

Документ подписан простой электронной подписью
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**Federal State Autonomous Educational Institution of Higher Education
Peoples' Friendship University of Russia named after Patrice Lumumba
RUDN University**

Agrarian and Technological Institute

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

COURSE SYLLABUS

MOLECULAR METHODS OF DIAGNOSTICS

course title

Recommended by the Didactic Council for the Education Field of:

35.04.04 AGRONOMY

field of studies / speciality code and title

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

INTEGRATED PLANT PROTECTION

higher education programme profile/specialisation title

1. COURSE GOAL(s)

The discipline "Molecular Methods of Diagnostics" is part of the Master's program "Integrated Plant Protection" under the field of study 35.04.04 "Agronomy" and is studied in the 1st semester of the 1st year. The discipline is delivered by the Agrobiotechnology Department.

The discipline consists of 5 sections and 14 topics and is aimed at studying modern methods of diagnosing viral infections of plants.

The purpose of mastering the discipline is: obtaining the formation of basic knowledge about the methods and ways of spreading viral infection, measures to prevent infection of plants and methods of localization of lesions, familiarization with modern methods of identification and diagnosis of viruses.

2. REQUIREMENTS FOR LEARNING OUTCOMES

Mastering the discipline "Molecular Methods of Diagnostics" is aimed at developing the following competencies (parts of 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)
PC-2	Able to develop methodologies for conducting experiments, master new research methods	PC-2.1 Develops methodologies for conducting experiments;
PC-5	Able to prepare scientific and technical reports, reviews and scientific publications based on the results of conducted research	PC-5.1 Develops a research program to study the effectiveness of agronomic techniques;
PC-7	Able to carry out phytosanitary control at the state border to protect the territory of the Russian Federation from the penetration of quarantine and other dangerous pathogens of plant diseases and pests, and weeds	PC-7.1 Recognizes quarantine objects and identifies quarantine pests and pathogens; PC-7.2 Conducts examination of crops and plant products for the presence of quarantine objects;

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The discipline "Molecular Methods of Diagnostics" belongs to the part formed by participants of educational relations of Block 1 "Disciplines (modules)" of the higher education program.

Within the framework of the higher education program, students also master other disciplines and/or practices that contribute to achieving the planned learning outcomes of the discipline "Molecular Methods of Diagnostics".

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	Able to develop methodologies for conducting experiments, master new research methods		Scientific research work; Scientific and Research Practice; Plant Quarantine; Biotechnology in Plant Protection; Biological Method of Plant Protection; Organization of Integrated Plant Protection Systems; Plant immunity; Plant Protection in Organic Farming**; Instrumental methods of research;
PC-5	Able to prepare scientific and technical reports, reviews and scientific publications based on the results of conducted research		Plant Quarantine; Virology;
PC-7	Able to carry out phytosanitary control at the state border to protect the territory of the Russian Federation from the penetration of quarantine and other dangerous pathogens of plant diseases and pests, and weeds		Scientific research work; Scientific and Research Practice; Undergraduate practice/Pre-diploma practice; Mathematical Modeling and Design;

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

** – Elective disciplines/practices

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

The total labor intensity of the discipline "Molecular Methods of Diagnostics" is 2 credit units.

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
<i>Contact academic hours</i>	34	34
including:		
Lectures (LC)	0	0
Lab work (LW)	34	34
Seminars (workshops/tutorials) (S)	0	0
<i>Self-studies</i>	23	23

Type of academic activities	Total academic hours	Semesters/training modules
		1
<i>Evaluation and assessment (exam/passing/failing grade)</i>	<i>15</i>	<i>15</i>
Course workload	academic hours	72
	credits	2

* To be filled in regarding the higher education programme correspondence training mode.

