



UNIVERSITY "ISMAIL QEMALI" VLOR
FACULTY OF TECHNICAL AND NATURAL SCIENCES
DEPARTMENT OF BIOLOGY

APPROVED
Head of the Biology Department
Dr. Aurora BAKAJ

MICROBIOLOGY SUBJECT PROGRAM

Head/Teacher of the course:	Dr. Aurora Bakaj
Charge:	65 hours in total (39 hours lex / 13 hours sem / 13 hours lab)
Subject typology:	Disciplines of the characteristic formation of the program
Academic year/semester when it takes place:	Spring 2022
Subject type:	Mandatory subjects
Study program:	Bachelor in Biology
Subject code:	BIO 264
E-mail address of the holder/pedagogue:	aurora.bakaj@univlora.edu.al

summary AND LEARNING OUTCOMES:

Microbiology is one of the fundamental disciplines of biology. During this cycle of lectures, will be addressed issues such as: Biology of Microorganisms, Classification of Microorganisms, and Environmental and Biomedical Microbiology . Addressing the problems of cell biology, microbial metabolism and its diversity, microbial growth and its control, and the genetics of microorganisms. Classification of microorganisms, their characteristics and interaction with humans, animals, plants or the environment. Treating microorganisms as a microbial community capable of colonizing and modifying the surrounding environment.

BASIC CONCEPTS:

- 1 eukaryotic**
- 2 prokaryote**
- 3 Bacteria**
- 4 algae**
- 5 The mushrooms**
- 6 protozoans**
- 7 Viruses**

COURSE TOPICS:

Topics to be covered in the lectures:

- Topic 1** Microbiology as a science and object of study. History, modern developments of microbiology and types of microorganisms. Morphology of prokaryotes. The cell wall of prokaryotes. Cell biology, Metabolism and its diversity in microorganisms.
- Topic 2** DNA organization in prokaryotes, Surface structures of bacterial cells, Glycolysis, Cellular respiration, Photosynthesis. Metabolism and its diversity in microorganisms. Anoxygenic and oxygenic photosynthesis.

- Topic 3** The Calvin cycle. Chemolithotrophy, Anaerobic respiration. Anaerobic respiration Metabolism and its diversity in microorganisms, Microbial growth.
- Topic 4** Fermentation and its diversity, Nitrogen fixation. Nutrient media, cell growth and bacterial cultures. Microbial growth, Control of microbial growth. The influence of environmental factors
- Topic 5** Types of sterilization, Disinfection, Antibiotics. Antibiotics, Resistance to antibiotics. Control of microbial growth in foods. Microbial genetics. Structure and function of genetic material.
- Topic 6** Regulation of gene expression. Regulation of transcription. Global regulation. Mutation, its molecular bases and mutants. Mutagens. Mutagenesis and carcinogenesis. Genetic recombination. Transduction and plasmids.
- Topic 7** Conjugation and chromosome movement. Transposons and yeast genetics. Evolution and taxonomy of microorganisms. Primitive organisms, Endosymbiosis. Classification of organisms and methods of identification of microorganisms.
- Topic 8** Phylogeny of bacteria. Phylogeny of Arks. General characteristics of viruses, structure, taxonomy, Isolation of viruses, their cultivation and identification. Bacteriophages. Animal viruses, bacteria viruses.
- Topic 9** Animal RNA viruses. Animal DNA viruses. Consequences of viral infection of an animal cell. Viroids and prions. Basic concepts in microbial ecology. Assessment of biodiversity. Environmental microbiology.
- Topic 10** Assessment of microbial activity. Microbiology of waters and deep seas. Soil microbiology and biogeochemical cycles. Bioremediation and biodegradation of petroleum and synthetic chemicals. Relationships of microorganisms with other organisms.
- Topic 11** Lichens and mycorrhizae. Agrobacterium. Bacteria in symbiosis with leguminous plants. Normal human skin microbiota of the oral cavity. Microorganisms as human pathogens. Normal microbiota of the gastrointestinal tract and other parts of the body.
- Topic 12** First and second line of defense. Immunity and the immune system. Humoral and cellular immunity. Immune tolerance. Pathogen entry, invasion and colonization in a host, exotoxins. Endotoxins, Skin pathogens. Microorganisms as human pathogens.
- Topic 13** Pathogens of the respiratory system, bacterial infections. Viral infections of the respiratory tract. Pathogens of the cardiovascular, lymphatic and nervous system. Pathogens of the digestive system, bacterial and viral infections. Reproductive system pathogens.

Topics to be covered in the seminars:

- Topic 1** Developments in microbiology and prokaryotic cell biology.
- Topic 2** Cell Biology, Cellular Respiration and Photosynthesis.
- Topic 3** Metabolism and its diversity in microorganisms
- Topic 4** Microbial growth
- Topic 5** Control of microbial growth
- Topic 6** Microbial genetics
- Topic 7** Evolution and taxonomy of microorganisms
- Topic 8** Domains of bacteria and archaea. Eukaryotic microorganisms
- Topic 9** Viruses
- Topic 10** Environmental microbiology. Relationships of microorganisms with other organisms
- Topic 11** Relationships of microorganisms organisms with others (continued). Host defense mechanisms
- Topic 12** Microorganisms as human pathogens
- Topic 13** Microorganisms as human pathogens. (continued)

Topics that will be covered in other obligations related to the course: laboratory work, practices, course

a) Topics of laboratory work:

- Topic 1** Instruments and techniques for the observation of microorganisms.
- Topic 2** Preparation of microscopic preparations (Preparation of living preparations with pressed point)
- Topic 3** Viewing the movement of *Escherichia coli* in the microscope.
- Topic 4** Preparation of non-living or stained preparations, Negative staining.
- Topic 5** Simple staining, Methylene blue staining.
- Topic 6** Composite stains, Gram staining.
- Topic 7** Preparation of yeast preparations
- Topic 8** Preparation of non-living preparations of fungi
- Topic 9** Sterilization and tools used in microbiology
- Topic 10** Cultivation of microorganisms, nutrient media
- Topic 11** Cultivation of microorganisms in the fields
- Topic 12** Cultivation of microorganisms in the fields
- Topic 13** Determination of morphological and cultural characteristics in the identification of microorganisms

FORM OF KNOWLEDGE CONTROL

control	Percentage assessment
Control I	20%
Annual assessment Seminars, laboratories, and teaching practice	20%
Final check	60%

ATTENDANCE:

The grading is based on the conversion of the total grade into %, grade 5-10 progressively 40-100%. The student, who results in less than 75% attendance for the period that belongs to each partial exam, the period for which he will be tested, will not be included in the relevant exam, will be evaluated with M.

If the student has attended the course, but does not appear in the next exam, he is assessed NP (Did Not Appear).

COURSE FORMAT:

The subject will be evaluated on the basis of two partial exams, assignments and the final exam. Points earned will be cumulative. The exams will not be repeated, for any reason. If you miss an exam without any major reason, then you will lose points for that exam that you did not appear for.

LITERATURE

a) Mandatory basic literature:

1. Series of lectures by Dr. Aurora Bakaj
2. "General microbiology", E. Hamzaraj (Basic literature)

b) Recommended literature:

"Cellular biology", T. Rexha

**Lecturer
Dr. Aurora BAKAJ**