EC 05-VII Problems and Methods of Research in Physiology, Biochemistry of Plants and Microbiology

Code	EC 05-VII
ECTS credits	3
Attendance time	6th Semester
Language of instruction	Ukrainian
Duration	1
Cycle	Each Winter Semester
Coordinator	Lectures, Iryna Rayevska
Instructor(s)	Lectures, Iryna Rayevska
Allocation of study programmes	Biology
Recommended prerequisites	modern directions of research into the vital activity of plants and microorganisms; basic research methods; the basics of conducting physiological, biochemical and microbiological analyses.
Learning objectives	
Syllabus	Fundamental and applied value of research in physiology and biochemistry of plants. Connection of physiology and biochemistry of plants with genetics, breeding, genetic and cellular engineering, bioinformatics, plant genomics, preservation of plant biodiversity. The main directions of research in the field of physiology and biochemistry of plants and microbiology in Ukraine, Europe and the USA. Basic information about the institutions of the National Academy of Sciences of Ukraine and the National Academy of Agrarian Sciences of Ukraine, classical and agrarian universities as centers of development of various fields of plant physiology and biochemistry. The main directions of modern research in the physiology and biochemistry of plants in the leading universities and laboratories of Europe and the USA. Fundamental and applied value of research in microbiology. Information about classic microbiological experiments and their fundamental and

	practical significance. Ways and possibilities of using the results of fundamental microbiological experiments in various fields. Modern directions of research into the structure, physiology and patterns of life of microorganisms in Ukraine, Europe and the USA. The most famous microorganism research centers in the world and their main areas of research. The world's most famous collections of microorganisms and storage problems of prokaryotes and microscopic eukaryotes. Research methodology as a means of solving a scientific problem in the physiology and biochemistry of plants. The concept of "research methodology". Characteristics of the main types of experiments: laboratory, vegetation, field, their advantages and limitations. In vitro culture of plant tissues, cells and organs. Colorimetry, spectrophotometry, electrophoresis. Modern methods in plant physiology: polymerase chain reaction, proteomics, genomics, transcriptomics, metabolomics, ionomics. Requirements for the methods are resolution, accuracy, reproducibility, expressivity. The general scheme of building and conducting an experiment in physiology, plant biochemistry and microbiology. The experiment, its structure - variants, repetitions, a series of experiments. The principles of conducting experiments are the principle of single difference, reproducibility, typicality, accuracy. Methods of cultivation of microorganisms. Microscopic methods of studying microorganisms. Fluorescence microscopy. Electron microscopy. Methods of cytological studies of bacteria. Various methods of simple and complex coloring of preparations. Methods of studying the course of physiological and biochemical processes in microorganisms. The main groups of methods are physiological, biochemical, physicochemical. Physiological methods – determination of growth processes (number of cells, cell biomass, synthesis of basic structural elements). Biochemical methods: methods of determining the content and composition of metabolites in microorganisms of different groups. Methods of determination of enzymes.
Literature	Manual of environmental microbiology / editor in chief, Christon J. Hurst ; editors, Ronald L. Crawford … [et al.].—3rd ed. - ASM Press, 2007 – 1317 p. Benson H.J. Microbiological Applications A Laboratory Manualin General Microbiology, 8thedition. – 2002. – 496 p. Duncan F. MCB 1000L Applied Microbiology Laboratory Manual, 4thedition. – 2005. – 70 p. Cappuccino J. G., Sherman N. Microbiology: A Laboratory Manual, 5thedition. – 1999. – 471 p
Teaching and learning methods	Lecture (2 WH), Laboratory (1 WH)

Workload	Classroom hours: 30 h Laboratory hours: 15 h Individual study time/preparation and postprocessing: 45 h Total: 90 h
Assessment	The assessment consists of written examination and preliminary graded study achievements
Grading procedure	The module grade is the sum of preliminary study achievements and the examination grade
Basis for	• Plant Physiology and Biochemistry • Ecophysiology of Plants and Microorganisms • Methods of Biochemical Analysis of Plants • Applied Biochemistry and Biotechnology of Plants • Isolation and Identification of Microorganisms • Basic Methods of Sanitary, Soil and Water Microbiology