practical a ssessment	Practices will be assessed through practical exercises, notebooks, exams, completion and presentation of work, clinical cases, etc that collect the practical contents worked on.
SE3	Individual and/or group work (continuous assessment)	Evaluation of work done in the classroom or outside it individually or in groups.

# 7. COURSE PROGRAM

#### 1.- COURSE PROGRAM:

MICROBIOLOGY THEORETICAL PROGRAM:

#### I. IMPORTANCE AND APPLICATIONS OF MICROBIOLOGY.

**Unit 1. Microbiology and microorganisms. Applications of microbiology to Dentist Practice:** First observations of microorganisms. Controversy over spontaneous generation. Microorganisms as etiological agents of infectious diseases. Birth of Immunology. Applications of Microbiology.

II. MORPHOLOGY AND STRUCTURE OF THE MICROBIAL CELL.

Unit 2. The prokaryotic cell:
Size, shape and bacterial clusters. General structure of the prokaryotic cell.
Topic 3. Surface structures of the bacterial cell:
Capsules and mucous layers, bacterial cell wall, plasma membrane, flagella and fimbriae.
Unit 4. Internal structures of the bacterial cell:
Nuclear material. Chromosomal and extrachromosomal DNA. Ribosomes. Bacterial endospores.
Spore sporulation and germination.

**III. ANTIMICROBIAL AGENTS OF THERAPEUTIC USE.** 





Unit 5. Antimicrobial Agents: Origins and Classifications:
Antibiotics that act at the level of cell wall synthesis. β-lactams and glycopeptides.
Unit 6. Antimicrobial Agents Inhibiting Protein Synthesis:
Aminoglycosides. Tetracyclines. Macrolides.
Unit 7. Antibacterials that act on the synthesis of nucleic acids:
Quinolones. Metronidazole.
Unit 8. Antibacterials that affect the plasma membrane:
Polypeptide antibiotics. Antimetabolites: Sulfamides. Trimethoprim.
Unit 9. Bacterial resistance to antibiotics:
Origin of resistance. Mechanisms of resistance. Epidemiology of resistance.

#### IV. MICROBIAL NUTRITION AND METABOLISM.

**Unit 10. Bacterial cell energy production processes:** Processes of obtaining energy. Respiration. Concept of fermentation.

#### V. MORPHOLOGY, STRUCTURE AND REPLICATION OF VIRUSES.

#### Unit 11. Nature of viruses:

Characteristics of the viral particle: nucleic acid, capsid and envelope. Generalities about virus multiplication. Oncogenic viruses. Bacteriophages. **Unit 12. Antivirals for use in dentistry.** 

#### VI. FUNGI OF CLINICAL INTEREST.

**Unit 13. Taxonomy and diversity of fungi.** Fungi and yeasts of clinical interest. **Unit 14. Antifungals for use in dentistry.** 

#### VII. CONTROL OF MICROORGANISMS.

**Unit 15. Sterilization by physical and chemical agents.** Temperature. Filtration. Radiations. Gas sterilization. Disinfectants and antiseptics.

#### V. IMMUNOLOGY AND INTERACTIONS MICROORGANISM - HOST

Unit 16. Host-parasite relations and epidemiology in infectious diseases:

Pathogenic, commensal and opportunistic microorganisms. The oral microbiota. Microbial Pathogenicity and virulence mechanisms.

Unit 17. Ecology of the oral cavity:

Generalities of the oral microbiota. Formation of biofilms and complications.

#### VI. INFECTIONS OF THE ORAL CAVITY:

Unit 18. Microorganisms implicated in dental decay:

Genus Streptococcus, Candida, Lactobacillus. Predisposing factors.

Unit 19. Microorganisms implicated in periodontal disease (gingivitis and periodontitis): Genus *Prevotella*, *Porphyromonas* and Fusobacterium.

**Unit 20. Microorganisms involved in endodontic infections (pulp and periapical tissues).** Genus *Streptococcus, Enterococcus, Veillonella, Bacteroides, Fusobacterium, Prevotella* and *Porphyromonas.* 

Unit 21 Systemic diseases produced by bacteria of the oral cavity: *Streptococcus* spp. responsible for endocarditis

#### VII. PARASITOLOGÍA

Unit 25. General characteristics of the parasites:

Definition and types of parasite, hosts, and biological cycles.



#### Unit 26. Parasitic arthropods: Myiasis

Unit 27. Parasitic protozoa: *Trichomonas tenax*, *Entamoeba gingivalis*, Acanthamoeba sp , Mucocutaneous Leishmaniasis

Unit 28. Other parasitosis of importance in human health: echinococcosis, cysticercosis, trichinellosis, etc...

