**SYLLABUS**

**Spring semester 2022-2023 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)** | |
| **OBZh 2222** | Basics of Animal Biotechnology | 6 | 15 | 0 | | 15 | | 3 | 7 |
| **Academic course information** | | | | | | | | | |
| **Form of education** | **Type of course** | **Types of lectures** | | | **Types of practical training** | | **Number of IWS** | | **Form of final control** |
| Online/combined | Theoretical | Problematic, analytical lecture | | | Problems solutions, situational tasks | | Not less than 3 | | Scheduled |
| Lecturer & assistant | Djansugurova Leyla Bulatovna, PhD, full professor | | | | | |  | | |
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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 main aim of course is to introduce the main methods, tools, and techniques, accepted in modern biotechnology of animals. | 1) demonstrate knowledge of the basic scientific principles and laws accepted in animal biotechnology; | 1.1 demonstrate ability to reproduce the main principles of animal biotechnology.  1.2 be able to select appropriate protocols for various tasks.  1.3 know the main issues of current bioethical protocols. |
| 2) be able to work with massive data, scientific publications, instructions, books, etc. to find and select any methods, protocols, and tools, which are essential for the biotechnological procedures. | 2.1 classify all model organisms in groups in accordance to their properties, plan a scientific experiment;  2.2 compare different protocols and methods in accordance to their properties;  2.3 assess obtained experiential data in accordance to its quality. |
| 3) be skilled enough to analyze data, theses, reports, and articles. | 3.1 analyze obtained data according to current information.  3.2 prognose any possible variants of the results. |
| 4) design an experiment and be able to modify it according to the main methods and principles used in animal biotechnology. | 4.1 plan the experiment taking into account available information.  4.2 use modern methods and tools for the experiment.  4.3 modify the experiment if it is necessary. |
| 5) present the results both of theoretical and practical education. | 5.1 create a presentation, a scientific report, or a thesis as a conclusion of the experiment.  5.2 be able to discuss the main advantages and disadvantages of the selected method of research. |
| **Prerequisites** | “Zoology", Cytology", "Biochemistry", "Developmental Biology", “General and Molecular genetics”, “Physiology”, "Biotechnology of microorganisms", "Plant Biotechnology". | |
| **Post requisites** | “Gene engineering”, “Biostatistics”. | |
| **Information resources** | 1. Animal Biotechnology. Technologies, Markets & Companies – Edited by Prof. K.K. Jain. Jain PharmaBiotech. A Jain Pharma Biotech Report. 2013. 215 p. 2. Щелкунов С.Н. Генная инженерия. Новосибирск. Изд-во Новосибирского государственного университета. 2004. 3. Biotechnology. Medtec. Ellyn Daugherty, 2015. 439 p. 4. Турашева С. К. Заядан Б.К., Джансугурова Л.Б. Basics of Biotechnology: textbook Qazaq universitety 2019 - г. ISBN 978-601-04-4230-6 428 стр. 5. A.Verma, A. Singh. Animal Biotechnology. Models in Discovery and Translation. 1st Edition. Academic Press. 2013. 668 p. 6. Animal Biotechnology. Technologies, Markets & Companies – Edited by Prof. K.K. Jain. Jain PharmaBiotech. A Jain Pharma Biotech Report. 2013. 215 p. 7. Мак-Ларен Э. Химеры млекопитающих, М. Мир, 1979 8. Мухамедгалиев Ф.М., Тойшибеков М.М., Абильдинов Р.Б., Бердонгарова О.И., Джанабеков К.Д. Трансплантация зигот в племенном овцеводстве.- Алма-Ата: Наука, 1981.- 168с. 9. Серов О.Л. Перенос генов в соматические и половые клетки. Новосибирск. 1985. 10. Карш Фр.Дж. Гормональная регуляция размножения у млекопитающих. Под ред. К.Остина, Р.Шорта.- Москва “Мир”.-1987.-с.8-31. 11. Эрнст Л.К. Трансплантация эмбрионов сельско-хозяйственных животных. М., 1989. 12. Завертяев Б.П. Биотехнология в воспроизводстве и селекции крупного рогатого скота. Л., Агропромиздат,1989, с. 1-255. 13. Муромцев Г.С. и др. Основы сельскохозяйственной биотехнологии. Москва ВО «Агропромиздат», 1990. 14. Р.Е. Спиер, Дж. Гриффитс. Биотехнология клеток животных. Москва, ВО «Агропромиздат» 2 тома. 15. Гилберт С.. Биология развития. В 3-х томах. Биология развития. М. Мир, 1993. 16. Глик Б., Пастернак Дж. Молекулярная биотехнология. Принципы и применение. М. Мир, 2002. 589 с. 17. Корочкин Л.И. Биология индивидуального развития (Генетический аспект) М. МГУ, 2002, 264 с. 18. Шевелуха В.С., Калашникова Е.А., Воронин Е.С. и др. Сельскохозяйственная биотехнология. 2-е изд. М. Высшая школа, 2003. | |

