SILLABUS

of discipline «Genetically engineering»

preparation direction of specialty «5B070100 - Biotecnology» for bachelor course

3– course, 6 - semester, credit number – 3

# Almaty, 2016

## Standard of study program has composed by Al Faraby Kazakh National University

## Author: Bigalyev Aitkhazha Bigalyevich

*The program has recommended to publish by scientific –methodical Council of Biology Department of Al Faraby Kazakh National University*

*«» 2015 year. Protocol №:*

**«Genetically Engineering» discipline recommendations**

*After this course student must know*:

1. the modern methods using in genetically engineering;
2. the methods of control and assessment on the human genome inside and outside the country,
3. international standards of genetically engineering management;
4. the main problems and advances of modern biotechnology;
5. the research methods, using in chromosomal and gene engineering;
6. the principles of quality standards and technical improving of control and safety systems of environment;
7. the principles of effective usage of nature resources;
8. the main directions in gene therapy;
9. the basic principles of bioethics in genetically engineering;

This course is split into few sections which can help students to pass the exam successfully.

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| --- | --- | --- |
| **№** | **Type** | **Percentage** |
| 1 | Lectures | 10% |
| 2 | Laboratory work | 30% |
| 3 | Seminar and workshops | 20% |
| 4 | Student Independent Work | 20% |
| 5 | Individual and team work | 20% |

1. **Class attendance**

It is mandatory to attend all lectures and laboratory classes. In dependence on everyday activity students will be assessed using 100 bands scale. All participants of this course have to work individually and as a team member, discuss the important questions, describe personal point of view and share the opinions among the rest of the group.

**2. Laboratory work special requirements**

According to the syllabus students have to do all laboratory tasks individually or in team. Also they must be able to discuss the themes and answer all questions. After the end of laboratory classes every student has to be able to present a short report.

**3. Seminar and workshops**

During the semester students should stay tuned and prepare a few scientific presentations about new investigations in the field of genetically engineering. Professor assistant gives all recommendations about scientific news and also provide relevant web-sources.

**4. Student Independent Work**

Student independent works can be presented as presentations, projects, scientific reports, posters or paper publications. It is totally prohibited to cheat and use previously published materials.

**5. Individual and team work**

Students must discuss results; give helpful recommendations for individual or team work.

The final assessment of students takes place during the examination. It is also prohibited to cheat, use mobile phones, tablets and any electronic devices, ask other students for answers and replace the lists of answers. Exam questions are prepared according to the current syllabus.

**Author:** Bigalyev А.Б. Dr, Bio. Sci., professor

By professional preparation bachelor of biotechnology must be:

**Prerequisites.**  Actually, The discipline to give for student information about general biology and genetics, bioresource use and control methods and negative effects on genetically sustainability and diversity inside country also, but and adjoining country, which is used of genetically resources and biotechnology methods by request of convention in accordingly of country law. Main aims are to protection of genetically and biologically resources, conservation and sustainable using of biodiversity components Republic of Kazakhstan and to take economical issue, to improving of nature using strategy, law aspects and financial system.

**Adjacent disciplines:**

«General ecology, «General genetics», «Human genetics and sustainable development of society», «Biological diversity of plants, animals», «Ecologically genetics education and viewpoint».

