Federal State Autonomous Educational Institution of Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA
NAMED AFTER PATRICE LUMUMBA
RUDN University
Institute of Medicine

educational division (faculty/institute/academy) as higher education programme developer

COURSE SYLLABUS

Biotechnology

course title

Recommended by the Didactic Council for the Education Field of:

31.05.01 General Medicine

field of studies / specialty code and title

The course instruction is implemented within the professional education programme of higher education:

31.05.01 General Medicine

higher education programme profile/specialisation title

2026 г.

1. COURSE GOALS

The discipline is aimed at studying the principles of production, regulation and use of biotechnological medicines and biomedical technologies.

The goal of the course **"Biotechnology"** is to develop general ideas, abilities, and skills in obtaining and using biotechnology methods in medicine.

2. REQUIREMENTS FOR LEARNING OUTCOMES

Mastering the course (module) "Biotechnology" is aimed at developing the following competencies in students: PC-3.

Table 2.1. List of competences that students acquire through the course study

Competence code	**Competence descriptor**	**Competence formation indicators** (within this course)
GPC-4	Capable of using medical devices as prescribed by the procedure for providing medical care, as well as conducting patient examinations to establish a diagnosis	GPC-4.1: Able to use medical devices in accordance with current medical care procedures, clinical guidelines (treatment protocols) for medical care, and care taking into account medical care standards; GPC-4.2: Able to evaluate the effectiveness and safety of medical devices;

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The course refers to the core/variable/elective* component of (B1) block of the highere ducational programme curriculum.

* - Underline whatever applicable.

Within the higher education programme students also master other (modules) and / or internships that contribute to the achievement of the expected learning outcomes as results of the course study.

Table 3.1. The list of the higher education programme components/disciplines that contribute to the achievement of the expected learning outcomes as the course study results

Competence code	**Competence descriptor**	**Previous courses/modules***	**Subsequent courses/modules***
GPC-4	*Capable of using medical devices as prescribed by the procedure for providing medical care, as well as conducting patient examinations to establish a diagnosis*	Introductory training to acquire basic professional skills and abilities: patient care (simulation center); Introductory training to acquire basic professional skills and abilities: patient care; Introductory training to acquire basic professional skills and abilities: junior medical assistant; Physics; Chemistry; Bioorganic Chemistry	Internship in emergency medical procedures (simulation center); Internship to acquire basic professional skills and experience in the following areas: procedural nurse assistant; General Surgery; Neurology, Medical Genetics, Neurosurgery; Endocrinology; Anesthesiology, Resuscitation, Intensive Care; Radiology; Traumatology, Orthopedics; Topographic Anatomy and Operative Surgery; Hospital Surgery, Pediatric Surgery; Oncology, Radiation Therapy; Pharmacology;

* To be filled in according to the competence matrix of the higher education programme.

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

The total workload of the course "**Biotechnology** is 2 credits (72 academic hours).

*Table 4.1. Types of academic activities during the periods of higher education programme mastering (**full-time training**)**

Types of academic activities		**TOTAL,**ac.h.	**Semester(s)**			
			4			
Contact work, academic hours		***36***	***36***			
Including:						
Lectures (LC)		-	-			
Lab work (LW)		36	36			
Seminars (workshops/tutorials) (S)		-	-			
Self-studies		*18*	*18*			
Evaluation and assessment (exam/passing/failing grade)		*18*	*18*			
Total course workload	academic hours	**72**	**72**			
	credits	**2**	**2**			

5. COURSE CONTENTS

Table 5.1. Course contents and academic activities types

Course module title	**Course module contents (topics)**	**Academic activities types**
Module 1 Fundamentals of the modern biotechnological concept.	1.1 Introduction to modern biotechnology. Definition, subject and tasks of biotechnology as a science and a sphere of production. Brief historical background. The main scientific and applied areas of biotechnology. Solving fundamental problems of medicine based on the achievements of biotechnology.	LW

	1.2 Bio-object-the basis of biomedical technologies. The concept of a biological object. Classification of biological objects as producers of medicinal and diagnostic drugs. Macromolecules of natural origin are industrial biocatalysts. Methods of improvement of biological objects: selection, mutagenesis, cell and genetic engineering of the Republic of	LW
	1.3 Fundamentals of organization of production of biological products. Structure of BT production. Preparatory (preparation of seed material, culture medium and fermenter) and main stages: fermentation, isolation, fractionation, purification. . Classification of biosynthesis by technological parameters (periodic, regulated, continuous, etc.)	LW
Module 2 Post-genomic technologies	2.1 Genetic engineering. Recombinant proteins and peptides. Production of genetically engineered insulin and peptide growth factors. Insulin. Sources of receipt. Species specificity. Recombinant human insulin. An alternative route for obtaining recombinant insulin; synthesis of A and B chains in different cultures of microbial cells.	LW
	2.2 Gene therapy. Modern methods of treating hereditary diseases are not at the gene level, the disadvantages of such therapy. Background and history of development of gene therapy methods for hereditary diseases, methods for obtaining normal variants of defective genes.	LW
Module 3 Plant and cell producers	3.1 Plant bioobjects as a source of biologically active substances Culture of plant cells, organs and tissues. Callus tissues on an agarized medium. Suspension cell cultures in a liquid medium. Protoplast cultures. Isolated plant organs that allow you to get hundreds of thousands of shoots from one meristem. The main groups of BAS produced by plants used in medical practice. Alkaloids. Cardiac glycosides. Triterpene saponins. Terpenoids and essential oils. Flavonoids and polyphenolic compounds.	LW
	3.2 Cell technologies in medicine History of research in the field of organ and tissue culture. Basic methods of organ cultivation. Hybridization of animal cells. Production of cell hybrids in natural and artificial conditions. Cloning of animals. Methods of nuclear transplantation. Cloning of mammals. Use of human cell culture. Stem cells. Methods of preserving cell cultures.	LW

