**SYLLABUS**

**Spring semester 2021-2022 academic years**

**on the educational program “Biotechnology”**

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| **Discipline’s code** | **Discipline’s title** | **Independent work of students (IWS)** | **No. of hours per week** | **Number of credits** | **Independent work of student with teacher (IWST)** |
| **Lectures (L)** | **Practical training (PT)** | **Laboratory (Lab)** |
| **OB1202** | Objects of Biotechnology | 6 | 15 | 15 | 15 | 5 | 6 |
| **Academic course information** |
| **Form of education** | **Type of course**  | **Types of lectures** | **Types of practical training**  | **Number of IWS** | **Form of final control** |
| Online | Theoretical | Problematic, Analytic | Problem solving, situational tasks, video analysis | 5 | Test CDO Moodle |
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| **Academic presentation of the course**  |

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| **Aim of course**  | **Expected Learning Outcomes (LO)**As a result of studying the discipline the undergraduate will be able to: | **Indicators of LO achievement (ID)**(for each LO at least 2 indicators) |
| The aim of the course "Objects of Biotechnology" is to consider microorganisms, plants and animals as objects of biotechnology, as well as the basic principles and approaches used to create new biological objects. | **LO 1.** Conduct a comparative assessment of microbiological processes that ensure the production of high-quality biotechnological products based on the study of the characteristics of food raw materials and finished products | **ID 1.1** Classify the types of sterilization, pasteurization, disinfection and possess methods for evaluating their effectiveness.**ID 1.2** Determine the ways and conditions of contamination of production by microorganisms and the possibility of their elimination.**ID 1.3** Conduct microbiological analysis of food products and determine the content of their total number and sanitary-indicative microorganisms. |
| **LO 2** Based on theoretical models predict the nature of changes in the properties of raw materials in the process of its biotransformation and obtain products with the specified quality characteristics | **ID 2.1** Classify the biochemical processes that occur during the storage of food raw materials and finished products to detect defects in products and microorganisms that cause their spoilage.**ID 2.2** Explain how to control technically harmful and pathogenic microflora.**ID 2.3** Conduct sanitary and hygienic examination of food products and draw up relevant acts.**ID 2.4** Be able to have skills in using equipment used in plant biotechnology |
| **LO 3** Operate with basic knowledge in the field of National and international quality control system and biological safety of biotechnological products | **ID 3.1** Formulate the provisions of the regulatory framework for the legal regulation of food safety (the law “On the quality and safety of food products” and other legal acts).**ID 3.2** Formulate the basic principles for the formation of quality and safety of raw materials, food products in the HACCP and ISO systems.**ID 3.3** Classify Regulatory and Technical documentation used in the production of biotechnological products: state and industry documents (GOST; OST; TU; RD); enterprise documentation system |
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| **Prerequisites** | Microbiology and Virology, Physiology of Microorganisms, Low molecular biological substances. |
| **Post requisites** | Manufacturing Practice |
| **Information resources**  | **Main:** *1.* Reinhard Renneberg. *Biotechnology for Beginners [2007]. ISBN:* 9780123735812. 2. Gladys Alexandre and etc. Advances in applied microbiology [2009]. ISBN: 978-0-12-374788-4 3. Turasheva S.K. Basics of Biotechnology: Plant Biotechnology. Textbook. Almaty. 2016. -198 p. 4.Zayadan B.L., Dzhansugurova L.B., Turasheva S.K. Basics of Biotechnology. Textbook. - Almaty: Kazakh University, 2018. - 354 p.5. Gareth Price. Biology: An Illustrated Guide to Science [2006]. ISBN-10: 0-8160-6162-9 6. John Wiley & Sons Ltd. Dictionary of Microbiology and Molecular Biology, Third Edition [2006]. ISBN-13 978-0-470-03545-0 7. Moselio Schaechter. Encyclopedia of microbiology. Third edition [2009]. *ISBN:* 9780123749802 8. Talaro-Talaro: Foundations in Microbiology, Fourth Edition [2011]. ISBN: 978-0072320428 **Additional:** 1. Eugene W. Nester and etc. Microbiology: a human perspective, sixth edition [2011]. ISBN 978–0–07–299543–5 2. Prescott, Harley, and Klein’s microbiology, seventh edition [2008]. ISBN 978–0–07–299291–5 3. Nathan S. Mosier, Michael R. Ladisch. Modern biotechnology: connecting innovations in microbiology and biochemistry to engineering fundamentals [2009]. ISBN 978-0-470-11485-8 4. Tortora, Gerard J. Microbiology: an introduction [2010]. ISBN-13: 978-0-321-55007-1 5. Madsen, Eugene L. Environmental microbiology [2008].ISBN-13: 978-1-4051-3647-1 6. Talaro, Kathleen P. Foundations in microbiology. 8th edition [2012]. ISBN 978-0-07-337529-8. 7. Нестерова С.Г. Лабораторный практикум по «Систематике растений». Учебно-метод. пособие. Алматы, 2011, -82 с.**Internet resources:** https://www.goodreads.com/ https://www.coursera.org/ https://www.edx.org/ https://ed.ted.com/  |

