UNIVERSITY OF WARMIA AND MAZURY
Faculty of Agriculture and Forestry

56S1-MIKROSRO **ENVIRONMENTAL MICROBIOLOGY** **ECTS: 3.5**

HOURS PER SEMESTER/WEEK: LECTURES: 15/1; CLASSES: 30/2
FIELD OF THE STUDY: Environmental protection
Level of study: First-cycle (Engineer's degree) program

Course status: obligatory *
Year of the study: II

COURSE CONTENTS

LECTURES: The role of microorganisms in maintaining soil homeostasis. Participation of microorganisms in biogeochemical cycles. Water as a living environment for microorganisms. Occurrence and qualitative and quantitative composition of microorganisms in natural and organic fertilizers, waste, and sewage. Participation and importance of microorganisms in the production of organic fertilizers, waste disposal, and sewage treatment. The importance of microorganisms in shaping the value of natural fertilizers. The role of microorganisms in biodegradation. Air as a living environment for microorganisms. Pathogenic microorganisms for plants, animals, and humans and methods of protection against pathogens. The importance of microbiology in increasing food and feed resources. Importance of epiphytic microorganisms. Environmental hazards caused by toxins produced by bacteria and fungi. Technical use of microbes.

CLASSES: Characteristics of microorganisms involved in the cycle of carbon, nitrogen, sulfur, and phosphorus. Significance of nitrification and denitrification processes in the environment. Significance of microorganisms binding atmospheric nitrogen. Characterization and determination of microorganisms in various soil ecosystems. Determination of the number of bacteria and the state of microbiological water pollution. The use of microorganisms in biological methods of wastewater treatment. Determination of the number of microorganisms in sewage and sewage sludge. Determination of the microbiological composition of natural fertilizers. Identification of microorganisms in the atmospheric air and determination of the microbiological degree of atmospheric air pollution. Microbiological analysis of food products of plant and animal origin. Significance and occurrence of mycotoxins and nitrosamines in the environment. Completion of the exercise material.

EDUCATIONAL PURPOSE: Familiarization with the function of microorganisms in the circulation of matter and energy, microbiological assessment of soil, water, air, and food quality.

LEARNING OUTCOMES

Knowledge. The student knows biogeochemical cycles. Defines microbiological and biochemical processes. Explains the role of microorganisms in different environments.
Skills. Performs microbiological analysis. Verifies test results against literature and legal regulations. Evaluates and draw correct conclusions from microbiological analysis and explain the role of microorganisms in various environments.
Social competences. He cares about maintaining homeostasis and the microbial diversity of environments. Takes care of compliance with sanitary rules. He remains cautious and critical in expressing his opinion on the microbiological status of individual products and environments.

TEACHING FORMS AND METHODS

Lectures. Informative lecture with multimedia presentation
Classes. Lab exercises, group work

FORM AND CONDITIONS FOR VERIFICATION OF LEARNING OUTCOMES

Lectures. Written exam - 10 questions or test. For a satisfactory grade - at least 60% of correct answers.
Classes. Practical test - assessment of work with the use of a microscope, recognition of individual groups of microorganisms, and determination of microorganisms in various ecosystems. Laboratory exercises - written test.

BASIC LITERATURE

1) Błaszczyk M, Mikrobiologia środowisk, Eds. PWN, Warszawa, 2010. 2) Błaszczyk M., Mikroorganizmy w ochronie środowiska, Eds. PWN, Warszawa, 2007. 3) Kołwzan B., Adamiak W., Grabas K., Pawelczyk A., Podstawy mikrobiologii w ochronie środowiska, Eds. Politechnika Wrocławska, 2006. 4) Salyers A.A., Whitt D.D., Mikrobiologia. Różnorodność, chorobotwórczość i środowisko, Eds. PWN, Warszawa, 2003.

ADDITIONAL LITERATURE

1) Parker M.M., Brock Biology of Microorganisms. Ninth Edition, Eds.Prentice Hall International Editions, 2000. 2) Paul E.A., Clark F.E., Mikrobiologia i biochemia gleb, Eds.UMCS Lublin, 2000. 3) Maier R.M., Pepper I.L., Gerba C.P., Environmental Microbiology, Academic Press, 2000.

THE TEACHER/TEACHERS CONDUCTING THE CLASSES:

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* note: optional course availability depends on Polish students' choice!