**SYLLABUS**

**Fall semester 2023-2024 academic year**

**Educational program "8D05104 - Genetic"**

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| **ID** **and name** **of course** | **Independent work** **of the student****(IWD)** | **Number of credits** | **General****number** **of credits** | **Independent work** **of the student****under the guidance** **of a teacher (IWDT)** |
| **Lectures (L)** | **Practical classes (PC)** | **Lab. classes (LC)** |
| **SPGR 7303,****Modern problems of plant genetics** | 6 | 15 | 30 | 0 | 5 | 7 |
| **ACADEMIC INFORMATION ABOUT THE COURSE** |
| **Learning Format** | **Cycle,****component** | **Lecture** **types** | **Types** **of practical classes** | **Form and platform final control** |
| *Offline* | MD, Elective component | problematic,analytical lecture | solving problems,situational tasks | ExamWriting / “Univer”. |
| **Lecturer - (s)** | Amirova Aigul, candidate of biological science |
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| **Assistant - (s)** |  |
| **e-mail :** |  |
| **Phone :** |  |
| **ACADEMIC COURSE PRESENTATION** |
| **Purpose****of the course** | **Expected Learning Outcomes (LO) \***  | **Indicators of LO achievement (ID)** |
| The purpose of the discipline: to develop the ability to modernize selection, genetic and genetic engineering activities in agricultural centers.  | 1. Assess achievements and current state of modern problems of plant genetics in accordance with the specialty and specialization. | 1.1 Knows the current states of modern plant genetics and relationship of genetics with other disciplines; Summarize the achievements of modern plant genetics and biotechnology. |
| 1.2 Owns the methods of genetics for setting up experiments and processing measurement results. |
| 2. Use advanced technologies of plant genetics, plant cell engineering, somatic hybridization and genetic engineering in the breeding process. Explain modern problems of plant genetics. | 2.1 Can apply advanced technologies of plant genetics, plant cell engineering, somatic hybridization and genetic engineering within the framework of professional activities in the specialty of genetics. |
| 2.2 Knows the methodological foundations of scientific knowledge and creativity in practice. |
| 3. Improve qualifications in the professional field of genetics; in scientific and pedagogical work by the specialty. | 3.1 Can apply the acquired knowledge in the professional field of genetics. |
| 3.2 Owns the acquired knowledge and skills in scientific and pedagogical work by the specialty. |
| 4. Summarize scientific information obtained from literary sources in the field of plant genetics and biotechnology on the use of cytoplasmic male sterility in breeding and genetic research, chromosome engineering of plants, chromosome technologies in the selection of grain crops and the study of molecular genetic mechanisms of plant morphogenesis. | 4.1 Can analyze the information obtained from literary sources in the field of genetics and plant biotechnology. |
| 4.2 Owns modern information in the field of plant genetics and biotechnology, necessary for studying the molecular genetic mechanisms of plant morphogenesis. |
| 5. 5. Plan and manage projects; be able to find and make decisions among different opinions. Have depth knowledge of genetically engineered enzymes, DNA sequencing methods, genomic libraries, transgenic plants, deciphering the genome of grain crops and the use of plants as test systems. | 5.1. Can compose the projects and manage of them; |
| 5.2 Can identify the problems, find and make decisions in the context of different opinions. |
| **Prerequisites** | Genetic evolution mechanisms, Academic writing, Innovative teaching technologies of genetics |
| **Postrequisites** | Modern problems of human and animal genetics, The implementation of a Doctoral Thesis |
| **Learning Resources** | **Literature** Main: 1. Шулембаева К.К., Токубаева А.А. Реконструкция генома мягкой пшеницы на основе хромосомной инженерии и отделенной гибридизации: монография. КазНУ им. аль-Фараби. - Алматы : Қазақ ун-ті, 2019. - 240 с.2. Огурцов А.Н., Близнюк О.Н., Масалитина Н.Ю. Основы генной инженерии и биоинженерии. Учебное пособие. Часть 1.: Молекулярные основы генных технологий. Харьков: НТУ "ХПИ", 2018. - 288 с.Additional:1. Нефедова Л.Н., Применение молекулярных методов исследования в генетике: Учебное пособие. - М.: НИЦ Инфра-М, 2012. - 104 с. 2. Муминов Т.А., Куандыков Е.У. Основы молекулярной биологии : курс лекций. - Алматы : ССК, 2017. – 222 с. 3.Varshney Rajeev K. Plant Genetics and Molecular Biology. - London: Springer, 2018. - 298 p.4. Halford Nigel G. Crop Biotechnology: Genetic Modification And Genome Editing. - London: World Scientific, 2018. - 218 p.5. Glick Bernard R. Molecular biotechnology: principles and applications of recombinant DNA. - 4th ed. - Washington, 2010. - 1200 p. **Research infrastructure**1. Laboratories and other locations where teaching and learning will take place**Professional scientific databases**1. <https://vc.ru/future/109057-gennaya-inzheneriya-sostoyanie-na-2020>2. <https://sites.google.com/site/anogurtsov/lectures/ge>2.**Internet resources** (at least 3-5)1. <http://elibrary.kaznu.kz/ru> 2. MOOC / video lectures, etc.3. <https://www.isaaa.org/resources/publications/pocketk/16/> |

