

Odesa I. I. Mechnikov National University

Faculty of Biology

Department of Microbiology, Virology and Biotechnology

COURSE SYLLABUS

Course title: Antimicrobial Drugs and Probiotics

Workload	Credits – 3, Hours – 90, Content Modules – 2
Semester, Year of Study	Full-time program: Year – 1, Semester – 2 (Spring)
Days, Time, Location	According to the schedule
Workplace	Faculty of Biology, Department of Microbiology, Virology and Biotechnology
Consultations	The consultation schedule is provided by the instructor during the first lecture

COMMUNICATION

Communication in the classroom is conducted according to the schedule. Outside class hours, students may ask questions during consultations (the schedule is provided by the instructor during the first class).

Other forms of communication include offline and online Zoom consultations.

COURSE ANNOTATION

The subject of the discipline is modern methods for the development of antimicrobial agents, international quality standards in the production of antimicrobial agents, as well as the consequences and ethical aspects of the development and application of antimicrobial agents.

Prerequisites: successful completion of the courses “Microbiology,” “Organic Chemistry,” “Biochemistry,” “General Cytology,” and “Genetics and Molecular Biology.”

Postrequisites: Knowledge of antimicrobial agents, their mechanisms of action and resistance, as well as the principles of selecting probiotic strains, developing antimicrobial and probiotic products, and evaluating their safety and

efficacy can be applied in bachelor's and master's thesis research and future professional practice.

Purpose of the course “Antimicrobial Drugs and Probiotics” The purpose of teaching this special course is to ensure that Master's students in biotechnology acquire the necessary level of knowledge, skills and abilities in the course “Antimicrobial Drugs and Probiotics.”

Objectives of the discipline:

1. To form in higher education applicants the required level of knowledge and skills provided by the educational-professional program.
2. To provide understanding of modern methods for development of antimicrobial agents.
3. To characterize the composition and role of normal human microbiota and methods for correction of dysbiotic conditions.
4. To form understanding of principles and technology of obtaining probiotic preparations, prebiotics and functional food products.

Learning Outcomes

As a result of studying the specialized course, students should

know:

- the main groups of producers of antibiotic compounds;
- the taxonomic position of individual producers and their biological properties;
- modern approaches to the search for new active natural substances and to the development of synthetic antimicrobial compounds;
- the differences between synthetic and natural compounds with antimicrobial properties;
- the principles of classification of antimicrobial agents;
- the mechanisms of antimicrobial action;
- the mechanisms of resistance development to antimicrobial agents;
- the main characteristics of individual groups of antimicrobial agents: mechanism of biological action, spectrum of activity, classification, etc.;
- the basic principles of development, classification, and mechanisms of action of probiotics, prebiotics, and synbiotics;
- the requirements for probiotic strains (safety, functional activity, technological properties);
- the technological stages of probiotic production and quality control;

- the requirements of national legislation and international standards for the development and implementation of antimicrobial and probiotic agents.

be able to:

- prepare technical documentation for an antimicrobial or probiotic product;
- apply international standards (EUCAST, CLSI, GMP, GLP) in planning activities related to the development and production of antimicrobial and probiotic agents;
- use databases to search for producers of antimicrobial compounds and probiotic strains, identify bioactive compounds, and predict the development of resistance;
- design a basic technological scheme for the production of antimicrobial and probiotic products;
- assess the safety and functional efficacy of probiotic preparations.

COURSE DESCRIPTION

Forms and Methods of Instruction

The course is delivered in the form of lectures (20 hours)*, practical classes (8 hours)*, and organized independent student work (62 hours)*.

The main training of students is carried out during lectures and practical classes; however, a significant part is also based on independent study of the subject.

During the teaching of the discipline, the following instructional methods are applied:

According to the sources of knowledge:

- verbal methods (narration, lecture, discussion, explanation, seminars, conversation);
- visual methods (illustration, demonstration, observation).

According to the type of cognitive activity:

- explanatory and illustrative methods.

According to the formation of practical skills and abilities:

practical classes, development of schemes and tables, preparation of structured notes, compilation of a glossary of terms.

* may vary for Ukrainian and English language classes

COURSE CONTENT

CONTENT MODULE I. GENERAL CHARACTERISTICS OF ANTIBIOTICS, METHODS OF THEIR ISOLATION AND DETERMINATION

General information about antibiotics and their significance for medicine and the national economy. Historical data on the development of the doctrine of antibiotics. The current state of antibiotic science. Significance for biology.

TOPIC 1. Antagonism among microorganisms.

TOPIC 2. Basic principles of antibiotic selection.

TOPIC 3. Methods for quantitative determination of antibiotics.

TOPIC 4. Main stages of studying an antibiotic and its producer.

TOPIC 5. Ways to increase the antibiotic-producing capacity of microorganisms.

TOPIC 6. Industrial production of antibiotics.

TOPIC 7. Classification of antibiotics.

TOPIC 8. Main mechanisms of biological action of antibacterial agents.

TOPIC 9. Microbial resistance to antibacterial agents.

TOPIC 10. Antibiotics produced by eubacteria.

TOPIC 11. Antibiotics of microscopic fungi.

TOPIC 12. Plant and animal antibiotics..

TOPIC 13. Synthetic antibacterial agents.

TOPIC 14. Antiviral and antiparasitic agents.

CONTENT MODULE II. BASIC PRINCIPLES OF PROBIOTIC DEVELOPMENT

TOPIC 15. Probiotics and prebiotics, their role in maintaining and restoring normal microbiota.

TOPIC 16. Probiotic production technology.

TOPIC 17. Mono- and multistrain probiotics.

TOPIC 18. Recombinant probiotics, synbiotics, functional foods.

TOPIC 19. Regulatory framework.

TOPIC 20. Bioethics and biosafety of antimicrobial and probiotic use.

ASSESSMENT

During ongoing assessment, the results of oral questioning as well as the completion of practical assignments are evaluated. Periodic assessment is carried out in the form of modular tests (computer-based testing).

The student may receive the maximum score (100 points) for each type of work. The final grade in the academic discipline is calculated as the sum of scores, each of which constitutes a corresponding percentage of the overall grade, depending on the complexity of the tasks and the volume of independent work. Periodic assessment is conducted through control tests for each module.

The results of students' academic performance are recorded as a grade according to the national scale, the 100-point scale, and the ECTS scale.

Grading Scale (National and ECTS)

Score	ECTS	National grade
90–100	A	Passed
85–89	B	Passed
75–84	C	Passed
70–74	D	Passed

60–69	E	Passed
35–59	FX	Retake allowed
0–34	F	Failed – mandatory repetition

COURSE POLICY

Policy on deadlines and resubmission: Assignments submitted late without valid reasons are graded at a reduced score (75% of the maximum possible points for the respective type of activity). Resubmission of module assessments is permitted only with the approval of the Dean's Office and upon presentation of valid reasons (e.g., medical certificate).

Policy on academic integrity: Cheating during tests is prohibited (including the use of mobile devices).

Policy on attendance and lateness: Attendance is a mandatory component of assessment and is awarded points. For valid reasons (e.g., illness, employment, international internship), learning may take place online upon agreement with the course instructor.

Mobile devices: Mobile devices may be used only during online testing and practical classes.

Classroom conduct: In accordance with the “Internal Regulations of Odesa I. I. Mechnikov National University”

(http://onu.edu.ua/pub/bank/userfiles/files/documents/kd_2020_dodatok4.pdf), students must: comply with internal regulations; treat university property (equipment, teaching materials, instruments, etc.) with care; be disciplined and neat; maintain cleanliness and order in all educational premises; and follow safety instructions.