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| **Academic policy of the course in the context of university moral and ethical values** | **Academic Behavior Rules:** All students have to register at the MOOC. The deadlines for completing the modules of the online course must be strictly observed in accordance with the discipline study schedule. ATTENTION! Non-compliance with deadlines leads to loss of points! The deadline of each task is indicated in the calendar (schedule) of implementation of the content of the curriculum, as well as in the MOOC.**Academic values:**- Practical trainings/laboratories, IWS should be independent, creative.- Plagiarism, forgery, cheating at all stages of control are unacceptable.- Students with disabilities can receive counseling at e-mail izmukan@mail.ru. |
| **Evaluation and attestation policy** | **Criteria-based evaluation:** assessment of learning outcomes in relation to descriptors (verification of the formation of competencies in midterm control and exams).**Summative evaluation:** assessment of work activity in an audience (at a webinar); assessment of the completed task. |

**CALENDAR (SCHEDULE) THE IMPLEMENTATION OF THE COURSE CONTENT:**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| weeks  | Topic name | LO | ID | amount of hours  | Maximum score | Form of Knowledge Assessment  | TheForm of the lesson / platform |

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| **Module 1** Microbial Biotechnology |
| 1 | **L.1.** Introduction. A subject and microbiology problems. General characteristics of viruses  | LО 1 | ID 1.1.ID 1.2.ID 1.3. | 2 | 2 |  | Video lecture in Zoom |
| **PT.1.** Features of microorganisms. | LО 1 | ID 1.1.ID 1.2.ID 1.3. | 1 | 5 | Analysis | Webinarin Zoom |
| **Lab 1** Work rules in microbiological laboratory. Microscopic examination techniques. | LО 1 | ID 1.1.ID 1.2.ID 1.3. | 1 | 5 | Analysis | Webinarin Zoom |
| 2 | **L.2** Structural differences and similarities of Prokaryotic and Eukaryotic cells, and their specification | LО 1LO 2 | ID 1.2.ID 1.3.ID 2.1. | 2 | 2 |  | Video lecture in Zoom |
| **PT.2.** Morphology of the bacteria. Surface structures. | LО 1LO 2 | ID 1.2.ID 1.3.ID 2.1. | 1 | 5 |  | Video lecture in Zoom |
| **Lab 2** Microscopy | LО 1LO 2 | ID 1.2.ID 1.3.ID 2.1. | 1 | 5 | Analysis | Webinarin Zoom |
| 3 | **L.3** Biotechnologically important viruses | LО 1LO 2 | ID 1.2.ID 1.3.ID 2.1.ID 2.3. | 2 | 2 |  | Video lecture in Zoom |
| **PT.3.** Morphology of the bacteria: Internal components and inclusions. | LО 1LO 2 | ID 1.2.ID 1.3.ID 2.1.ID 2.3. | 1 | 5 |  | Webinarin Zoom |
| **Lab 3.** Aseptic technique  | LО 1LO 2 | ID 1.2.ID 1.3.ID 2.1.ID 2.3. | 1 | 5 |  | Webinarin Zoom |
| **IWSP 1 Consultation on the implementation of IWS1** | LО 1LO 2 | ID 1.2.ID 1.3.ID 2.1.ID 2.3. |  |  |  | Webinarin Zoom |
| **IWS 1.** Cultivation and identification of viruses. | LО 1LO 2 | ID 1.2.ID 1.3.ID 2.1.ID 2.3. |  | 25 | Logic task |  |
| 4 | **L.4** Biotechnologically important bacteria.Archaea | LО 3LO 4 | ID 3.2ID 3.3 | 2 | 2 |  | Video lecture in Zoom |
