

AL-FARABI KAZAKH NATIONAL UNIVERSITY
Faculty of biology and biotechnology
Department of Biotechnology

AFFIRM

Dean of the Faculty

_____ Kurmanbayeva M.S.

“28” May 2024 Protocol No. 11

EDUCATIONAL AND METHODOLOGICAL COMPLEX OF DISCIPLINE
7M051-Biological and related sciences

"6B05101-Biological Engineering"

Course – 2

Semester – 3

Number of credits – 9

Almaty 2024

When developing the work program of a discipline (module), the following are taken as a basis:

The educational and methodological complex of the discipline syllabus, together with the title page and the Sheet of Additions and Changes, is stored in paper form at the department.

The educational and methodological complex is oriented toward a non-medicine-based educational program with no direct contact with viral pathogens and subjects who might be carriers (vectors) of viral infections or other containment risks like viral titer or other cell culture-based virus reservoirs.

The educational and methodological
complex of discipline developer
PhD, Senior Lecturer Khaidarov Saken

(Signature)

The purpose and objectives of mastering the discipline

Mastering the discipline is to form an understanding of medical virology, which studies the pathogens of human infectious diseases (their morphology, physiology, ecology, biological and genetic characteristics), methods of their cultivation and identification, specific methods of diagnosis, treatment and prevention. Medical virology is developing based on the use of ideas and techniques borrowed from related disciplines (genetics, biochemistry, molecular biology, bioorganic chemistry, etc.), and at the same time, pays the most significant attention to objects that are vital for maintaining the health of the population and reducing economic losses.

The objectives of the course are:

- to show the metabolic and functional diversity of biological organisms, to introduce the basic principles of classification of viruses parasitizing humans;
- to give students knowledge of diagnostic methods, specific prevention and treatment of infectious diseases, indication (detection) and identification (definition) of pathogens of viral infections.
- to show the practical significance of engineering biosystems for solving global problems in health care facing humanity.

Sample topics for essays, assignment papers, test questions

1. The role of bioengineering principles.
2. Genome strategy and reproduction of microorganisms.
3. Genetic interactions of biological systems
4. Polymerase chain reaction of viral respiratory infections.
5. Laboratory diagnostics of bacterial infections.

Educational technologies

Educational technologies used in studying this discipline include 20% interactive classes compared to the volume of classroom classes. Examples of interactive forms and methods of conducting classes include simulation technologies, role-playing and business games, training, game design, etc.; non-simulation technologies, lectures (problem-based, visualization, etc.), and discussions (with and without "brainstorming").

Methodological recommendations for organizing the study of the discipline

The training consists of classroom studies, including lectures, seminars, practical classes, and independent work. The main study time is allocated to mastering theoretical knowledge and acquiring practical skills and abilities.

When studying an academic discipline (module), it is necessary to use all the resources available, including the main and additional educational literature, lecture material, visual aids and demonstration materials, and laboratory equipment, and to master the practical skills and abilities acquired in the course of working with demonstration visual aids and solving situational problems.

Practical classes are conducted through workshops, using visual aids, equipment, and technology to solve situational problems and answer test assignments.

Students' independent work involves preparation for practical classes and initial, current, midterm, and final assessments. It also includes individual classroom and homework with visual materials, basic and additional educational literature, Internet resources, solving situational problems, writing abstracts and essays, etc.

Each student is provided with access to the University and department library collections. During the study of the academic discipline, under the guidance of the teacher, familiarization with classical and modern methods of laboratory diagnostics of viral infections is carried out. Students solve situational problems and fill in training tables.

Students' initial level of knowledge is determined by testing, and current control of assimilation of the subject is determined by an oral survey during classes, during clinical reviews, when solving typical situational problems and answering test assignments. At the end of the study of the academic discipline (module), an intermediate knowledge control is carried out using test control, checking practical skills and solving situational problems. Questions on the academic discipline (module) are included in the Final State Certification of Residents.

Structure of educational and methodological complex of discipline

Syllabus

Content of the discipline (theses or lecture notes, content of practical/laboratory classes, independent work assignments, etc.)

