

Microbiology (IInd Year of study, IIIrd SEMESTER)

Credit value (ECTS) 7

Course category

Domain (Imposed)

Course holder:

Assist. Prof. Dr. Florin-Daniel LIPȘA

Discipline objectives (course and practical works)

The aim of the course is to have students acquire knowledge on taxonomic descriptions, morphological characters and physiological behavior of the main groups of microorganisms that have practical implications. Students will also study the physico-chemical and biological development of microorganisms and metabolic behavior based on physiological particularities and growth conditions.

Practical works seek to familiarize students with technical work in microbiology laboratories and knowledge of general notions relating to taxonomy, morphology, physiology and reproductive particularities of the main groups of microorganisms with implications in food science and biotechnology.

Contents (syllabus)

Course (chapters/subchapters)
The object of study, the history and the importance of microbiology.
Prions.
Viruses: definition and general particularities; nature and origin of viruses; overall structure of the virus; classification, cultivation and identification of viruses; multiplication of viruses: the relationship virus - host cell; bacteriophages, cyanophages, micoviruses, viroids.
Bacteria: nomenclature, taxonomy, morphology, size, cell structure, chemical composition of bacterial cell, energy metabolism, respiration, nutrition, growth and multiplication. Particular groups of bacteria.
Diatoms: morphology, anatomy, nutrition, breeding and taxonomy.
Protozoa: morphology, anatomy, nutrition, breeding and taxonomy.
Fungi: morphology, anatomy, nutrition, breeding and taxonomy.
Soil Microbiology: role of microorganisms in the formation and evolution of organic matter; Microbiological theory of the formation of humus; various microbial activity of soils; soil microbial profile.
Microbiology of water.
Microbiology of air.
Microbiology of fermentations.
Influence of ecological factors on microorganisms: effect of pH; influence of temperature; influence of water; the influence of radiant energy; influence the mineralogical composition of the soil.

Ecological interrelationships between organisms: interrelations between populations of soil microorganisms: methabiosis, antagonism and symbiosis; Interrelations between soil microorganisms and higher plants: spermatosphere, rhizosphere; Mycorrhiza; Interrelations between fungi and plants in the case of mycorrhiza.
The role of microorganisms in achieving biological circuits in nature: - Nitrogen cycle: biological nitrogen fixation, ammonification, nitrification, denitrification. - Carbon cycle: the degradation of carbohydrates, hemicelluloses, starch, pectin, cellulose and lignin. - The contribution of microorganisms to achieve biological circuits of sulfur, phosphorus, potassium, calcium, iron and manganese. - Circuit of biological trace elements.
Microbial biodegradation and biodeterioration.
The influence of xenobiotics substances on microorganisms.

Practical works
The presentation of the General Microbiology laboratory; work safety rules; Laboratory equipment and utensils; good practice working in microbiology.
Optical microscope Krüss MBL 2000 Microscopic measurements.
Sterilization: Sterilization methods in microbiology, sterilization by physical and chemical agents.
The technique of cultivation of microorganisms: Seeding with a Pasteur pipette, with a loop, and seeding in Petri dishes.
The conduct of microscopic examination: examination of blade-slide preparations, in suspended drop; technical execution of a smear.
Morphology of bacteria: colorful preparations examination after simple coloration technique; Gram coloration.
Morphology of fungi: examination of blade-slide preparations or in suspended drop.
Determining the number of microorganisms per gram of soil
Examining of aerobic and anaerobic free nitrogen fixing bacteria
Examining of molecular nitrogen symbiotic fixing bacteria
Exam of cellulolytic microorganisms
Air microbiota. Distribution of microorganisms in the air. Factors that determine air microbiota
Microorganisms in the water. Distribution of microorganisms in water. Factors that determine water microbiota.
The study metabolic activity of microorganisms and determination of products Alcoholic fermentation. Lactic fermentation. Butyric fermentation. Acetic fermentation
Final colloquium of knowledge evaluation

Bibliography

1. Eliade Gh., Ghinea L., Ștefanic Gh. - *Microbiologia solului*, Ed. CERES, București, 1975.

2. Hatman M. - *Microbiologie*, Universitatea Agronomică Iași Centrul de multiplicare, Iași, 1990.
3. Malschi Dana, 2009. *Elemente de biologie, ecofiziologie si microbiologie.(Biocenologie terestra. Biologia solului. Hidrobiologie. Ecosisteme antropizate.)* Note de curs si aplicatii practice, Manual in format electronic. Facultatea de Stiinta Mediului, Universitatea Babes-Bolyai. Editura Bioflux, Cluj-Napoca. <http://www.editura.bioflux.com.ro/carti-2009/>
4. Mihăescu Gh., Gavrilă L. - *Biologia microorganismelor fixatoare de azot*, Ed. CERES, București, 1989.
5. Pamfil D., - *Microbiologie*, Editura Genesis, Cluj-Napoca, 1999.
6. Papacostea P. - *Biologia solului*. Ed. Științifică și Enciclopedică, București, 1976.
7. Ulea E., **Lipșa F.D.** - *Îndrumător practic de microbiologie*, Ed. Ion Ionescu de la Brad, Iași, 2012.
8. Ulea E., **Lipșa F.D.** - *Microbiologie*, Ed. Ion Ionescu de la Brad, Iași, 2011.
9. Zarnea Gh. - *Tratat de microbiologie generală*, Ed. Academiei Române, București, Vol. I - 1983, Vol. II - 1984, Vol. III - 1986, Vol. IV - 1990, Vol. V – 1994.

Evaluation

Evaluation form	Evaluation Methods	Percentage of the final grade
Exam	Oral examination	60%
Appreciation of the activity during the semester	Oral assessment during the semester, verification tests and final laboratory colloquium.	40%

Contact

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