#### **IMMUNOLOGY THEORETICAL PROGRAM:**

#### Lesson 1: INTRODUCTION TO IMMUNOLOGY:

Definition, natural and acquired immune system, primary and secondary responses, humoral and cellular responses, phylogeny of the immune system.

#### Lesson 2: ORGANS AND CELLS OF THE IMMUNE SYSTEM:

Primary and secondary organs, innate immune system cells, acquired immune system cells. Hematopoiesis

#### Lesson 3: IMMUNOGLOBULINS:

Structure, classes and subclasses, biological functions. Generation of B lymphocytes repertoire.

#### Lesson 4: MONOCLONAL ANTIBODIES:

Definition and production. Diagnostic monoclonal antibodies. Therapeutic monoclonal antibodies. Chimeric and humanized antibodies. LECTURE

#### Lesson 5: COMPLEMENT SYSTEM:

Definition, main function, classical and alternative pathways, membrane attack complex, anaphylatoxins, other complement functions.

#### Lesson 6: HUMAN MAJOR HISTOCOMPATIBILITY COMPLEX:

HLA. HLA-I and HLA-II molecules, structure, function, genetic organization, distribution, polymorphism and heredity.

#### Lesson 7: ANTIGEN PROCESSING AND PRESENTATION:

Endocytic and cytosolic pathways for antigen processing and presentation to helper and cytotoxic T lymphocytes. Pharmacological modulation of lymphocyte activation.

#### Lesson8: T LYMPHOCYTES ACTIVATION AND FUNCTION:

T lymphocytes subsets: helper, cytotoxic, regulatory. T cell receptor,  $TcR\alpha\beta$  and  $TcR\gamma\delta$  T lymphocytes, generation of diversity. Immune synapse. Function of cytotoxic T lymphocytes.

#### Lesson 9: CYTOKINES:

Definition and general characteristics. Functions and mechanisms. Interleukines. Chemokines and lymphocyte circulation. Other cytokines.

#### Lesson 10: ADHESION MOLECULES AND LIGANDS.

Definition and function. Types of adhesion molecules. Migration and extravasation. Lymphocyte homing.

#### Lesson 11: THE IMMUNE SYSTEM IN ACTION:

Infections. Th1, Th2, Th17 and Treg responses. Immunotherapy: adyuvants, modulators and immunossuppresor

#### Lesson 12: TOLERANCE: Central mechanisms:

thymic and bone marrow clonal deletion. Peripheral mechanisms: clonal anergy and active suppression. Oral tolerance, clinical applications. Maternal-fetal tolerance. Immune privilege sites.

#### Lesson 13: PRIMARY IMMUNODEFICIENCIES:

Antibodies immunodeficiencies, cellular and combined immunodeficiencies. Complement deficiencies. Phagocytosis deficiencies.



#### Lesson 14: SECONDARY IMMUNODEFICIENCIES:

AIDS. latrogenic immunodeficiencies. Other secondary immunodeficiencies. LECTURE: The AIDS patient and dental practice

#### Lesson 15: HYPERSENSITIVITY:

Type I: Allergy. Type II: drugs hypersensibility. Type III: serum sickness and farmer's lung. Typo IV: Contact dermatitis.

#### Lesson 16: AUTOIMMUNE DISEASES:

Concept of autoimmunity. Pathogenenesis theories. Major systemic autoimmune diseases. Major organ-specific autoimmune diseases. LECTURE: Autoinmunity patient and dental practice.

#### Lesson 17: TRANSPLANTATION IMMUNOLOGY:

Transplantation types: syngeneic, allogeneic, xenogeneic. Allogeneic response. Organ rejection immunobiology. Hyperacute, acute and chronic rejection. Transplantation and immunosuppression. Bone marrow transplantation. Graft versus host disease.

#### Lesson 18: TUMOR IMMUNOLOGY:

Anti-tumor immunity. Tumor antigens. Immune surveillance. Anti-tumoral immune therapy strategies.

#### **PRACTICE PROGRAM:**

#### MICROBIOLOGY

- I. <u>Microbiological Techniques.</u>
  - 1. Sterilization.
  - 2. Culture of bacteria and fungi.
  - 3. Observation of bacterial and fungal samples: stained preparations.
- II. Bacteriological analysis of samples from the oral cavity.
  - 1. Sampling.
  - 2. Culturing samples.
  - 3. Interpretation of the culture plates and identification.
- III. Microbial analysis of a clinical sample.
  - 1.- Culture interpretation.
  - 2.- Gram stain.

#### PARASITOLOGY

- I. Microscopic observation of parasites: Life observation of *Trichomonas* sp. Stain.
- II. Microscopic observation of protozoa in the oral cavity.