Summary assessment guide and learning outcome assessment criteria

Recommended literature and methods to develop the research orientated skills both in publication and academic fields of activity

Control and measuring tools (tasks on the topics of the discipline for current and midterm control)

Control and measuring material for final control

Map of educational and methodological support of the discipline «Medical Virology»

SYLLABUS
Spring semester 2025 academic year
Educational program "6B05101-Biological Engineering"

| ID and name of course, | Independent work of the student (IWS) | Number of credits | | | General number of credits | Independent work of the student under the guidance of a teacher (IWST) |
|--|--|---------------------------------|--|---|---------------------------|--|
| | | Lectures (L) | Practical classes (PC) | Lab. classes (LC) | | |
| Viral disease management | 5 | 3,0 | 6,0 | | 5 | 6 |
| ACADEMIC INFORMATION ABOUT THE COURSE | | | | | | |
| Learning Format | Cycle, component | Lecture types | Types of practical classes | Form and platform final control | | |
| Offline | | Informative, lecture-discussion | Seminar talk, seminar discussion, analysis, logical task | Standard writing off-line | | |
| Lecturer - (s) | Khaidarov Saken | | | | | |
| e-mail: | logicalmind1984@mail.ru | | | | | |
| Phone: | 8 7775976108 | | | | | |
| ACADEMIC COURSE PRESENTATION | | | | | | |
| Purpose of the course | Expected Learning Outcomes (LO) * | | | Indicators of LO achievement (ID) | | |
| <p>to describe the basic knowledge about virus pathogens and diseases. To investigate the biology of human pathogenic viruses, focusing in particular on factors that impact the outbreak and spread of human viral diseases and better understanding the biology of viruses and virions</p> <p>What medical treatment should be taken into consideration and what consequences can false or zero treatment can lead</p> | As a result of studying the discipline, the undergraduate will be able to: | | | | | |
| | 1. To describe the basic structures and replication strategies of the major classes of human viral pathogens | | | 1.1 To know of the features of general viral structure, genome, and life cycle 1.2 To differentiate fundamental features between each viral pathogen | | |
| | 2. To explore and analyze the political, social, economic and biological factors that impact the outbreak and spread of viral diseases; | | | 2.1 To define outbreak and spread of viral diseases 2.2 To determine different factors that impact outbreak and spread | | |
| | 3. To demonstrate familiarity with the specialized vocabularies and fundamental concepts of the various disciplines involved in the epidemiological analysis of viral disease outbreaks; | | | 3.1 To describe basic knowledge about the main stages of epidemiological analyses 3.2 Ability to determine viruses' disease outbreaks with specialized concepts | | |
| | 4. To show an appreciation of how different academic disciplines can supplement and reinforce one another in the study of viral disease outbreaks and their causes; | | | 4.1 To evaluate different control measures of spread and outbreak of viral diseases 4.2 To know the disciplines under study for advanced analysis of viral disease outbreaks in a way that is not ordinarily available to each discipline alone. | | |
| 5. To apply the acquired knowledge, skills and competencies in research activities | | | 5.1 To predict professional competence of a research scientist in the field of "Viral disease management" 5.2 To recognize ability as a research scientist in the field of "Viral disease management" | | | |
| Prerequisites | Unique methods for the isolation and study of gene material and recombination of them | | | | | |
| Postrequisites | Microbiology, Thesis defense | | | | | |
| Learning Resources | <p>Literature</p> <ol style="list-style-type: none"> Кузнецова, Е. А. Микробиология. Часть 1: учебное пособие / Е. А. Кузнецова, А. А. Князев. — Казань: Казанский национальный исследовательский технологический университет, 2017. — 88 с. Ткаченко, К. В. Микробиология: учебное пособие. Саратов: Научная книга, 2019. — 159 с Virology: Principles and Applications by Carter and Saunders, 2nd edition 2013 Molecular and Cellular Biology of Viruses, 1st Edition. Phoebe Lostroh 2019 http://elibrary.kaznu.kz <ol style="list-style-type: none"> https://byjus.com/biology/bacteriophage/ https://www.bacteriofag.ru/ | | | | | |