**DISCIPLINE OF CONTENT AND STRUCTURE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| weeks | | Title of lecture | hours | balls |
| **Мodule 1 History, study methods and modern advances of genetically engineering** | | | | |
| 1 | | Lecture 1. History, study methods of genetically engineering | 1 |  |
| Seminar 1. To view of chromosomal and gene engineering methods. (morphological, cytogenetically and molecular-genetically) | 2 |  |
| 1 HSW |  |  |
| 2 | | Lecture 2. Theoretical issue of fundamental aspects of genetically engineering technology: (chromosomal - gene engineering methods). | 1 |  |
| Seminar 2. To view of creation genetically engineering. | 2 |  |
| HSW 2 |  |  |
| 3 | | Lecture 3. Modern genetically methods of selection. | 1 |  |
| Seminar 3. View of cell engineering experimental issue basic to plants and animals selection. | 2 |  |
| HSW 3 |  |  |
| **Module 2** Genetically evaluable of organisms by chromosomal and gene engineering. | | | | |  |
| 4 | | Lecture 4. Genetically basic of hereditary and in hereditary evaluable. Individual and groups evaluable. | 1 |  |
| Seminar 4. View the methods of changing and addition of separate chromosome and gene analyses. | 2 |  |
| HSW 4 |  |  |
| 5 | | Lecture 5. Principles and methodology of the introduction of additional chromosome and getting new forms and supplemented line. | 1 |  |
| Seminar 5. Consider the introduction of instructional techniques into the genome of a particular species or varieties of any additional pairs of chromosomes of another species. | 2 |  |
| HSW 5 |  |  |
| 6 | | Lecture 6. Changing dynamics of ecosystems. | 1 |  |
| Seminar 6. The role of genetic engineering methods in coherent and incoherent evolution. | 2 |  |
| HSW 6 |  |  |
| 7 | | Lecture 7. Monitoring studies on the stability of biological systems as a result of the application of engineering technology. | 1 |  |
| Seminar 7. Selections principles in evolutionary theory. Biocenotically crises and their causes, as a result of genetic engineering. | 2 |  |
| HSW 7 |  |  |
|  |  |  |
| **1 midterm** |  | **30** |
| **Module №3.The role of genetically engineering modern advances for sustainable development of natural populations genome (plants, animals, human) and ecosystem in general.**   |  |  |  |  | | --- | --- | --- | --- | | 8 | Lecture №8. Species, as a main carrier of evolution by Vernandstys theory and its influence on modern technology`s sustainability. | 1 |  | | Seminar №8. Factors and driving forces of speciation in modern conditions, application of genetic engineering methods. | 2 |  | | 9 | Lecture №9. Systems community as a elementary carrier of evolution process. | 1 |  | | Seminar №9. Influence of community to the evolution. Modification of internal and external environmental factors on community and society. | 2 |  | | Students independent work – 9 SIW |  |  | | 10 | Lecture №10. Internal and external factors of historical climatic change and they’s role in organic evolution. | 1 |  | | Seminar №10. Climate, climatic and environmental change mechanisms, models of biologically systems sustainable development. | 2 |  | | Students independent work |  |  | | 11 | Lecture №11. Genetic engineering – artificial change of necessary organisms (bacteria, animals, plants) to another species | 1 |  | | Seminar №11. To consider the methods and ways of genes change (transgenic) | 2 |  | | Students independent work |  |  | | 12 | Lecture №12. Principles of separation from bacteria, animals or plants genes for change or artificial synthesis of necessary genes. | 1 |  | | Seminar №12. To consider the methods of creation the special genetic constructions (vectors), in which separated genes will introduce in another genes. | 2 |  | | Students independent work – |  |  | | 13 | Lecture №13. Transgenic plants and animals which changed in genetic operations. | 1 |  | | Seminar №13. To get acquainted with genes – promoters, terminators, and genes reporters, wich change the genes. | 2 |  | | Students independent work |  |  | | 14 | Lecture №14. Ti – plasmids of Acrobacterium tumefasiens ground bacteria, which carry the gene of protein – toxic and introduction in plant cells (ONA of plants). | 1 | | |  | Seminar №14. Use of to create the form of useful agricultural plants, sustainable for harmful insects | 2 |  | | Students independent work |  |  | | 15 | Lecture №15. New methods of selection chimerical or transgenic animals and role of genes in cell differentiation and regulation of interaction between cells in process of development. | 1 |  | | Seminar №15.To carry out the review of experimental methods of obtain into bally extraordinary animals, which one father and mother, but more than one quantify of parents. (chimerical animals) | 2 |  | | Students independent work |  |  | | | | | |
|  | **2 midterm** | |  | **30** |
| **Exam** | |  | **40** |
|  | **Total** | |  | **100** |
|  | |  |  |
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**LITERATURE**

**Basic:**

1. [Beyond Biotechnology: The Barren Promise of Genetic Engineering](https://www.questia.com/library/120079343/beyond-biotechnology-the-barren-promise-of-genetic) By Craig Holdrege; Steve Talbott University Press of Kentucky, 2008

