Federal State Autonomous Educational Institution of Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA
RUDN University

Medical Institute

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

COURSE SYLLABUS

Cell Culture Technologies

course title

Recommended by the Didactic Council for the Education Field of:

06.04.01 Biology

field of studies / speciality code and title

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

Gene and tissue engineering

higher education programme profile/specialisation title

2025

1. COURSE GOAL

The goal of mastering the discipline “Cell Culture Technologies” is to obtain basic knowledge about the methods of isolation and principles of culturing mammalian cells, and to develop skills in the practical application of the acquired knowledge. The discipline “Cell Culture Technologies” is aimed at obtaining basic knowledge about methods of cultivating mammalian cells, types of cell cultures, which is necessary for the formation of a natural scientific worldview and the practical activities of a biologist.

2. REQUIREMENTS FOR LEARNING OUTCOMES

Mastering the discipline “Cell Culture Technologies” is aimed at developing the following competencies in students:

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

Competence code	**Competence descriptor**	**Competence formation indicators** (within this course)
GPC-5	Able to participate in the creation and implementation of new technologies and control of their environmental safety using living objects	GPC-5.1. Knows the theoretical foundations and promising areas of work with various biomedical objects GPC-5.2. Possesses the skills necessary to participate in the creation and implementation of new technologies in the field of professional activity
GPC-8	Able to use modern research equipment and computer technology to solve innovative problems in professional activities.	GPC-8.1. Knows the types of modern equipment for laboratory research in the field of professional activity
PC-1	Conducts scientific research in the field of genetic and tissue engineering	PC-1.1. Knows the principles, modern concepts and tools in the field of genetic and tissue engineering PC-1.2. Applies knowledge and skills in the field of genetic and tissue engineering to perform independent scientific research
PC-2	Designs and constructs new product/technology in the field of genetic and tissue engineering	PC-2.1. Identifies the tools needed to create a new product/technology PC-2.3. Performs laboratory manipulations necessary for development and evaluates the quality of the product
PC-3	Identifies and applies tools and approaches to conduct work in the field of genetic and tissue engineering	PC-3.1. Knows materials and methods used in genetic and tissue engineering PC-3.2. Applies genetic and tissue engineering technologies to solve practical problems

3.COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The discipline “Cell Culture Technologies” belongs to the variable part of block B1 of the higher educational programme curriculum.

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-5	Able to participate in the creation and implementation of new technologies and control of their environmental safety using living objects		Bioinformatics in bioengineering Introductory practice Genomics: theory and practice
GPC-8	Able to use modern research equipment and computer technology to solve innovative problems in professional activities.		Gene Editing Basics Introductory practice Bioinformatics in bioengineering
PC-1	Conducts scientific research in the field of genetic and tissue engineering		Gene Editing Basics Scientific and technical seminar Legal regulation in biotechnology Scientific seminar Writing articles and grant applications Rational experiment in biomedicine Research practice Research work Undergraduate practice
PC-2	Designs and constructs new product/technology in the field of genetic and tissue engineering		Gene Editing Basics Technology transfer Scientific and technical seminar Rational experiment in biomedicine Scientific seminar Research practice Research work Undergraduate practice
PC-3	Identifies and applies tools and approaches to conduct work in the		Gene Editing Basics Rational experiment in biomedicine

Competence code	Competence descriptor	Previous courses/modules*	Subsequent courses/modules*
	field of genetic and tissue engineering		Research practice Research work Undergraduate practice Technology transfer

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

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

1)The total workload of the course _is 9 credits

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

Type of academic activities		Total academic hours	Semester(s)		
			1	2	3
Contact academic hours		**143**	72	39	32
including					
Lectures (LC)					
Lab work (LW)		65	36	13	16
Seminars (workshops/tutorials) (S)		78	36	26	16
Self-studies		147	99	30	18
Evaluation and assessment (exam/passing/failing grade)		34	9	3	22
Course workload	academic hours	**324**	**180**	**72**	**72**
	credits	**9**	**5**	**2**	**2**

5. COURSE CONTENTS

Table 5.1. Course contents and academic activities types

Course module title	Course module contents (topics)	Academic activities types
Section 1. Introduction and history of the development of cell cultivation	Topic 1.1. Introduction to the course. History of the development of methods for culturing eukaryotic cells. Concept of cell cultures.	LW, S
Section 2. Isolation of cells from tissues and organs of mammals	Topic 2.1. Potential and degree of differentiation of stem cells. Niches and sources of stem cell isolation. Methods for tissue disaggregation. Separation of cells according to physical properties.	LW, S
Section 3. Methods for culturing human and animal cells	Topic 3.1. The concept of suspension and adhesive cell cultures. Cultivation of substrate dependent cells (2D culture), feeder cells. Growing cells in spheroids (3D culture),	LW, S

Course module title	Course module contents (topics)	Academic activities types
	hybridomas. Use of bioreactors for culturing eukaryotic cells. Topic 3.2. Passaging of cell cultures, separation of cells from culture plastic. Quantity control and cryopreservation of cultured cells, cryoprotectors.	
Section 4. Cell culture media	Topic 4.1. Consumables and reagents for growing cells in vitro. Types of culture media. Key components and additives of nutrient media: growth factors, antibiotics, amino acids Topic 4.2. Princes of organizing the work of the culture box, working in compliance with the rules of asepsis. The concept of contamination of cell cultures, detection of mycoplasmas.	LW, S
Section 5 Cultivation of the most significant cell cultures	Topic 5.1. Separation of isolated cells by immunophenotype. Flow cytometry and magnetic sorting. LR, NW Topic 5.2. Cultivation of fibroblasts, multipotent stromal cells, transplantable tumor lines. Morphological characteristics of various cell types, differentiation. LR, NW Topic 5.3. Cultivation of primary cultures. Methods for directed cell differentiation. The concept of induced pluripotent stem cells.	LW, S