3. <https://www.khanacademy.org/science/biology/biology-of-viruses/virus-biology/a/bacteriophages>
 4. <https://rostec.ru/news/bakteriofagi-meditsina-budushchego/>

| | |
|-------------------------------|--|
| Academic course policy | <p>The academic policy of the course is determined by Al-Farabi Kazakh National University's academic policy and policy of academic integrity. Documents are available on the main page of IS Univer.</p> <p>Integration of science and education. The research work of undergraduate and doctoral students deepens the educational process. It is organized directly at the university's departments, laboratories, scientific and design departments, and student scientific and technical associations. Independent work of students at all levels of education is aimed at developing research skills and competencies based on obtaining new knowledge using modern research and information technologies. A research university teacher integrates the results of scientific activities into the topics of lectures and seminars (practical) classes, laboratory classes and into the tasks of the IWS and IWS, which are reflected in the syllabus and are responsible for the relevance of the topics of training sessions and assignments.</p> <p>Attendance. The deadline for each task is indicated in the calendar (schedule) for implementing the course content. Failure to meet deadlines results in loss of points.</p> <p>Academic honesty. Practical/laboratory classes, IWS develop the student's independence, critical thinking, and creativity. Plagiarism, forgery, the use of cheat sheets, and cheating at all stages of completing tasks are unacceptable.</p> <p>Compliance with academic honesty during the period of theoretical training and at exams, in addition to the main policies, is regulated by <u>the "Rules for the final control", "Instructions for the final control of the autumn/spring semester of the current academic year", "Regulations on checking students' text documents for borrowings"</u>.</p> <p>Documents are available on the main page of IS Univer.</p> <p>Basic principles of inclusive education. The educational environment of the university is conceived as a safe place where there is always support and equal attitude from the teacher to all students and students to each other, regardless of gender, race/ethnicity, religious beliefs, socio-economic status, physical health of the student, etc. All people need the support and friendship of peers and fellow students. For all students, progress is more about what they can do than what they can't. Diversity enhances all aspects of life. All students, especially those with disabilities, can receive counseling assistance by phone / e-mail aiymmun2013@gmail.com or via video link in MS Teams</p> <p>Integration MOOC (massive open online course). When integrating MOOC into the course, all students need to register for MOOC. The deadlines for passing MOOC modules must be strictly observed in accordance with the course study schedule.</p> <p>ATTENTION! The deadline for each task is indicated in the calendar (schedule) for implementing the course content and in the MOOC. Failure to meet deadlines results in loss of points.</p> |
|-------------------------------|--|

INFORMATION ABOUT TEACHING, LEARNING AND ASSESSMENT

| Score-rating letter system of assessment of accounting for educational achievements | | | Assessment Methods | | | | | | | | | | | | | | | |
|---|----------------------------------|--------------------------|---|------------------------------------|--|------------------|----------------------|--|---|---------------------------|--|----|------------------|--|----|----------------------|--|----|
| Grade | Digital equivalent points | points, % content | <p>Criteria-based assessment is the process of correlating actual learning outcomes with expected learning outcomes based on clearly defined criteria. Based on formative and summative assessment.</p> <p>Formative assessment is a type of assessment that is carried out in the course of daily learning activities. It is the current measure of progress. Provides an operational relationship between the student and the teacher. It allows you to determine the capabilities of the student, identify difficulties, help achieve the best results, timely correct the educational process for the teacher. The performance of tasks, the activity of work in the classroom during lectures, seminars, practical exercises (discussions, quizzes, debates, round tables, laboratory work, etc.) are evaluated. Acquired knowledge and competencies are assessed.</p> <p>Summative assessment - type of assessment, which is carried out upon completion of the study of the section in accordance with the program of the course. Conducted 3-4 times per semester when performing IWS. This is the assessment of mastering the expected learning outcomes in relation to the descriptors. Allows you to determine and fix the level of mastering the course for a certain period. Learning outcomes are evaluated.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">Formative and summative assessment</th> <th>Points % content</th> </tr> </thead> <tbody> <tr> <td>Activity at lectures</td> <td></td> <td>5</td> </tr> <tr> <td>Work in practical classes</td> <td></td> <td>30</td> </tr> <tr> <td>Independent work</td> <td></td> <td>25</td> </tr> <tr> <td>Final control (exam)</td> <td></td> <td>40</td> </tr> </tbody> </table> | Formative and summative assessment | | Points % content | Activity at lectures | | 5 | Work in practical classes | | 30 | Independent work | | 25 | Final control (exam) | | 40 |
| Formative and summative assessment | | Points % content | | | | | | | | | | | | | | | | |
| Activity at lectures | | 5 | | | | | | | | | | | | | | | | |
| Work in practical classes | | 30 | | | | | | | | | | | | | | | | |
| Independent work | | 25 | | | | | | | | | | | | | | | | |
| Final control (exam) | | 40 | | | | | | | | | | | | | | | | |
| A | 4.0 _ | 95-100 | | | | | | | | | | | | | | | | |
| A- | 3.67 | 90-94 | | | | | | | | | | | | | | | | |
| B+ | 3.33 | 85-89 | | | | | | | | | | | | | | | | |
| B | 3,0 | 80-84 | | | | | | | | | | | | | | | | |
| B- | 2,67 | 75-79 | | | | | | | | | | | | | | | | |
| C+ | 2,33 | 70-74 | | | | | | | | | | | | | | | | |
| C | 2,0 | 65-69 | | | | | | | | | | | | | | | | |
| D+ | 1,33 | 55-59 | | | | | | | | | | | | | | | | |

