

## Degree Course in Biomedical Laboratory Techniques

### INTEGRATED TEACHING: CLINICAL MICROBIOLOGY

SSD: MED/07, MED/42, VET/06, MED/46

CFU: 8

DOCENTE RESPONSABILE: Daniele Armenia

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MODULO: microbiologia, batteriologia, virologia

SSD: MED/07

CFU: 4

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MODULO: parassitologia generale

SSD: VET/06

CFU: 1

Name: [Massimo Gravante](#)

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MODULO: igiene e prevenzione ambientale

SSD: MED/42

CFU: 1

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MODULO: scienze e tecniche di medicina di laboratorio

SSD: MED/46

CFU: 2

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### PREREQUISITES

Even though no prior exams passed are necessary to follow the course, in order to understand the course, the student should have basic knowledge of immune system, the characteristics of bacterial, fungal, protozoal cells, the concept antibiotic resistance and structure of viruses.

### LEARNING OBJECTIVES

Essential objectives of the course are to learn the classification and taxonomy of the main bacteria, viruses, protozoa and fungi of human interest and diseases related to infections. Furthermore, to address the training development envisaged for a health worker, another objective will be to learn the basic concepts of hygiene and public health, with particular attention to the concepts of health and disease and their determinants, strategies and primary prevention methods and secondary. From a more applicative point of view, the knowledge of the different diagnostic methodologies for such infections will be indispensable. These

objectives will be achieved through lectures, seminars and interactive teaching activities, intended to facilitate learning and improve the ability to face and solve the main questions of Microbiology.

### **EXPECTED LEARNING RESULTS**

The expected learning outcomes are consistent with the general provisions of the Bologna Process and the specific provisions of Directive 2005/36 / EC. They are found within the European Qualifications Framework (Dublin descriptors) as follows:

#### **Knowledge and understanding**

At the end of this teaching the student will have to know:

- The specific classes of bacteria, viruses, fungi and protozoa related to human-interest infections and related diseases.
- The criteria for the diagnosis of diseases caused by pathogenic microorganisms
- The main direct indirect diagnostic techniques: microscopy, cultural tests, serological tests, molecular tests.
- The basics of microbiological pharmacology in diagnostics: tests for the evaluation of susceptibility to anti-microbial drugs and the mechanisms of resistance
- definition of health
- definition of disease
- health determinants: individual, behavioural, environmental, social and economic
- definition of prevention: primary, secondary and tertiary prevention
- prevention strategies and methods
- environment and health
- general concepts on the prevention of infectious diseases and vaccinations
- general concepts on the prevention of chronic degenerative diseases and screening
- knowledge and comprehension of the main culture media for the isolation of bacteria, with particular attention to their classification and composition
- knowledge and comprehension of the concept of sterilization in the field of microbiology
- knowledge and comprehension of the concept of antibiogram and the methods of execution in the microbiology laboratory
- knowledge and comprehension of blood culture and its importance for microbiological diagnosis
- knowledge and comprehension of the concept of urine culture and correct processing
- knowledge and comprehension the pre-analytical phase in the microbiology laboratory
- knowledge and comprehension the various colours used in the microbiology laboratory for the identification of bacteria
- knowledge and comprehension agglutination, immunochromatography and serological techniques for the identification of bacteria and human antibodies.
- knowledge and comprehension of traditional and innovative methodologies for the diagnosis of viruses
- knowledge and comprehension of the principles of pcr real-time, types of probes used
- knowledge and comprehension of the advantages and disadvantages of diagnostic methodologies in the field of know how to know and understand the wrong analytical data

#### **Applying knowledge and understanding**

At the end of the course the student will be able to:

Use the laboratory knowledge acquired for the autonomous study of aspects related to the field of microbiological diagnostics, to which the student will dedicate himself in the professional activity

### **Communication skills**

At the end of the course, the student should know :

Use scientific terminology, specific in the field of research and identification of bacteria, viruses, fungi and protozoa, in accordance with the various laboratory contexts

### **Making judgements**

At the end of the course, the student should know:

- carry out general assessments of the Microbiology.

### **These expected learning outcomes are measurable with the final evaluation**

## **COURSE SYLLABUS**

### **Module: Microbiology, bacteriology and virology**

Special bacteriology

Staphylococci, Streptococci, Pneumococcus and Enterococci. Bacilli and Clostridia. Corinebacteria and Listeria. Enterobacteriaceae. Pseudomonas. Vibrions, Campylobacter and Helicobacter. Hemophiles, Bordetellae. Yersinia and Pasteurella. Neisseria. Anaerobic microorganisms. Legionellae. Mycobacteria. Spirochaetes. Mycoplasmas. Rickettsia. Chlamydia. Antibacterial vaccinations. Principles of antimicrobial therapy.