* - to be filled in only for **full** -time training: *LC - lectures; LW - lab work; S - seminars.*

6. CLASSROOM EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Classroom equipment and technology support requirements

Type of academic activities	Classroom equipment	Specialised educational / laboratory equipment, software, and materials for course study (if necessary)
Laboratory	An auditorium for conducting laboratory work, individual consultations, ongoing monitoring and intermediate certification, equipped with a set of specialized furniture and equipment.	Laboratory centrifuge series Z 32 with accessories, version: 6K, manufactured by Hermle Labortechnik GmbH. CO2 laboratory incubators Shellab, model: 3517-2 without accessories, manufactured by Sheldon Manufacturing Inc. Biowizard series laminar flow cabinet with accessories, the following size: SL-130, manufactured

Type of academic activities	Classroom equipment	Specialised educational / laboratory equipment, software, and materials for course study (if necessary)
		by KojairTech Oy, Epoch automatic spectrophotometer with accessories. Model: EPOCH Biological microscope, manufactured by Leika Microsystem SMS GmbH. Thermal cycler for amplification of nucleic acids 1000, version C1000 Touch, complete with reaction optical module CFX96 Magnet separator MidiMACS Separation Unit 130-042-302. Automatic cell counter TC20. Redistiller GPL 2104. MiniSpin laboratory microcentrifuge, MiniSpin plus version. Vortex personal V-1 plus. Box of abacterial air environment for working with DNA samples during PCR diagnostics BAV-PCR-"Laminar-S." according to TU 9443-004-51495026-2004
Specialized auditorium	An auditorium for conducting seminar-type classes, group and individual consultations, ongoing monitoring and intermediate certification, equipped with a set of specialized furniture and technical means for multimedia presentations. (audience 328) Set of specialized furniture, Electric wall screen Cactus MotoExpert 150x200cm (CS-PSME-200X150-WT), BenQ MH550 projector, Microscopes Biomed 4, Mikmed 5, MBS 10, Software: Microsoft products (OS, office application package , including MS Office/ Office 365, Teams)	Set of specialized furniture, Electric wall screen Cactus MotoExpert 150x200cm (CS-PSME-200X150-WT), BenQ MH550 projector, Microscopes Biomed 4, Mikmed 5, MBS 10, Software: Microsoft products (OS, office application package, including MS Office/ Office 365, Teams)
For independent work of students	An auditorium for independent work of students (can be used for seminars and consultations), equipped with a set of specialized furniture and computers with	Set of specialized furniture, Electric wall screen Cactus MotoExpert 150x200cm (CS-PSME-200X150-WT),

Type of academic activities	Classroom equipment	Specialised educational / laboratory equipment, software, and materials for course study (if necessary)
	access to EIOS. Set of specialized furniture, Electric wall screen Cactus MotoExpert 150x200cm (CS-PSME-200X150-WT), BenQ MH550 projector, Software: Microsoft products (OS, office application package, including MS Office/ Office 365, Teams) -	BenQ MH550 projector, Software: Microsoft products (OS, office application package, including MS Office/ Office 365, Teams)

* The premises for students' self-studies are subject to **MANDATORY** mention

7. RESOURCES RECOMMENDED FOR COURSE STUDY

Main readings:

1. Animal cell culture. Practical guide Freshni R.Yan.. M.: BINOM. Knowledge Laboratory, 2010 – 691 p.
2. Biology of stem cells and cell technologies: Textbook: 2 volumes / Ed. M.A. Paltseva. – M6 Medicine: Shiko, 2009.- (Educational literature for students of medical universities). T.1.- 272 pp.: ill. T.2.- 455 p.: ill.
3. Introduction to cell biology Chentsov Yu. S.: textbook for high school universities in the direction. "Biology" and biol. specialist. - M.: Alliance, 2015. - 495 p.

Additional readings:

1. Cells. edited by B. Lewin et al., trans. from English I. V. Filippovich, ed. Yu. S. Chentsova. - Moscow: BINOM. Knowledge Laboratory, 2011. - 951 p.
2. Methods of cell cultivation / Ed. G.P. Pinaeva, M.S. Bogdanova. - St. Petersburg: Polytechnic Publishing House. Univ., 2008.-278 p.

Internet sources

1. Electronic libraries (EL) of RUDN University and other institutions, to which university students have access on the basis of concluded agreements:

- RUDN Electronic Library System (RUDN ELS) http://lib.rudn.ru/MegaPro/Web
- EL "University Library Online" http://www.biblioclub.ru
- EL "Yurayt" http://www.biblio-online.ru
- EL "Student Consultant" www.studentlibrary.ru
- EL "Lan" http://e.lanbook.com/
- EL "Trinity Bridge"

2.Databases and search engines:

NCBI: https://www.ncbi.nlm.nih.gov/

RUDN University Bulletin: access mode from the territory of RUDN University and remotely http://journals.rudn.ru/

Scientific library Elibrary.ru: access via RUDN IP addresses at: http://www.elibrary.ru/defaultx.asp

ScienceDirect (ESD), FreedomCollection, Cell Press, Elsevier Publishing House. There is remote access to the database, access via RUDN IP addresses (or remotely using an individual login and password).

Google Scholar (eng. Google Scholar) - a free search engine for the full texts of scientific publications of all formats and disciplines. Indexes full texts of scientific publications. Access mode: https://scholar.google.ru/

Scopus is a scientometric database published by the publishing house Elsevier. Access to the platform is carried out via RUDN IP addresses or remotely. http://www.scopus.com/

* The training toolkit for self- studies to master the course is placed on the course page in the university telecommunication training and information system under the set procedure.

DEVELOPERS:

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