| | | | | | |
|---|-----|-------|------|-------|-----|
| D | 1,0 | 50-54 | tory | TOTAL | 100 |
|---|-----|-------|------|-------|-----|

Calendar (schedule) for the implementation of the course content. Methods of teaching and learning.

| A week | Topic name | Number of hours | Max. ball |
|-----------------------------|---|-----------------|-----------|
| 1 | L.1 Biological Energy Conservation | 1 | |
| | PT 1 Oxygen-rich, poor and none environment | 1 | 10 |
| 2 | L.2 Microbial Growth | 1 | |
| | PT 2 Types of microbial growth | 1 | 10 |
| | IWS P 1. Consultations on the implementation of IWST 1, a lab case of OD-measure | | 15 |
| 3 | L.3 Bioenergetics and Metabolic Diversity | 1 | |
| | PT 3 Bioreactors. Reduce or oxidize, why do we need a good e-acceptor? | 1 | 10 |
| 4 | L.4 Viruses | 1 | |
| | PT 4 general properties of viruses, viral structure, viral growth, animal virus methods, and viral replication. | 1 | 10 |
| | IWS1. Paper discussion (Project method) | 1 | 15 |
| 5 | L.5 Information Flow in Biological Systems | 1 | |
| | PT 5 DNA-RNA-Protein | 1 | 10 |
| 6 | L.6 Regulation of cell activity. | 1 | |
| | PT 6 Factors and cell interaction definers The development and dynamics | 1 | 10 |
| | IWST 2. Consultation on implementation of IWS 2 a lab case | | |
| | IWST 3. Drugs that inhibit translation | | |
| 7 | L.7 Genetic Exchange in Bacteria | 1 | |
| | PT7 Genetical diversity methods | 1 | 10 |
| Midterm control 1 | | | 100 |
| 8 | L.8 Genomics I | 1 | |
| | PT 8 DNA sequencing technology, genome sequencing technology, current statistics, and the basics of genome sequence analysis. | 1 | 10 |
| 9 | L.9 Genomics II | 1 | |
| | PT 9 on site working: https://www.exoscale.com/syslog/blast/ https://www.youtube.com/watch?v=WRKQGwh_Mw0 | 1 | 10 |
| | IWST 4. Consultation on implementation – finding important genes or strains | | |
| 10 | L.10 Microbial Growth Control | 1 | |
| | PT 10 Growth and adaptation | | 10 |
| 11 | L.11 Microbe-host Interactions | 1 | |
| | PT 11 Immunity response resemblance | 1 | 10 |
| 12 | L.12 Epidemiology | 1 | |
| | PT 12 Types of spreading | 1 | 10 |
| | IWST 5. Consultation on implementation of IWS 4 | | 15 |
| 13 | L.13 Diagnostic microbiology. | 1 | |
| | PT 13 Lessons Learned from Pandemic 2020 | 1 | 10 |
| 14 | L.14 Immunology I | 1 | |
| | PT 14 innate immunity and inflammation, cells and organs of the immune system, signals, chemokines, cytokines, and adaptive immune response. | 1 | 10 |
| | IWS 4. Bacteriophages: the future of medicine | | 15 |
| 15 | L.15 Immunology II | 1 | |
| | PT 15 TB test and pathogenesis | 1 | |
| | IWST 6. Consultation on preparation for the exam | | |
| 16 Midterm control 2 | | | 100 |
| Final control (exam) | | | 100 |
| TOTAL for course | | | 100 |