| **PT.4** Reproduction of bacteria. Sporulation. Conjugation.  | LО 3LO 4 | ID 3.2ID 3.3 | 1 | 5 |  | Webinarin Zoom |
| **Lab 4.** Staining methods. Simple staining with Methylene Blue. Gram staining method. | LО 2LO 3 | ID 2.1ID 2.2ID 2.3.ID 3.2ID 3.3 | 1 | 5 |  | Webinarin Zoom |
| 5 | **L.5** Eukaryotic microorganisms in biotechnology | LО 2 | ID 2.1ID 2.2ID 2.3 | 2 | 2 |  | Video lecture in Zoom |
| **PT.5** Morphology of actinomycetes. Morphology of eukaryotic microorganisms. | LО 2 | ID 2.1ID 2.2ID 2.3 | 1 | 5 |  | Webinarin Zoom |
| **Lab 5.** Pure culture isolation | LО 2 | ID 2.1ID 2.2ID 2.3 | 1 | 5 |  | Webinarin Zoom |
| **IWSP 2 Consultation on the implementation of IWS2** | LО 2 | ID 2.1ID 2.2ID 2.3 |  |  |  | Webinarin Zoom |
| **IWS 2** Importance of *E.coli* in development of biotechnology | LО 2 | ID 2.1ID 2.2ID 2.3 |  | 25 | Logic task |  |
|  **Make a structural and logical diagram of the read material** | LO 1LO 2LO 3 | ID 1.1-1.3ID 2.1-2.3ID 3.1-3.3 |  | 10 |  |  |
| 5 | **MT 1** | LО 1LO 2 | ID 1.2.ID 1.3.ID 2.1.ID 2.3. |  | 100 |  |  |
| 6 | **L. 6** Levels of organization and properties of living systems  | LО 2 | ID 2.4. | 2 |  |  | Video lecture in MS Teams |
| **PT 6** The relationship of various levels of organization of living matter. | LО 2 | ID 2.4. | 1 | 5 | Analysis | Webinarin MS Teams |
| **Lab 6** Methods of sterilization explants of higher plants.  |  |  | 1 | 5 |  | MOOCopen.kaznu.kz |
| 7 | **L.7** Structural and functional features of the organization of cells and metabolism of plants Plants as objects of biotechnology | LО 2 | ID 2.4. | 2 |  |  | Video lecture in MS Teams |
| **PT 7** Physiological and biochemical characteristics of plant cells. | LО 2LO 3 | ID 2.4.ID 3.2ID 3.3 | 1 | 5 | Analysis | Webinarin MS Teams |
| **Lab 7** Obtaining callus tissues of monocotyledonous |  |  | 1 | 5 |  | MOOCopen.kaznu.kz |
| 8 | **L.8** Cultures of cells, tissues and organs of plants | LО 2LO 3 | ID 2.4.ID 3.2ID 3.3 | 2 |  |  | Video lecture in MS Teams |
| **PT 8** Higher and lower plants as objects of biotechnology. | LО 2LO 3 | ID 2.4ID 3.1ID 3.2 | 1 | 5 | Analysis | Webinarin MS Teams |
| **Lab 8** Obtaining callus tissues of dicotyledonous plants. |  |  | 1 | 5 |  | MOOCopen.kaznu.kz |
| 8 | **IWSP 3 Consultation on the implementation of IWS3** |  | ID 1.1. |  | 5 |  | Webinarin MS Teams |
| 8 | **IWS 3** Cell culture of endemic plants and its applications | LО 2LO 3 | ID 2.4ID 3.1ID 3.2 |  | 25 | Problem task |  |
| 9 | **L.9** Subcellular structures as biological objects | LО 2LO 3 | ID 2.4ID 3.1ID 3.2 | 2 |  |  | Video lecture in MS Teams |
| **PT 9** Tissue cultures of plants as model systems in theoretical and experimental research | LО 2LO 3 | ID 2.4ID 3.2ID 3.3 | 1 | 5 | Analysis | Webinarin MS Teams |
| **Lab 9** Isolation and cultivation of mature wheat embryo on agar culture medium. |  |  | 1 | 5 |  | MOOCopen.kaznu.kz |
| 10 | **L.10** The main directions of using methods of cellular biotechnology to obtain new practically significant objects for biotechnology | LО 2LO 3 | ID 2.4ID 3.1ID 3.2ID 3.3 | 2 |  |  | Video lecture in MS Teams |
