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**Federal State Autonomous Educational Institution for 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

MOLECULAR GENETICS IN PRACTICAL BIOLOGY AND MEDICINE

course title

Recommended by the Didactic Council for the Education Field of:

31.05.01 General Medicine

field of studies / speciality code and title

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

General Medicine

higher education programme profile/specialisation title

1. COURSE GOAL(s)

The goal of the course is to equip students with the knowledge in the field of practical application of the achievements of Molecular Genetics.

2. REQUIREMENTS FOR LEARNING OUTCOMES

Mastering the course Molecular Genetics in practical Biology and Medicine course is aimed at the development of the following competences (competences in part): PC-2

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

Competence code	Competence descriptor	Competence formation indicators (within this course)
PC-2	Being able to examine a patient in order to determine a diagnosis	PC-2.3 Being able to refer a patient to a laboratory examination in case there are medical indications in accordance with the current procedures for the provision of medical care, clinical guidelines (treatment protocols) on the provision of medical care taking into account the medical care standards

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The course refers to the core/variable/elective component of (B1) block of the higher educational 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*
PC-2	Being able to examine a patient in order to determine a diagnosis	-	Microbiology, Virology Propaedeutics of Internal Diseases Immunology General Surgery Dermatovenerology Evidence-based Medicine Neurology, Medical Genetics, Neurosurgery Faculty Therapy Faculty Surgery Obstetrics and Gynecology

			Otorhinolaryngology Ophthalmology Urology Professional Diseases Infectious Diseases Psychiatry, Medical Psychology Hospital Therapy Polyclinic Therapy Hospital Surgery, Pediatric Surgery Paediatrics Traumatology, Orthopedics Anesthesiology, Resuscitation, Intensive Care Oncology, Radiation Therapy Phthisiology Endocrinology Allergology Reproductive Health Endoscopic Urology Medical Enzymology
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* 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 is 2 credits (72 academic hours).

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	Semesters/training modules			
		1	2	3	4
<i>Contact academic hours</i>	34	34			
Including:					
Lectures (LC)	34	34			
Seminars (workshops/tutorials) (S)					
<i>Self-studies</i>	38	38			
<i>Evaluation and assessment (exam/passing/failing grade)</i>	12	12			
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. Introduction	Topic 1.1. History and prospects of Molecular Genetics The subject, objectives and history of Molecular Genetics. Prospects for development.	LC
	Topic 1.2. Contribution of Russian scientists to the development of Molecular Genetics Role of Russian scientific schools in the development of Molecular Genetics. Modern Russian leaders in the field.	LC
Module 2. Radiogenetics	Topic 2.1. Biological effects of ionizing radiation Radioactivity. Sources and types of ionizing radiation. Ionizing radiation as a physical mutagen. The low-dose radiation paradox. Bystander effect, hormesis, and adaptive response. Differences between radiation on Earth and radiation in space.	LC
Module 3. Genetic aspects of human reproduction	Topic 3.1. Genetics of sex determination Mechanisms of sex determination in different organisms, including humans. Disorders of sex determination. Genetic mechanisms involved in human infertility.	LC
Module 4. Biology of Aging	Topic 4.1. Genetic aspects of aging. Active longevity. Theories of Aging. The phenomenon of aging at genetic and epigenetic levels. Biohacking and the Active Longevity program.	LC
Module 5. Personalized Medicine	Topic 5.1. What can your DNA tell you? Genetic ancestry testing. Determining human age via DNA. Paternity, talent, and lifestyle tests. Genetics and sports performance.	LC
	Topic 5.2. Genetic tests in Medicine Genetic tests for disease predisposition. Genetics of cancer. NIPT (how to determine the sex of a child and its genetic status from the mother's blood).	LC
Module 6. Fundamentals of Biotechnology	Topic 6.1. Genetically modified organisms Basic principles of creating genetically modified organisms. Applications of GMOs (pharmacology, medicine, food industry, fundamental science). Genetically modified microorganisms, plants and animals	LC
	Topic 6.2. Human gene therapy Basic principles of gene therapy. In vivo gene therapy. Ex vivo gene therapy. Development of vectors for gene therapy. Treatment protocols for certain genetic diseases using gene	LC

	therapy methods.	
	Topic 6.3. Stem Cells and Regenerative Medicine History of stem cell research. Cloning. Generation of induced pluripotent stem cells. Genome editing systems. Clinical applications.	LC
Module 7. Ethical issues in Modern Biology	Topic 7.1. Ethics in Genetics Historical aspects of Ethics in Genetics.	LC

	Topic 7.2 Eugenics. The Nuremberg Code and the Declaration of Helsinki. Ethical issues of genetic modification of germ cells, zygotes, and embryos. Vaccination (modern RNA vaccines). The risk of discrimination based on genetic characteristics.	LC
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* - 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 classrooms	Classroom equipment	Specialised educational / laboratory equipment, software, and materials for course study (if necessary)
Seminar	A classroom for laboratory work, individual consultations, current and mid-term assessment; equipped with a set of specialised furniture and machinery (328, 329, 330, 331, 342, 343)	A set of specialized furniture; whiteboard; technical means of multimedia presentations. Software: Microsoft Windows, MS Office / Office 365, MS Teams.
Lab-work	Laboratory of Molecular Genetics (332, 332A)	PCR laboratory equipment
Self-studies	A classroom for independent work of students (can be used for seminars and consultations), equipped with a set of specialised furniture (342)	A set of specialized furniture; whiteboard; technical means of multimedia presentations.

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

7. SOURCES RECOMMENDED FOR COURSE STUDY

Main readings:

1. Essential medical biology. V.2 : Genetics / N. V. Chebyhev, S.H. Larina, E.S. Gorozhanina [и др.] ; Ed. by N.V. Chebyshev. - Книга на английском языке. - Moscow : Medical Informational Agency, 2020. - 112 p.

Additional readings:

1. Fletcher H., Hickey I. Genetics. – Garland Science. – 2013.
2. Klug W.S., Cummings M.R., Spencer C.A., Palladio M.A. Concepts of genetics. – Pearson Education International. – 2014.
3. Lewin B. Genes. – Oxford University Press. – 2012.
4. Vogel and Motulsky's Human Genetics: Problems and Approaches / M. Speicher, Antonarakis S.E., Motulsky A.G. – Springer. – 2010.

Internet sources:

1. Electronic libraries with access for RUDN students:
- RUDN online library <http://lib.rudn.ru/MegaPro/Web>
 - Scientific electronic library: - <http://elibrary.ru>
 - EL "University Library Online" <http://www.biblioclub.ru>
 - EL "Student Consultant" www.studentlibrary.ru
 - EL "Lan" <http://e.lanbook.com/>
 - EL "Yurayt" <http://www.biblio-online.ru>

1. Databases and search engines:
- National Center for Biotechnology Information (NCBI) - www.ncbi.nlm.nih.gov
 - Google Academy - <http://scholar.google.ru/>
 - SCOPUS <http://www.scopus.com/>

Training toolkit for self- studies to master the course *:

1. Workbook

* 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.

8. ASSESSMENT TOOLKIT AND GRADING SYSTEM* FOR EVALUATION OF STUDENTS' COMPETENCES LEVEL UPON COURSE COMPLETION

The assessment toolkit and the grading system* to evaluate the competences formation level (competences in part) upon the course study completion are specified in the Appendix to the course syllabus.

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

DEVELOPERS:

Associate professor, Department of
Biology and General Genetics

position, department

signature

M.M. Azova

Name

Head of the Department:

of Biology and General Genetics

Department

signature

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HEAD OF THE HIGHER EDUCATION PROGRAM:

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