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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 lebedevaleena@gmail.com. |
| **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 | Amo-unt of hours | Maximum score | Form of Knowledge Assessment | The  Form of the lesson  / platform |

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| 1 | **L.1** The main directions and tasks of modern animal biotechnology. | LО 1 | ID 1.1  ID 1.2 | 2 | 2 |  | Video lecture  in Zoom |
| 1 | **LW.1** Scientific methodology in a research facility. | LО 2  LO 3 | ID 2.1  ID 2.2  ID 2.3  ID 3.1  ID 3.2 | 1 | 8 | Active participation | Webinar  in MS Teams |
| 2 | **L.2** Objects of Animal Biotechnology. | LО 1  LO 3 | ID 1.1  ID 1.2  ID 3.1 | 2 | 2 |  | Video lecture  in Zoom |
| 2 | **LW. 2** Organisms and their components used in animal biotechnology: DNA, cells, tissues, and individuals. | LO 1  LО 2 | ID 1.1  ID 2.2 | 1 | 8 | Active participation | Webinar  in MS Teams |
| 3 | **L.3** History of Animal Biotechnology. | LО 1 | ID 1.1  ID 1.2 | 2 | 2 |  | Video lecture  in Zoom |
| 3 | **LW.3** The basic skills of the biotechnology laboratory. Materials, tools, and solutions. | LО 2 | ID 2.1  ID 2.2 | 1 | 8 | Active participation | Webinar  in MS Teams |
| 3 | **IWSP 1. Consultation on the implementation of IWS1** | LО 5 | ID 5.1  ID 5.2 | 1 | 0 |  | Webinar  in MS Teams |
| 3 | **IWS 1.** Current achievements and prospects of animal biotechnology. | LО 5 | ID 5.1  ID 5.2 | 1 | 20 | Presentation | Report in Moodle |
| 4 | **L.4** Methodological base of Animal Biotechnology. Types of producing organisms: allophenic animals, cloned animals, transgenic animals. | LО 1 | ID 1.1  ID 1.2 | 1 | 2 |  | Video lecture  in MS Teams |
| 4 | **LW.4** Animal models as producers of proteins, antibodies, and drugs. | LО 3 | ID 3.1  ID 3.2 | 2 | 8 | Active participation | Webinar  in Zoom |
| 5 | **L.5** Biosafety and Bioethics issues in Animal biotechnology. The Future of Animal Biotechnology. | LО 1 | ID 1.1  ID 1.2 | 1 | 2 |  | Video lecture  in MS Teams |
| 5 | **LW.5** Bioethics as the fundamental issues in animal biotechnology. | LО 3 | ID 3.1  ID 3.2 | 2 | 8 | Active participation | Webinar  in Zoom |
| 5 | **IWSP 2 Consultation on the implementation of IWS2** | LО 4 | ID 5.1  5.2 | 1 | 0 |  | Webinar  in MS Teams |
| 5 | **IWS 2** Genetic engineering, design for the tissue- and time -specific gene expression. Organ and tissue transplantation: overcoming the barrier of immunological incompatibility. Use of embryonic stem cells. | LО 4 | ID 5.1  ID 5.2 | 1 | 20 | Presentation | Report in Moodle |
| 5 | **MT 1** | LО 1 | ID 1.1. | 1 | 100 |  |  |
| 6 | **L.6** Good manufacturing practice. Good laboratory practice. Intellectual property rights. | LО 1 | ID 1.1  1.2 | 1 | 2 |  | Video lecture  in MS Teams |
| 6 | **LW.6** Introduction to DNA: mutations, gene expression, and protein production. | LО 2  LO 3 | ID 2.1  ID 3.1 | 2 | 8 | Active participation | Webinar  in Zoom |
| 7 | **L.7** Chimeras. Methodological base of Embryoengineering. | LО 1 | ID 1.1. | 1 | 2 |  | Video lecture  in MS Teams |
| 7 | **LW.7** Introduction to animal reproduction and *in vitro* fertilization. | LО 3 | ID 3.1  ID 3.2 | 2 | 8 | Analysis | Webinar  in Zoom |
| 8 | **L.8** Artificial insemination, *In vitro* fertilization, and embryo transfer in animals. | LО 1 | ID 1.1  1.2 | 1 | 2 |  | Video lecture  in MS Teams |
| 8 | **LW.8** Chimera production. Types of animal chimeras. | LО 3 | ID 3.1. | 2 | 8 | Analysis | Webinar  in Zoom |
| 8 | **IWSP 3 Consultation on the implementation of IWS3** | LО 5 | ID 5.1  5.2 | 1 | 0 |  | Webinar  in MS Teams |
| 8 | **IWS 3** Manufacture of food substrates in Animals biotechnology. Production of pharmaceuticals in Animals biotechnology. Production of biologically active substances in Animals biotechnology. | LО 5 | ID 5.1 | 1 | 20 | Logic task | Report in Moodle |
| 9 | **L.9** The base of cryobanking. Cryopreservation of gametes and embryos. | LО 1 | ID 1.1  1.2 | 1 | 2 |  | Video lecture  in MS Teams |