Special Virology

Main classes of viruses of medical interest: Adenovirus, Herpesvirus, Poxvirus, Papovavirus, Parvovirus, Hepatitis virus, Picornavirus, Orthomyxovirus, Paramyxovirus, Rhabdovirus, Retrovirus, Reovirus, Togavirus, Flavivirus, Rotavirus. Diagnostics and antiviral therapy

Notes on special mycology

General characteristics of fungi: wall structure. dimorphism. metabolism, pigments, ecology, habitat, tropism, thallus morphology, hyphal growth, asexual blast and thallic reproduction, colony formation, germination, latency, variability, pathogenicity factors, pathogenesis of endogenous and exogenous fungal infections, non-specific and specific defence mechanisms against fungal infections, classification of fungal infections; anti-fungal diagnosis and therapy.

### **Module: parasitology**

General parasitology. Parasitic protozoans of medical interest. Helminths: Trematodes, Cestodes and Nematodes. Particular attention will be paid to the modes of transmission and the life cycle of parasites in order to better understand the isolation and identification techniques, the diagnostic methodologies and the hygiene rules of prevention.

### **Module: Hygiene and environmental prevention**

Definition of health and disease: Definition of primary, secondary and tertiary prevention; Health promotion; The determinants of health and illness, proximal and distal determinants, lifestyles, empowerment, healthy inequalities.

General concepts of control of communicable diseases: outline of methods of transmission, management and control (isolation, quarantine, chemo- and immuno-prophylaxis, sanitization, disinfection and sterilization measures); Epidemiology and Prevention of chronic degenerative diseases Environment and Health Report

### **Module: Technical Sciences of Laboratory Medicine**

Bacteriology: Culture media: preparation, growth factors, seeding sterilization.

Biochemical identification of microorganisms susceptibility Blood culture, urine culture.

Other methods: agglutination, precipitation, immunofluorescence, etc. Virology:

Laboratory medicine: evolution of virological diagnosis techniques. Real-time PCR: basic principles and technical aspects.

Application of real-time PCR in the virological field.

Importance of quantitative real-time dosages in the virological field Examples of case-reports in the validation of the analytical data

### **COURSE STRUCTURE**

The frontal teaching will be divided into 2, 3 or 4 hours lessons according to the academic calendar. The frontal teaching includes theoretical lessons with interaction and the projection of videos on the topics covered and seminars on specific topics. At the beginning of each lesson there will be a summary of the previous lesson in order to verify the correct understanding on the part of the students.

### **COURSE GRADE DETERMINATION**

The exam of the integrated course consists of an oral exam, during which the Examining Commission will evaluate the student's ability to apply the knowledge and will ensure that the skills are adequate to know and correctly apply the notions of microbiology, laboratory medicine and hygiene. The following will also be evaluated: making judgements, communication skills and learning skills according to as indicated in the Dublin descriptors.

In the evaluation, knowledge and understanding has a weight of 50%, knowledge and understanding applied by 20% and autonomy of judgment by 30%

The integrated teaching exam consists of an oral during which the commission will assess the student's ability to apply the knowledge learned and will ensure that the skills are adequate to solve the problems that arise in the specific disciplinary field and taking I also take into account the objectives of the teaching. The exam can be passed with a grade of 18/30. The student's learning ability, judgment ability and communication skills will be assessed. In the evaluation, knowledge and understanding have a weight of 50%, knowledge and understanding of 20% and autonomy of judgment of 30%

The assessments can be carried out both in progress and at the end of the integrated course. The methodology will be communicated at the beginning of the lessons together with the bibliography and / or teaching materials necessary for the preparation for the final evaluation.

The exam will be assessed according to the following criteria:

**Not suitable:** Poor or lacking knowledge and understanding of the topics; limited capacity for analysis and synthesis, frequent generalizations of the requested contents; inability to use technical language.

**18-20:** Just enough knowledge and understanding of the topics, with obvious imperfections; just sufficient capacity for analysis, synthesis and autonomy of judgment; poor ability to use technical language.

**21-23:** Sufficient knowledge and understanding of the topics; sufficient ability to analyze and synthesize with the ability to reason with logic and coherence the required contents; sufficient ability to use technical language.

**24-26:** Fair knowledge and understanding of the topics; discrete ability to analyze and synthesize with the ability to rigorously argue the required contents; good ability to use technical language.

**27-29:** Good knowledge and understanding of the required contents; good ability to analyze and synthesize with the ability to rigorously argue the required contents; good ability to use technical language.

**30-30L:** Excellent level of knowledge and understanding of the required content with an excellent ability to analyze and synthesize with the ability to argue the required content in a rigorous, innovative and original way; excellent ability to use technical language.

## SUPPORT ACTIVITIES

In addition to the teaching activity, the student will be given the opportunity to participate in seminars, research internships, department internships and monographic courses, and any ECM courses pertaining to the topics covered. The topics of the activities are not subject to examination.

## READING MATERIALS

Didactic material provided during the lessons (lecture notes, presentations, scientific articles)

Text:

The basics of Microbiology

Authors: Richard A. Harvey, Pamela C. Champe Bruce D. Fisher

## RESPONSIBLE AVAILABILITY

Students are received by appointment by writing to the following address:

Prof. Daniele Armenia

email [daniele.armenia@unicamillus.org](mailto:daniele.armenia@unicamillus.org)