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| **Academic****course policy** | The academic policy of the course is determined by [the Academic Policy](https://univer.kaznu.kz/Content/instructions/%D0%90%D0%BA%D0%B0%D0%B4%D0%B5%D0%BC%D0%B8%D1%87%D0%B5%D1%81%D0%BA%D0%B0%D1%8F%20%D0%BF%D0%BE%D0%BB%D0%B8%D1%82%D0%B8%D0%BA%D0%B0.pdf) and [the Policy of Academic Integrity of Al-Farabi Kazakh National University .](https://univer.kaznu.kz/Content/instructions/%D0%9F%D0%BE%D0%BB%D0%B8%D1%82%D0%B8%D0%BA%D0%B0%20%D0%B0%D0%BA%D0%B0%D0%B4%D0%B5%D0%BC%D0%B8%D1%87%D0%B5%D1%81%D0%BA%D0%BE%D0%B9%20%D1%87%D0%B5%D1%81%D1%82%D0%BD%D0%BE%D1%81%D1%82%D0%B8.pdf) Documents are available on the main page of IS Univer .**Integration of science and education.** The research work of students, undergraduates and doctoral students is a deepening of the educational process. It is organized directly at the departments, laboratories, scientific and design departments of the university, in 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 IWST, IWS, which are reflected in the syllabus and are responsible for the relevance of the topics of training sessions andassignments.**Attendance.** The deadline for each task is indicated in the calendar (schedule) for the implementation of the content of the course. Failure to meet deadlines results in loss of points.**Аcademic honesty.** Practical/laboratory classes, IWS develop the student's independence, critical thinking, and creativity. Plagiarism, forgery, the use of cheat sheets, cheating at all stages of completing tasks are unacceptable.Compliance with academic honesty during the period of theoretical training and at exams, in addition to the main policies, is regulated by [the "Rules for the final control"](https://univer.kaznu.kz/Content/instructions/%D0%9F%D1%80%D0%B0%D0%B2%D0%B8%D0%BB%D0%B0%20%D0%BF%D1%80%D0%BE%D0%B2%D0%B5%D0%B4%D0%B5%D0%BD%D0%B8%D1%8F%20%D0%B8%D1%82%D0%BE%D0%B3%D0%BE%D0%B2%D0%BE%D0%B3%D0%BE%20%D0%BA%D0%BE%D0%BD%D1%82%D1%80%D0%BE%D0%BB%D1%8F%20%D0%9B%D0%AD%D0%A1%202022-2023%20%D1%83%D1%87%D0%B3%D0%BE%D0%B4%20%D1%80%D1%83%D1%81%D1%8F%D0%B7%D1%8B%D0%BA%D0%B5.pdf) , ["Instructions for the final control of the autumn / spring semester of the current academic year"](https://univer.kaznu.kz/Content/instructions/%D0%98%D0%BD%D1%81%D1%82%D1%80%D1%83%D0%BA%D1%86%D0%B8%D1%8F%20%D0%B4%D0%BB%D1%8F%20%D0%B8%D1%82%D0%BE%D0%B3%D0%BE%D0%B2%D0%BE%D0%B3%D0%BE%20%D0%BA%D0%BE%D0%BD%D1%82%D1%80%D0%BE%D0%BB%D1%8F%20%D0%B2%D0%B5%D1%81%D0%B5%D0%BD%D0%BD%D0%B5%D0%B3%D0%BE%20%D1%81%D0%B5%D0%BC%D0%B5%D1%81%D1%82%D1%80%D0%B0%202022-2023.pdf) , "Regulations on checking students' text documents for borrowings".Documents are available on the main page of IS Univer .**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 aigul\_amir@mail.ru or via video link in MS Teams *enter a permanent link to the meeting.***Integration MOOC (massive open online course).** In the case of 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. **ATTENTION!** The deadline for each task is indicated in the calendar (schedule) for the implementation of the content of the course, as well as in the MOOC. Failure to meet deadlines results in loss of points. |
| **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** | **Assessment according to the traditional system** | **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.**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.**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 IWD. 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. |
| A | 4.0 \_ | 95-100 | Great |
| A- | 3.67 | 90-94 |
| B+ | 3.33 | 85-89 | Fine |
| B | 3.0 | 80-84 | **Formative and summative assessment** | **Points % content** |
| B- | 2.67 | 75-79 | Activity at lectures | 5 |
| C+ | 2.33 | 70-74 | Work in practical classes | 20 |
| C | 2.0 | 65-69 | Satisfactorily | Independent work | 25 |
| C- | 1.67 | 60-64 | Design and creative activity | 10 |
| D+ | 1.33 | 55-59 | Unsatisfactory | Final control (exam) | 40 |
| D | 1.0 | 50-54 | TOTAL | 100 |
| **Calendar (schedule) for the implementation of the content of the course. Methods of teaching and learning.** |