SUMMATIVITY ASSESSMENT GUIDE

LEARNING OUTCOME ASSESSMENT CRITERIA

| Criteria | «Criteria» 20-25 % | «Good» 15-20% | «Satisfactory» 10-15% | «Fail» 0-10% |
|--|---|---|---|---|
| Knowledge and understanding of the theory and concept of the task | An “excellent” grade is given for an answer that contains an exhaustive explanation of the question, detailed argumentation for each conclusion and statement, is constructed logically and consistently, and is supported by examples. | The grade "good" is given for an answer that contains a complete but not exhaustive coverage of the question, a shortened argumentation of the main provisions, and allows for a violation of the logic and sequence of presentation of the material. The answer enables stylistic errors and imprecise use of terms. | The grade “satisfactory” is given for an answer that does not fully cover the questions asked in the ticket, superficially argues the main points, allows for compositional disproportions in the presentation, violations of logic and sequence of presentation of the material, and does not illustrate theoretical points with examples. | Incorrect presentation of the issues raised, erroneous argumentation, factual and linguistic errors, and faulty conclusions. |
| Application of the selected methodology and technology to specific tasks | Complete completion of the training assignment, a detailed, reasoned answer to the question posed, followed by solving practical problems | Partial completion of the academic assignment, incomplete, sometimes reasoned answers to the question posed with incomplete solutions of practical problems; illiterate use of scientific language standards for the course; | The material is presented in fragments, with a violation of logical sequence. Factual and semantic inaccuracies are allowed, and the theoretical knowledge of the course is used superficially. | An irrational method of solving a task or an insufficiently thought-out plan for answering; inability to solve tasks, to complete tasks in general; making more mistakes and omissions than the norm. |
| Evaluation and analysis of the applicability of the selected methodology to the proposed task, justification of the obtained result | Consistent, logical and correct substantiation of scientific provisions and applied methods and technology, literacy, compliance with scientific language standards, and 1-2 inaccuracies in the presentation of the material are allowed, which do not affect the generally correct conclusions (+ visualization of the results of the substantiation using graphic data). | 3-4 inaccuracies in the use of conceptual material, minor errors in generalizations and conclusions that do not affect the overall level of completion of the task are allowed. | The findings on the applicability of substantiated scientific provisions are vague and unconvincing; there are stylistic and grammatical errors, as well as inaccuracies in the processing of the results of the practical solution | The assignment was completed with gross errors, the answers to the questions were incomplete, and the conceptual material and argumentation were poorly used. |

Dean of the Faculty of Biology and Biotechnology

Kurmanbaeva M.S.

Head of the Department of
Biotechnology

Sarsekeyeva F.K.

Lector

Khaidarov S. Zh.

Map of educational and methodological support of the discipline
«Biological Engineering»
Lecturer-Khaidarov S. Zh.

| № | The name of the discipline | The authors and name of books | Quantity in the library of the Al-Farabi Kazakh National University | | | | Quantity in the after 2000 year | | | |
|---|----------------------------|---|---|--------|------------|-----|---------------------------------|-----|------------|--------|
| | | | main | | additional | | main | | additional | |
| | | | kaz | eng | kaz | eng | kaz | eng | kaz | eng |
| | Medical virology | <p>Main:</p> <p>1. Textbook of diagnostic microbiology, fifth edition, Connie R. Mahon, MS, Donald C. Lehman, EdD, MT(ASCP), SM(NRM). 3251 Riverport Lane Maryland Heights, Missouri 63043</p> <p>2. Microbiology, seventh edition, Prescott, Harley, and Klein, Published by McGraw-Hill, a business unit of The McGraw-Hill Companies, Inc., 1221 Avenue of Americas, New York, NY 10020.</p> <p>Additional:</p> <p>1. Emerging Infectious diseases A guide to diseases, Causative agents, and Surveillance LISA A. BELTZ, Published by Jossey-Bass A Wiley Imprint 989 Market Street, San Francisco, CA 94103-1741 www.josseybass.com</p> <p>2. Clinical Guide to Bioweapons and Chemical Agents, Vincent E. Friedewald, Springer-Verlag London Limited 2008</p> <p>Internet source</p> <p>1. Google Scholar 2. sci-hub 3. scopus.com 4. web of science</p> | | E-copy | | | | | | E-copy |
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Educational and methodological complex of discipline was compiled by Khaidarov Saken, PhD.

Based on the educational program "6B05101-Biological Engineering"

Consistent and recommended at a meeting of the biotechnology department on May 28, 2024, Protocol No. 11

Head of department _____ Sarsekeyeva F.K

(Signature)