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

Agrarian -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

2025

1. COURSE GOAL(s)

The purpose of mastering the discipline "Molecular Methods of Diagnostics" is to obtain basic knowledge about the methods and ways of spreading a viral infection, measures to prevent plant infection 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 the formation of the following competencies (part of the competencies) among students:

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

Competence code	Competence descriptor	Competence formation indicators (within this course)
PK-2	Develops methods of conducting experiments	PK-2.1. Participates in the development of regulatory documents for the diagnosis of pests
PK-5	Able to prepare scientific and technical reports, reviews and scientific publications based on the results of the research performed	PK-5.1. Introduces rapid diagnostic methods in the process of establishing the phytosanitary state of fields and gardens to develop a program to combat identified phytopathogens
PK-7	Conducts examination of crops and crop products for the presence of quarantine facilities	PK-7.1. Recognizes quarantine facilities and identifies quarantine pests and pathogens
		PK-7.2. Conducts an examination of crops and crop production for the presence of quarantine facilities

3.COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

Mastering the discipline "Molecular Methods of Diagnostics" is aimed at forming the following competencies (part of the competencies) among students:

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*
PK-2	Develops methods of conducting experiments		Scientific research work / Научно-исследовательская работа; Research Practice; Plant Quarantine; Biotechnology in Plant Protection; Biological Method of Plant Protection; Organization of Integrated Plant Protection Systems;

Compet ence code	Competence descriptor	Previous courses/modules*	Subsequent courses/modules*
			Plant immunity; Plant Protection in Organic Farming; Instrumental methods of research;
PK-5	Able to prepare scientific and technical reports, reviews and scientific publications based on the results of the research performed		Plant Quarantine; Virology;
PK-7	Conducts examination of crops and crop products for the presence of quarantine facilities		Mathematical Modeling and Design; Scientific research work / Научно-исследовательская работа; Research Practice; Undergraduate practice / Преддипломная практика;

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

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

Possible wording

The total labor intensity of the discipline "Molecular Methods of Diagnostics" is 2 credits for full-time education.

Table 4.1 – Types of educational work by periods of mastering the OP HE for full-time education

Type of academic activities		Total academic hours	Semesters/training modules			
			1	2	3	4
Contact academic hours		*34*	*34*			
including:						
Lectures (LC)						
Lab work (LW)		34	34			
Seminars (workshops/tutorials) (S)						
Self-studies		*23*	*23*			
Evaluation and assessment (exam/passing/failing grade)		*15*	*15*			
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 to Molecular Biology	Topic 1.1. The subject and history of molecular biology in the context of diagnostics. The structure of DNA and its properties. ELISA: the principle of the method and comparison with PCR	LW
Module 2: The main stages and sections of molecular genetic diagnostic methods	Topic 2.1. The basics of PCR methods. Classical PCR	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. Nested, ISSR, RFPL, LAMP, Drop-digital	LW
	Topic 2.5. Interpretation of PCR results. Schemes of analysis. Practical application.	LW
Module 3: Analysis of nucleotide sequences	Topic 3.1. The sequencing method. The principle, the stages.	LW
	Topic 3.2 The sequencing method. Interpretation of the results. Bioinformatic analysis and practical application.	LW
	Topic 3.3 Phylogenetic analysis	LW
Module 4: Genetically engineered organisms	Topic 4.1. Fundamentals of genetic engineering in agriculture. The use of developments and their impact on the environment	LW
	Topic 4.2. Methods of identification and diagnosis of genetically modified plants. International legislative practice of GMO control	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)
Scientific Laboratory	An auditorium for laboratory work, individual consultations, routine monitoring and	

Type of academic activities	Classroom equipment	Specialised educational / laboratory equipment, software, and materials for course study (if necessary)
	intermediate certification, equipped with a set of specialized furniture and equipment.	
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 / Year. A. Savinov, Family. V. Solomonov, Family. Spell. Ambarova, T. D. Nozdrina. — The 2nd is decreasing., erased. — Passed Through St. Petersburg : Lanya, 2023. — P. 84. — ISBN 978-5-507-46590-3. — Text : electronic // Lanya : 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., erased. Saint 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/

2.Databases and search engines:
- electronic foundation of legal and normative-technical documentation http://docs.cntd.ru/
- Yandex search engine https:// www .yandex.ru/
- Google search engine https://www.google.ru/
- Scopus abstract database http://www.elsevierscience.ru/products/scopus/

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

The set of lectures on the course «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:

position, department	name and surname

position, department	name and surname

position, department	name and surname

HEAD OF EDUCATIONAL DEPARTMENT:

name of department	name and surname

**HEAD
OF HIGHER EDUCATION PROGRAMME:**

position, department	name and surname