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| **A week** | **Topic name** | **Number of hours** | **Max.****ball** |
| **MODULE 1 – Modern problems of plant genetics.** |
| **1** | **L 1.** Modern problems of plant genetics. | 1 | 2 |
| **PC 1.** High-quality reference genome sequences | 2 | 8 |
| **2** | **L 2.** Challenging Features of Plant Genomes | 1 | 2 |
| **PC 2.** Major achievements in plant pan-genomics. | 2 | 8 |
| **IWDT 1.** Consultations on the implementation of **IWD 1** | 1 |  |
| **3** | **L 3.** In vitro culture and plant breeding.Pollen and Microspore culture in Plant Improvement | 1 | 2 |
| **PC 3.** Creation of Haploid and Dihaploid plants. | 2 | 8 |
| **IWD 1.** Modern problems of plant genetics. **(**individual / group project). | 2 | 15 |
| **4** | **L 4.** Recent applications of plant cell culture technology in the breeding process. | 1 | 2 |
| **PC 4.** Aspects of Somatic Hybridization | 2 | 8 |
| **5** | **L 5.** Genetic Resources, Chromosome Engineering, and Crop Improvement. | 1 | 2 |
| **PC 5.** Chromosome Engineering. | 2 | 8 |
| **MODULE 2 – Biotechnology based on Recombinant DNA.** |
| **6** | **L 6.** Recombinant DNA technology. | 1 | 2 |
| PC 6. The tools of recombinant DNA technology. | 2 | 8 |
| **IWDT 2.** Consultations on the implementation of **IWD 2**  | 1 |  |
| **7** | **L 7.** Methods of genetic transformation of plants. | 1 | 2 |
| **PC 7.** Genetic transformation of plants. | 2 | 8 |
| **IWD 2.** Chromosome Engineering and Crop Improvement. | 2 | 15 |
| **Midterm control 1** | **100** |
| **8** | **L 8.** Genetic transformation of plants with *Agrobacterium tumefaciens*. | 1 | 2 |
| **PC 8.** Agrobacterium-mediated plant transformation. | 2 | 6 |
| **IWDT 3.** Consultations on the implementation of **IWD 3**  | 1 |  |
| **9** | **L 9.** Method of biolistic transformation of plants. | 1 | 2 |
| **PC 9.** Particle bombardment method | 2 | 6 |
| **IWD 3. Control work** | 1 |  |
| **10** | **L 10.** Risks of modern biotechnologies and legal aspects of theirimplementation in agriculture. | 1 | 2 |
| **PC 10.** Main problems of food safety. | 2 | 7 |
| **IWDT 4.** Consultation on the implementation of **IWD 4** | 1 |  |
| **IWD 4** Plant genome analysis. Pan-genome of plants. | 2 | 15 |
| **MODULE 3 – Modern methods in plant improvement.**  |
| **11** | **L 11.** The plant microbiome: ecology, functions, and emergingtrends in microbial application. | 1 | 2 |
| **PC 11.** Plant microbiota and their interactions | 2 | 7 |
| **IWDT 5. Consultation on the implementation of IWD 5** | 1 |  |
| **12** | **L12.** From Sanger Technology to NGS: Getting Plants of the Ground. | 1 | 2 |
| **PC 12.** NGS is tightly bound to bioinformatics. | 2 | 7 |
|  | **IWD 5.** The plant microbiome. NGS.  | 2 | 15 |
| **13** | **L 13.** Impact of Genetic engineering in agriculture: zero hunger, achieving food security and nutrition and promoting sustainable agriculture. | 1 | 2 |
| **PC 13.** Effect of abiotic and biotic stresses on food production. | 2 | 7 |
| **IWD 6.** Consultation on the implementation **of IWST 6.** | 1 |  |
| **14** | **L 14.** Risk and safety assessment of genetically modified plants. | 1 | 2 |
| **PC 14.** Biosafety and regulation of genetically modified plants. | 2 | 7 |
|  | **IWD 6.** Control work | 1 |  |
| **15** | **L 15.** CRISPR/Cas Genome Editing and Precision Plant Breeding in Agriculture | 2 | 2 |
| **PC 15.** Plant Genome Editing via CRISPR/Cas DNA. | 1 | 7 |
| **IWDT 7.** **Consultation on examination issues**  |  |  |
| **Midterm control 2** | **100** |
| **Final control (exam)** | **100** |
| **TOTAL for course** | **100** |