| **PT 10** Immobilized biological objects. | LО 2LO 3 | ID 2.4ID 3.1ID 3.2 | 1 | 5 | Analysis | Webinarin MS Teams |
| **Lab 10** Obtaining callus tissue in carrot parenchymal cell culture |  |  | 1 | 5 |  | MOOCopen.kaznu.kz |
| 10 | **IWSP 4 Consultation on the implementation of IWS4** |  |  |  |  |  | Webinarin MS Teams |
| 10 | **IWS 4** Methodical principles of culture media preparation and cultivation in aseptical conditions | LО 2LO 3 | ID 2.4ID 3.1ID 3.2ID 3.3 |  | 25 | Problem task |  |
| 10 | **МТ (Midterm Exam)** | LО 1 | ID 1.1. |  | 100 |  |  |
| 11 | **L.11** Objects of Animal biotechnology. Biotechnology in Animal Agriculture: status and current issues. Regulation of the release of genetic modified organisms. | LО 1 | ID 1.1. | 2 |  |  | Video lecture in Zoom |
| 11 | **PT 11** Basic methods of animal biotechnology. Animal Breeding and Biotechnology. | LО 1 | ID 1.1. | 1 | 5 | Analysis | Webinarin Zoom |
| 11 | **Lab.11** The structure of an animal cell. Safety rules in laboratory. | LО 1 | ID 1.1. | 1 | 5 | Analysis | Webinarin Zoom |
| 11 | **IWSP 5 Consultation on the implementation of IWS5** | LО 1 | ID 1.1. |  |  |  | Webinarin Zoom |
| 11 | **IWS 5** Animal biotechnology and its applications | LО 1 | ID 1.1. |  | 25 | Logic task |  |
| 12 | **L.12** Animal reproduction.The main directions of animal breeding. | LО 2LO 3 | ID 2.4ID 3.1ID 3.2ID 3.3 | 2 |  |  | Video lecture in Zoom |
| 12 | **PT 12** Reproductive technologies: Artificial insemination. In vitro production of embryos.  | LО 2LO 3 | ID 2.4ID 3.1ID 3.2 | 1 | 5 | Analysis | Webinarin Zoom |
| 12 | **Lab. 12** The techniques of embryo transfer.https://www.youtube.com/watch?v=tBOQBMoQUeY | LО 1 | ID 1.1. | 1 | 5 | Analysis | Webinarin Zoom |
| 13 | **L.13** Animal cell technologies. Aseptic Techniques. | LО 2LO 3 | ID 2.4ID 3.1ID 3.2 | 2 |  |  | Video lecture in Zoom |
| 13 | **PT13** The features of the organization of biotechnological laboratory in animal husbandry. | LО 2LO 3 | ID 2.4ID 3.2ID 3.3 | 1 | 5 | Analysis | Webinarin Zoom |
| 13 | **Lab. 13** Cell culture media and components. | LО 1 | ID 1.1. | 1 | 5 | Analysis | Webinarin Zoom |
| 13 | **IWSP 6 Consultation on the implementation of IWS6** | LО 1 | ID 1.1. |  |  |  | Webinarin Zoom |
| 13 | **IWS 6** Animal reproductive technologies.  | LО 1 | ID 1.1. |  | 25 | Logic task |  |
| 14 | **L 14** Biotechnology and genetic engineering of mammals. | LО 2 | ID 2.4. | 2 |  |  | Video lecture in Zoom |
| 14 | **PT 14** Transgenic Animals.  | LО 2 | ID 2.4. | 1 | 5 | Analysis | Webinarin Zoom |
| 14 | **Lab. 14** Genetic engineering of mammals. | LО 1 | ID 1.1. | 1 | 5 | Analysis | Webinarin Zoom |
| 15 | **L 15** Applications of animal cell culture technology.  | LО 1 | ID 1.1. | 2 |  |  | Video lecture in Zoom |
| 15 | **PT 15** Animal biotechnology.Regulation of the reproduction of farm animals. Biotechnology economic implications. | LО 2 | ID 2.4. | 1 | 5 | Analysis | Webinarin Zoom |
| 15 | **Lab. 15** Mammalian cell and tissues culture. | LО 1 | ID 1.1. | 1 | 5 | Analysis | Webinarin Zoom |
| 15 | **MT 2** **(Midterm Exam)** | LО 1 | ID 1.1. |  | 100 |  |  |

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