
COURSE: GENERAL AND APPLIED MICROBIOLOGY

ACADEMIC YEAR: 2019-2020

TYPE OF EDUCATIONAL ACTIVITY: Characterizing

TEACHER: Prof. Giovanni SALZANO

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Language: **ITALIAN**

ECTS: 8

(6 of lessons and 2 of tutorials/practice)

n. of hours: 72 (48 of lessons and 24 of tutorials/practic)

Campus: **Potenza**Dept./School: **Dipartimento di Scienze**Program: **Biotechnologie (L2)**Semester: **II**beginning on 4th March 2020 , ending on 18th June 2020

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The main objective of the course is to provide students with the basis to face the study of the major fundamentals of microbiology including bacteriology, virology and immunology.

The main knowledge provided will be:

- *knowledge on the understanding of the concepts and fundamental principles of microbiology;*
- *key features of the structure, growth, physiology and behavior of bacteria, viruses, fungi and protozoa;*
- *Basic knowledge to deal with the study of genetic, metabolic strategies and ecology of microorganisms;*
- *basic knowledge of the main microbiological techniques to be applied in the laboratory.*

The main skills (ie the ability to apply their knowledge) will be:

- *identify and evaluate critically the principles and the mechanisms underlying the different fields of microbiology;*
 - *analyze the different applications of microbiology in biotechnology, industry and medicine;*
 - *use the acquired knowledge to the use of bacteria in the lab and the main sterilization techniques.*
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PRE-REQUIREMENTS

You 'must have acquired and assimilated the knowledge and the basic concepts provided by the course of Cell Biology and having taken and passed the exam because of preparation for the microbiology course.

SYLLABUSMicrobial cell (8 h)

Microbial cell composition. Methodologies to study the microorganisms. Principal features of fungi, algae and protozoa. Microbial metabolism: carbon and energy sources. Fermentations. Aerobic and anaerobic respiration. Bacterial photosynthesis. Fixation of carbon dioxide.

Microbial cell structure (8 h)

Size, shape, growth and movement of bacteria. Gram positive and negative. Structure and function of the cell membrane and wall. molecular structure of flagella and pili. Mathematical nature and expression of microbial growth. cellular transport systems.

Taxonomy and classification of bacteria (8 h)

Archaea. Photosynthetic eubacteria. Chemoautotrophs and mesophilic eubacteria. Gram-negative aerobic eubacteria. Enterobacteria. Gram-negative anaerobes eubacteria. Gram-positive spore-forming eubacteria. Gram-positive fermenting eubacteria. Ascomycetes. imperfect fungi. Yeasts.

Bacterial genome (8 h)

Bacterial chromosome. Transposable genetic elements in prokaryotes. Sequences of insertions. Polar mutations. IS elements. Transposons. Transposable elements in yeast. Mutations. Mutations in evolution. The plasmids. Types of plasmids and their biological significance. Bacterial transformation. Transduction: generalized transduction mediated by phage P22; specialized transduction mediated by phage λ . Conjugation. The properties of the F plasmid and HFR strains. Transfer of other plasmids mediated by plasmid F. Recombination. General homologous recombination: the Rec system in E. coli. The site-specific recombination: integration of the phage.

Regulation of gene expression (12 h)

Regulatory models in catabolic systems. Lac operon. Maltose regulon: example of positive regulation. Arabinose operon: positive and negative regulation. Feedback regulation of enzyme activity. Transcriptional regulation of the trp operon. Systems of regulation of the synthesis of amino acids and of protein synthesis. Global regulation models.

Viruses (4 h)

Structure and organization. Classification of viruses. Viral replication. Viruses of prokaryotes: bacteriophages. Reproduction of bacteriophages. Lytic cycle. Lysogenic cycle. Fago λ . P1 phage. Phage mu.

Isolation and characterization of microorganisms from the food matrix (24 h laboratory)

Description of the microbiology laboratory, equipment and materials used. Preparation of solutions and of liquid and solid substrates. Isolation of microorganisms from a food matrix. Decimal dilutions. Plates construction. Colony count. Purification of the isolates. Microscopic observation. Layout slides. Coloration. Morphology observation. Treatment with 3% KOH. Catalase test. Phenotypic characterization.

TEACHING METHODS

The course includes 72 hours of teaching between lessons and exercises. In particular it is provided 48 hours of lectures and 24 hours of guided exercises in the laboratory.

EVALUATION METHODS

The aim of the examination is to test the level of achievement of the previously mentioned educational goals.

The exam consists of an oral test in which it will be evaluated the ability to link and compare different aspects covered during the course; to pass the test you must acquire at least 18 points out of 30.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

Reference texts:

- *Madigan, Martinko. Biologia dei Microrganismi. ("il Brock"). Casa Editrice Ambrosiana . Vol.1 Microbiologia generale; Vol.2 Microbiologia ambientale, biomedica ed industriale cap.21,22,23.*
- *Dehò, Galli. Biologia dei microrganismi. Casa Editrice Ambrosiana.*
- *Wessner, Dupont, Charles. Microbiologia. Casa Editrice Ambrosiana.*

INTERACTION WITH STUDENTS

At the beginning of the course, after describing the objectives, program and methods of verification, the teacher provides students educational materials. Simultaneously, it collects a list of students who intend to enroll in the course, together with name, registration number and email.

Office hours: Tuesdays and Wednesdays from 17 to 19 at its 3A320 study, III Floor, 3A North building.

In addition to weekly reception, the teacher is available at all times for a contact with the students, through his e-mail.

EXAMINATION SESSIONS (FORECAST)¹

12/02/2020, 11/03/2020, 08/04/2020, 06/05/2020, 10/06/2020, 08/07/2020, 16/09/2020, 14/10/2020, 16/12/2020

SEMINARS BY EXTERNAL EXPERTS YES NO

FURTHER INFORMATION

¹Subject to possible changes: check the web site of the Teacher or the Department/School for updates.