**Dean \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Курманбаева М.С.**

**Head of Department \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Zhunusbayeva Zh.K.**

**Lecturer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Amirova A.K.**

**RUBRICATOR OF THE SUMMATIVE ASSESSMENT**

**CRITERIA EVALUATION OF LEARNING OUTCOMES**

Issued at the request of the teacher for each planned summative assessment (IWST)

**TEMPLATE**

**Task name** (points, % content from 100% MC, copy from the calendar (graphics) implementation of the content of the training course, methods of teaching and learning

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| **Criterion**   | **"Excellent"**  **Max. weight in %**  | **"Good"**  **Max. weight in %**  | **"Satisfactory"**  **Max. weight in %**  | **"Unsatisfactory"**  **Max. weight in %**  |
|    |    |    |    |    |

**Example 1. Written assignment "My professional history" (25% of 100% MC)**

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| **Criterion**  | **"Excellent"**20-25% | **"Good"**15-20% | **"Satisfactory"**10-15% | **"Unsatisfactory"**0-10% |
| **Understanding Theories** **and concepts of professional identity and professionalism of a teacher**   | Deep understanding of theories, concepts of professional identity and teacher professionalism. Relevant and relevant links (citations) to key sources are provided.  | Understanding theories, concepts of professional identity and teacher professionalism. Links (citations) to key sources are provided.  | Limited understanding of theories, concepts of professional identity and teacher professionalism. Limited references (citations) to key sources are provided.  | Superficial understanding / lack of understanding of theories, concepts of professional identity and professionalism of the teacher. Relevant references (citations) to key sources are not provided.  |
| **Awareness of key issues of professional identity and professionalism of teachers in Kazakhstan**   | Links well the key concepts of professional identity and teacher professionalism with the context of Kazakhstan. Excellent substantiation of arguments with evidence from empirical research (for example, based on interviews or statistical analysis).  | Links the concepts of professional identity and teacher professionalism with the context of Kazakhstan. Supports arguments with evidence from empirical research.  | Limited connection of the concepts of professional identity and professionalism of teachers with the context of Kazakhstan. Limited use of evidence from empirical research.  | There is little or no connection between the concepts of a teacher's professional identity and the context of Kazakhstan. Little or no use of empirical research.  |
| **Policy proposal or practical recommendations/suggestions**   | Offers sound policy and/or practical recommendations, proposals for improving the professional identity and professionalism of teachers in Kazakhstan.  | Offers some policy and/or practical recommendations, proposals for enhancing the professional identity and professionalism of teachers in Kazakhstan  | Limited policy and practical recommendations. Recommendations are non-essential, not based on rigorous analysis, and are shallow.  | Little or no policy and practice advice, or advice of very low quality.  |