Module 4 Biotechnology of medical devices	4.1 Biotechnology of probiotic preparations. Probiotics and normoflora Normoflora (probiotics, microbiotics, eubiotics) - preparations based on live cultures of symbiont microorganisms. human. Bifidobacteria, lactic acid bacteria; non- pathogenic strains of Escherichia coli, which forms bacteriocins as the basis of normoflors. Getting ready-made forms of normoflors. Monopreparations and preparations based on mixed cultures. Dosage forms of bifidumbacterin, colibacterin, and lactobacterin.	
	4.2 Medical enzymes The role of enzymes in the life of biological objects. Features of obtaining enzyme preparations, areas of application and indications for use. Methods of enzyme immobilization. Features of biosynthetic reactions, ways to accelerate them and increase productivity.	
	4.3 Modern wound coverings Biocompatible materials. Natural and synthetic wound coverings. Gel-forming and hydrogel coatings, wound film coatings, absorbable coatings, combined coatings, biotechnological coatings. Cultured skin substituents.	

6. EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS OF THE DISCIPLINE

Table 6.1. Equipment and technology support of the discipline

Type of academic activities	**Classroom equipment**	**Specialised educational / laboratory equipment, software, and materials for course study** (if necessary)
Lab-work	A classroom for laboratory work, individual consultations, ongoing assessments, and midterm assessments, equipped with specialized furniture and equipment.	A set of specialized furniture; a BAVnp-01-Laminar-S bacterial air hood for working with bacterial cultures that do not pose a health hazard to operators; an ELMI TW-2 laboratory thermostat; technical equipment: a Lenovo ThinkPad E15-IML laptop; an Epson EB-X31 multimedia projector; internet access. Software: Microsoft products (OS, office suite, including MS Office/Office 365, Teams, Skype), a list of specialized equipment, etc.

Lab-work	Аудитория для проведения лабораторных работ, индивидуальных консультаций, текущего контроля и промежуточной аттестации, оснащенная комплектом специализированной мебели и оборудованием.	A set of specialized furniture; a BAVnp-01-Laminar-S bacterial air hood for working with bacterial cultures that do not pose a health hazard to operators; an ELMI TW-2 laboratory thermostat; technical equipment: a Lenovo ThinkPad E15-IML laptop; an Epson EB-X31 multimedia projector; internet access. Software: Microsoft products (OS, office suite, including MS Office/Office 365, Teams, Skype), a list of specialized equipment, etc.
Self-studies	A classroom for independent student work (can be used for seminars and consultations), equipped with specialized furniture and computers with access to the Electronic Information System (EISS).	

7. RESOURCES RECOMMENDED FOR COURSE STUDY

Main readings:

1. Fundamentals and Advances in Medical Biotechnology. Editors: Mumtaz Anvar, Riyaz Ahmad Rather, Zeenat Farooq. 2022, 459 pages.

2. Биотехнология : учебник / В.А. Колодязна, М.А. Самотруева ; Колодязна В. А., Самотруева М. А. - Москва : ГЭОТАР-Медиа, 2025. - 384 с. - ISBN 978-5-9704-8839-3.

Дополнительная литература:

1. Промышленная биотехнология лекарственных средств : учебное пособие / Я. М. Станишевский. - Москва : ГЭОТАР-Медиа, 2021. - 142 с. : ил. - ISBN 978-5-29704-5845-7 : 750.00.

2. Наглядная биотехнология и генетическая инженерия / Р. Шмид. - 3-е изд. - Москва : Лаборатория знаний, 2020. - 324 с. : ил. - 880.00.

Ресурсы информационно-телекоммуникационной сети «Интернет»:

1. ЭБС РУДН и сторонние ЭБС, к которым студенты университета имеют доступ на основании заключенных договоров

- Электронно-библиотечная система РУДН – ЭБС РУДН https://mega.rudn.ru/MegaPro/Web
- ЭБС «Университетская библиотека онлайн» http://www.biblioclub.ru
- ЭБС «Юрайт» http://www.biblio-online.ru
- ЭБС «Консультант студента» www.studentlibrary.ru
- ЭБС «Знаниум» https://znanium.ru/

2. Базы данных и поисковые системы

- Sage https://journals.sagepub.com/
- Springer Nature Link https://link.springer.com/
- Wiley Journal Database https://onlinelibrary.wiley.com/
- Наукометрическая база данных Lens.org https://www.lens.org

ASSESSMENT TOOLKIT AND GRADING SYSTEM* FOR EVALUATIONOF STUDENTS' COMPETENCES LEVEL UPON COURSE COMPLETION

Evaluation materials and point-rating system* for assessing the level of competence formation (GPC-4) based on the results of mastering the discipline "**Biotechnology**" are presented in the Appendix to this Work Program of the discipline.

* The assessment toolkit and the grading system are formed on the basis of the requirements of the relevant local normative act of RUDN University.

DEVELOPERS:

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position, department name	signature	initials, last name

HEAD OF THE DEPARTMENT:

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