| 9 | **LW.9** Microsurgery of embryonic cells (morula, blastocyst) to create allofennic animals. Methods for assessment of the of the somatic cells, gametes and embryos viability. | LО 2 | ID 2.1  2.2 | 2 | 8 | Active participation | Webinar  in Zoom |
| 10 | **L.10** Animal cloning. History of cloning animals. | LО 1 | ID 1.1. | 1 | 2 |  | Video lecture  in MS Teams |
| 10 | **LW.10** Introduction to cloning. The main principle of DNA dedifferentiation. | LО 2 | ID 2.1. | 2 | 8 | Active participation | Webinar  In Zoom |
| 10 | **IWSP 4 Consultation on the implementation of IWS4** | LО 5 | ID 5.1 | 1 | 0 |  | Webinar  in MS Teams |
| 10 | **IWS 4** Production of antibodies in Animals biotechnology. Production of hormonal drugs in Animals biotechnology.. | LО 5 | ID 5.1. | 1 | 20 | Problem task | Report in Moodle |
| 10 | **МТ (Midterm Exam)** | LО 1 | ID 1.1. | 1 | 100 |  |  |
| 11 | **L.11** Methods for reprogramming the somatic nuclei potency. | LО 1 | ID 1.1. | 1 | 0 |  | Video lecture  in MS Teams |
| 11 | **LW.11** Method of embryonic cloning. Cloning method using the somatic cell nuclear transplantation. Cloning amphibians. Cloning mammals. | LО 1 | ID 1.1  1.2 | 2 | 8 | Analysis | Video lecture  in Zoom |
| 12 | **L.12** Stem cells. Cell potency and differentiation. Application of stem cells. | LО 2 | ID 2.1. | 1 | 0 |  | Webinar  in MS Teams |
| 12 | **LW.12** Introduction to stem cells. Types of stem cells. The main properties and future prospects of stem cells. | LО 1 | ID 1.1. | 2 | 8 | Analysis | Video lecture  in Zoom |
| 12 | **IWSP 6 Consultation on the implementation of IWS 5** | LО 4  LO 5 | ID 4.1  ID 5.1 | 1 | 0 |  | Webinar  in MS Teams |
| 12 | **IWS 5** Transgenic animals - as models of human diseases | LО 4  LO 5 | ID 4.1  ID 5.1 | 2 | 20 | Problem task | Report in Moodle |
| 13 | **L.13** Genetic transformation of animal somatic cells. | LО 4 | ID 4.1. | 1 | 2 |  | Video lecture  in MS Teams |
| 13 | **LW.13** The principles of genetic engineering in Animal biotechnology: constructing of genes for expressing in mammalian cells, selectable markers. | LО 2 | ID 2.1. | 2 | 8 | Analysis | Webinar  in Zoom |
| 14 | **L.14** Genetic transformation of animals. | LО 1 | ID 1.1. | 1 | 2 |  | Video lecture  in MS Teams |
| 14 | **LW.14** Methods of introducing the foreign DNAs into animal cells, identification of the foreign DNA in transformed cells and organisms | LО 2 | ID 2.1  2.2 | 2 | 8 | Analysis | Webinar  in Zoom |
| 15 | **L.15** Genetic engineering and gene therapy | LО 1 | ID 1.1.  ID 1.2 | 1 | 2 |  | Video lecture  in MS Teams |
| 15 | **LW.15** Determination of the expression pattern of the foreign DNA. | LО 2 | ID 2.1  ID 2.2 | 2 | 8 | Analysis | Webinar  in Zoom |
| 15 | **Consultation on the implementation of IWS6** | LО 5 | ID 5.1  ID 5.2 | 1 | 0 |  | Webinar  in MS Teams |
| 15 | **IWS 6** Ethical policy gene therapy germ and somatic cells. Ethical policy on human cloning. | LО 5 | ID 5.1.  ID 5.2 | 1 | 20 | Analysis | Report in Moodle |
| 15 | **Test** | LО 1 | ID 1.1. | 1 | 10 |  |  |
| 15 | **MT 2** | LО 1 | ID 1.1. | 1 | 100 |  |  |

[Abbreviations: QS - questions for self-examination; TK - typical tasks; IT - individual tasks; CW - control work; MT - midterm.

Comments:

- Form of L and PT: webinar in MS Teams / Zoom (presentation of video materials for 10-15 minutes, then its discussion / consolidation in the form of a discussion / problem solving / ...)

- Form of carrying out the CW: webinar (at the end of the course, the students pass screenshots of the work to the monitor, he/she sends them to the teacher) / test in the Moodle DLS.

- All course materials (L, QS, TK, IT, etc.) see here (see Literature and Resources, p. 6).

- Tasks for the next week open after each deadline.

- CW assignments are given by the teacher at the beginning of the webinar.]

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**Chairman of the Faculty Methodical Council Yurikova O.V.**

**Head of the Department Zhunusbayeva Zh.K.**

**Lecturer** **Djansugurova L.B.**