#### INMUNOLOGÍA

- I. Quantification of immunoglobulins in biological samples (saliva) by immunoprecipitation.
- II. II.Determination of autoantibodies by enzyme-linked immunosorbent assay (ELISA). Use of plate spectrophotometer.
- III. III. Determination of autoantibodies against extractable core antigens (ENA) by immunoblot

# 8. BIBLIOGRAFÍA DE LA ASIGNATURA

**1.- ESSENTIAL BIBLIOGRAPHY:** 





#### **MICROBIOLOGY**

- Liébana Ureña, J. 2002. Microbiología oral. (2ª Edición). Editorial McGraw-Hill. Interamericana.
- Madigan MT, Martinko JM, Dunlap PV y DP Clark. 2015. Brock Biología de los Microorganismos. 14ª Edición. Pearson Educación.
- Murray P R, Rosenthal KS y M A Pfaller. 2013. Microbiología Médica, 7<sup>a</sup> Edición. Elsevier Mosby.
- Negroni M. 2009: Microbiología estomatológica. (Edición:2ª) Editorial Médica Panamericana.

### PARASITOLOGY

- Ash, L.A.; Oriel L, T.C. Parasites. A guide to laboratory procedures and identification. ASCP Press. 1987.
- Beaver, P.C., Parasitologia Clínica de Craig Faust. Ed. México Masson Doyma. (2003).
- Bogistsh B.J,, Cheng, T. C. (1998). Human Parasitology. 2<sup>a</sup> Ed. Academic press. San Diego.
- Roberts, L.S. Foundations of Parasitology. 6<sup>a</sup> Ed. Times Mirror/Mosby College Publishing. St. Louis. (2000).

#### **IMMUNOLOGÍA**

-Roitt I. (2019). Fundamentos de Inmunología.12<sup>a</sup> Ed. Editorial Médica Panamericana. -Abbas Abul K. (2018). Inmunología Celular y Molecular. 8<sup>a</sup> Ed. Editorial Mc GrawHill/Interamericana. -Sompayrac (2016). How the immune System Works 5<sup>o</sup> Ed. Wiley-Blackwell.

-Playfair (2012). Immunology at a Glance, 10th Edition. Wiley-Blackwell

#### 2.- ADDITIONAL BIBLIOGRAPHY::

Revistas periódicas generales con frecuentes artículos relacionados disponibles en la biblioteca:

- Nature Medicine.
- The New England Journal of Medicine.
- The Lancet.

#### 4.- WEB RESOURCES:

- <u>http://www.seimc.org/inicio/index.asp</u>: page of the Spanish Society of Infectious Diseases and Clinical Microbiology, you can find many resources, such as:
  - Clinical guidelines.
  - Microbiological protocols.
  - Clinical protocols.
  - Quality control reviews.
- <u>http://www.semicro.es/</u>, is the Spanish Society of Microbiology. From it, you can access, for example, the Actualidad SEM magazine and many other links.
- En <u>http://www.cdc.gov/</u>, US CDC is accessed.
- En http://www.isciii.es/htdocs/index.jsp, you get to the Carlos III Health Institute.
- http://parasitology.dmu.ac.uk/learn/learning.htm parastiology online course

# 9. ATTITUDE IN THE CLASSROOM

1.- REGULATIONS:



Any irregular act of academic integrity (no reference to cited sources, plagiarism of work or inappropriate use of prohibited information during examinations) or signing the attendance sheet for fellow students not present in class will result in the student not being eligible for continuous assessment and possibly being penalized according to the University regulations.

The same rule will apply to those students that, without permission from the teacher, make use of electronic devices (computers, mobile phones, etc.) in the classroom. Audio and/ or live video recording, as well as taking photography is prohibited during the seminars, lectures and/or practical classes. Only, prior Professors express authorization, any of the so mentioned practices will be justified.

Likewise, all materials used in this course, including notes, tests, assignments, etc. are covered by copyrights which forbid you from sharing class materials with any group. The Professors reserve all copyright and other intellectual property rights associated with their material (notes, tests, assignments, etc.). You are in violation of the law if you post/text/share any course materials for use by others.

The entrance of coats, bags, folders to the laboratory is prohibited. Lockers are available to students at the entrance of the laboratory. The student must bring their lock.

Likewise, the use of the documentation provided by the teacher through the student portal (presentations, questions, exercises, seminars, practice notebooks, etc.) is restricted to the preparation of the subject. The teacher(s) reserve the right to make use of the measures included in the current legislation on Intellectual Property, in cases in which an unauthorized use and/or disclosure of said material is detected.

### **10. EXCEPTIONAL MEASURES**

Should an exceptional situation occur which prevents continuing with face-to-face teaching under the conditions previously established to this end, the University will take appropriate decisions and adopt the necessary measures to guarantee the acquisition of skills and attainment of learning outcomes as established in this Course Unit Guide. This will be done in accordance with the teaching coordination mechanisms included in the Internal Quality Assurance System of each degree.