2. [Enhancing Evolution: The Ethical Case for Making Better People](https://www.questia.com/library/118180626/enhancing-evolution-the-ethical-case-for-making) By John Harris Princeton University Press, 2007

3. [The Hope, Hype & Reality of Genetic Engineering: Remarkable Stories from Agriculture, Industry, Medicine, and the Environment](https://www.questia.com/library/102655521/the-hope-hype-reality-of-genetic-engineering-remarkable) By John C. Avise Oxford University Press, 2004

4. [DNA: Promise and Peril](https://www.questia.com/library/120088339/dna-promise-and-peril) By Linda L. McCabe; Edward R. B. McCabe University of California Press, 2008

5. [Genetic Privacy: A Challenge to Medico-Legal Norms](https://www.questia.com/library/105363047/genetic-privacy-a-challenge-to-medico-legal-norms) By Graeme Laurie Cambridge University Press, 2002

6. [Genes: A Philosophical Inquiry](https://www.questia.com/library/108410828/genes-a-philosophical-inquiry) By Gordon Graham Routledge, 2002

[Uncertain Peril: Genetic Engineering and the Future of Seeds](https://www.questia.com/library/117295602/uncertain-peril-genetic-engineering-and-the-future) By Claire Hope Cummings Beacon Press, 2008

# 7. An Introduction to Genetic Engineering By Desmond S. T. Nicholl, Cambridge University Press, 2008

8. [Genetics: A Conceptual Approach](https://www.goodreads.com/book/show/3172164-genetics?from_search=true&search_version=service) by [Benjamin A. Pierce](https://www.goodreads.com/author/show/875934.Benjamin_A_Pierce?from_search=true&search_version=service), 1997

9. [Genetics: From Genes to Genomes](https://www.goodreads.com/book/show/30867.Genetics?from_search=true&search_version=service) by [Leland Hartwell](https://www.goodreads.com/author/show/17303.Leland_Hartwell?from_search=true&search_version=service), [Leroy E. Hood](https://www.goodreads.com/author/show/17298.Leroy_E_Hood?from_search=true&search_version=service), [Michael L. Goldberg](https://www.goodreads.com/author/show/17299.Michael_L_Goldberg?from_search=true&search_version=service), 1997

10. [The Case Against Perfection: Ethics in the Age of Genetic Engineering](https://www.goodreads.com/book/show/320993.The_Case_Against_Perfection?from_search=true&search_version=service) by [Michael J. Sandel](https://www.goodreads.com/author/show/90763.Michael_J_Sandel?from_search=true&search_version=service), 2007

11. [Remaking Eden: How Genetic Engineering and Cloning Will Transform the American Family](https://www.goodreads.com/book/show/1219560.Remaking_Eden?from_search=true&search_version=service) by [Lee M. Silver](https://www.goodreads.com/author/show/17300.Lee_M_Silver?from_search=true&search_version=service), 1997

12. Жученко А.А. Экологическая генетика культурных растений и проблемы. Учебное пособие М.: ФГОУ ВПО РГАУ-МСХА, 2008, 131 стр.

2. Э.М.Ахундова Экологическая генетика. Баку.2005. 264 с.

13. Жимулев И.Ф. Общая и молекулярная генетика.- Новосибирск: Изд-во Новосибирского университета. 2002.

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17.Генетика: учебник для вузов / В. И. Иванов - М. : Академкнига, 2006. - 638 с. : ил.. - Библиогр.: с. 602. - Предм. указ.: с. 603. - ISBN 5-94628-146-1.

18. Генетика: учеб. пособие для вузов / А. А. Жученко - М. : Колос С, 2006. - 480 с. : ил.. - Библиогр. в конце глав. - Предм. указ.: с. 469-476. - ISBN 5-9532-0069-2.

**Resources of internet**

* + Electronic handbook. Режим доступа: <http://books4study.biz/c16>
  + Electronic handbook. [http://www.edu.ru](http://www.edu.ru/)
  + Electronic handbook. <http://www.maps/edu.ru>
  + Electronic Journal of genetics.: [http://www.maik.ru](http://www.maik.ru/)