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 to Molecular Biology	Topic 1.1. The subject and history of molecular biology in the context of diagnostics.	LW
Module 2: The main stages and sections of molecular genetic diagnostic methods	Topic 2.1. The basics of PCR methods.	LW
	Topic 2.2. Electrophoresis method for visualization of PCR results	LW
	Topic 2.3. Real-time PCR- qualitative and quantitative analysis	LW
	Topic 2.4. Modifications of the PCR method.	LW
	Topic 2.5. Interpretation of PCR results.	LW
Module 3: Analysis of nucleotide sequences	Topic 3.1. The sequencing method.	LW
	Topic 3.2. The sequencing method. Interpretation of the results.	LW
	Topic 3.3. Phylogenetic analysis	LW
Module 4: Genetically engineered organisms	Topic 4.1. Fundamentals of genetic engineering in agriculture.	LW
	Topic 4.2. Methods of identification and diagnosis of genetically modified plants.	LW
Module 5: Cloning method in the diagnosis of phytopathogens	Topic 5.1. Molecular cloning of DNA	LW
	Topic 5.2. Stages of formation of diagnostic protocols for the specific diagnosis of phytopathogens	LW
	Topic 5.3. Scientific and practical significance of the use of DNA and RNA in the effective diagnosis of phytopathogens and pests of crops	LW

* - 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	A classroom for laboratory work, individual consultations, current and mid-term	Set of specialized furniture, MIKMED-5 binocular

Type of academic activities	Classroom equipment	Specialised educational / laboratory equipment, software, and materials for course study (if necessary)
	assessment; equipped with a set of specialized furniture and equipment.	medical microscope, microscopic preparations. Technical means: interactive whiteboard
Self-studies	A classroom for independent work of students (can be used for seminars and consultations), equipped with a set of specialised furniture and computers with access to the electronic information and educational environment.	

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

7. RESOURCES RECOMMENDED FOR COURSE STUDY

Main readings:

1. *Diagnostics of Plant Diseases*. Publisher: IntechOpen. Publisher website: <https://www.intechopen.com/>. Publication date and place: 2021. Imprint: IntechOpen. Classification: Plant pathology & diseases. Pages: 142.
2. *Agronomic control in crop production: a textbook for universities* / V.E. Torikov, O.V. Melnikova, G.P. Malyavko, A.A. Osipov; edited by V.E. Torikov. — St. Petersburg: Lan, 2024. — 132 p. — ISBN 978-5-507-49427-9. — Text: electronic // Lan: electronic library system. — URL: <https://e.lanbook.com/book/417863>

Additional readings:

1. *Botany. Fungi are not plant taxonomy. Practicum* / A.A. Savinov, V.V. Solomonov, S.S. Ambarova, T.D. Nozdrina. — 2nd ed., revised. — St. Petersburg: Lan, 2023. — 84 p. — ISBN 978-5-507-46590-3. — Text: electronic // Lan: electronic library system. — URL: <https://e.lanbook.com/book/312920>
2. *General genetics: a textbook for universities* / E.A. Vertikova, V.V. Pylnev, M.I. Popchenko, Ya.Yu. Golivanov; edited by E.A. Vertikov. — 2nd ed., revised. — St. Petersburg: Lan Publ., 2025. — 112 p. — ISBN 978-5-507-50661-3. — Text: electronic // Lan: electronic library system. — URL: <https://e.lanbook.com/book/454442>

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 "Znanium": <https://znanium.ru/>

2. Databases and search engines:

- Sage: <https://journals.sagepub.com/>
- Springer Nature Link: <https://link.springer.com/>
- Wiley Journal Database: <https://onlinelibrary.wiley.com/>
- Scientometric database Lens.org: <https://www.lens.org>

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

- Lecture course on the discipline "Molecular Methods of Diagnostics".

* 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:

Senior Lecturer of the Agrobiotechnology Department

Bondarenko G.N.

position, department

name and surname

HEAD OF EDUCATIONAL DEPARTMENT:

Director of the Agrobiotechnology Department

Pakina E. N.

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