| **Letter,**  **APA style**   | The writing demonstrates clarity, conciseness and correctness. Strictly follows the APA style.  | The letter demonstrates clarity, conciseness and correctness. Basically follows the APA style.  | The letter has some key errors and clarity needs to be improved. There are mistakes in following the APA style.  | The writing is unclear, it is difficult to follow the content. Lots of mistakes in following the APA style.  |

   **Example 2. Group presentation "Teaching profession in Kazakhstan" (30% of 100% RK)**

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| **Criterion**  | **"Excellent"** 25-30% | **"Good"** 20-20% | **"Satisfactory"** 15-20% | **"Unsatisfactory"** 0 – 15% |
| **Understanding theories and concepts of the professional identity of the teacher and the teaching profession**   | Deep understanding of theories, concepts of the professional identity of the teacher and the teaching profession.  | Understanding theories, concepts of the professional identity of the teacher and the teaching profession.  | Limited understanding of theories, concepts of the professional identity of the teacher and the teaching profession.  | Superficial understanding / lack of understanding of theories, concepts of the professional identity of the teacher and the teaching profession.  |
| **Awareness of key issues of the professional identity of the teacher and the teaching profession in Kazakhstan**   | Competent correlation of the key concepts of the professional identity of the teacher and the teaching profession with the context of Kazakhstan. Excellent substantiation of arguments with evidence from empirical research (for example, based on interviews or statistical analysis).  | There is a connection between the concepts of professional identity of a teacher and the teaching profession with the context of Kazakhstan. The arguments are backed by evidence from empirical research.  | Limited correlation of the professional identity of the teacher and the concepts of the teaching profession with the context of Kazakhstan. Limited use of evidence from empirical research  | Insignificant connection / lack of connection between the concepts of the teacher's professional identity and the context of Kazakhstan. Little or no empirical research is used.  |
| **Pilot Study**   | Excellent use of the results of pilot studies (interviews or surveys) in the presentation  | Good use of the results of pilot studies (interviews or surveys) in the presentation.  | Satisfactory use of the results of pilot studies (interviews or surveys) in the presentation.  | Poor use of the results of pilot studies (interviews or surveys) in the presentation.  |
| **Suggestion of policy or practical recommendations/suggestions**   | Offers very good policy and/or practical advice or suggestions for improving the professional identity and teaching profession in Kazakhstan.  | Offers some policy and/or practical recommendations or suggestions for improving the professional identity and teaching profession in Kazakhstan.  | Limited policy and practical recommendations. Recommendations are non-essential, not based on rigorous analysis, and are shallow.  | Little or no policy and practice advice, or advice of very low quality.  |
| **Presentation,** **teamwork**   | Excellent, attractive presentation, excellent quality of visuals, slides, materials, excellent teamwork.  | Good engagement, good quality visuals, slides or other materials, good teamwork.  | Satisfactory level of involvement, satisfactory quality of materials, satisfactory level of teamwork.  | Low engagement, low quality content, poor teamwork.  |