

Документ подписан простой электронной подписью
Информация о владельце:
ФИО: Ястребов Олег Александрович
Должность: Ректор
Дата подписания: 26.05.2026 15:53:07
Уникальный программный ключ:
ca953a0120d891083f939673078ef1a989dae18a

**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

INSTRUMENTAL METHODS OF RESEARCH

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 "Instrumental Methods of Research" is part of the Master's program "Integrated Plant Protection" under the field of study 35.04.04 "Agronomy" and is studied in the 2nd and 3rd semesters of the 1st and 2nd years. The discipline is delivered by the Agrobiotechnology Department.

The discipline consists of 5 sections and 6 topics and is aimed at studying modern instrumental research methods used in agriculture.

The purpose of mastering the discipline is: formation of a highly qualified specialist with theoretical knowledge and practical skills in modern innovative technologies in agricultural production.

2. REQUIREMENTS FOR LEARNING OUTCOMES

Mastering the discipline "Instrumental Methods of Research" 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)
GC-1	Able to carry out critical analysis of problem situations based on a systematic approach, develop an action strategy	GC-1.2 Uses a systematic approach to solve assigned tasks;
GPC-1	Able to solve problems of development of the field of professional activity and/or organization based on the analysis of scientific and production achievements	GPC-1.1 Demonstrates knowledge of the main methods of analysis of scientific and production achievements in agronomy;
GPC-3	Able to use modern methods of solving problems when developing new technologies in professional activities	GPC-3.1 Analyzes methods and ways of solving problems related to the development of new technologies in agronomy;
GPC-4	Able to conduct scientific research, analyze results and prepare reporting documents	GPC-4.1 Analyzes methods and ways of solving research problems;
GPC-7	Able to master the tools for working with large arrays of structured and unstructured information, use modern digital methods of processing, analysis, interpretation and visualization of data in order to solve assigned tasks of professional and research activities in the field of agronomy	GPC-7.2 Uses modern digital methods of processing, analysis, interpretation and visualization of data in order to solve assigned tasks;
PC-2	Able to develop	PC-2.2 Applies modern types and methodologies

Competence code	Competence descriptor	Competence formation indicators (within this course)
	methodologies for conducting experiments, master new research methods	of observations and accounting in field experiments;

3.COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The discipline "Instrumental Methods of Research" belongs to the mandatory part 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 "Instrumental Methods of Research".

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*
GC-1	Able to carry out critical analysis of problem situations based on a systematic approach, develop an action strategy	Manuscript Design**; Information Technology; Pest Risk Analysis**; Forecast of Development of Agricultural Pests and Diseases**; History and methodology of scientific Agronomy; Scientific research work;	Scientific research work; Undergraduate practice/Pre-diploma practice; Plant immunity; Biotechnology in Plant Protection;
GPC-1	Able to solve problems of development of the field of professional activity and/or organization based on the analysis of scientific and production achievements	Scientific research work; Bacterial Diseases; Information Technology;	Scientific research work; Biotechnology in Plant Protection; Plant Quarantine; Plant immunity;
GPC-3	Able to use modern methods of solving problems when developing new technologies in professional activities	Scientific research work; Information Technology;	Scientific research work;
GPC-4	Able to conduct scientific research, analyze results and prepare reporting documents	Bacterial Diseases; Scientific research work;	Plant Quarantine; Biotechnology in Plant Protection; Plant immunity; Scientific research work; Undergraduate practice/Pre-diploma practice;
GPC-7	Able to master the tools for working with large arrays of structured and	Information Technology; Scientific research work;	Scientific research work;

Competence code	Competence descriptor	Previous courses/modules*	Subsequent courses/modules*
	unstructured information, use modern digital methods of processing, analysis, interpretation and visualization of data in order to solve assigned tasks of professional and research activities in the field of agronomy		
PC-2	Able to develop methodologies for conducting experiments, master new research methods	Scientific research work; Molecular Methods of Diagnostics**;	Scientific research work; Plant Quarantine; Biotechnology in Plant Protection; Plant immunity;

* 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 "Instrumental Methods of Research" is 5 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	
		2	3
<i>Contact academic hours</i>	87	36	51
including:			
Lectures (LC)	29	12	17
Lab work (LW)	0	0	0
Seminars (workshops/tutorials) (S)	58	24	34
<i>Self-studies</i>	58	28	30
<i>Evaluation and assessment (exam/passing/failing grade)</i>	35	8	27
Course workload	academic hours	72	108
	credits	2	3

* 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
---------------------	---------------------------------	---------------------------

Course module title	Course module contents (topics)	Academic activities types
Module 1: General provisions	Topic 1.1. Classification of instrumental methods for the study of environmental objects, sampling, sample preparation, separation and concentration, measurement (definition), data processing, conclusions and report, presentation of chemometrics	
Module 2: Atomic absorption spectrometry	Topic 2.1. Theoretical foundations of the atomic emission spectrometry method, radiation sources used in atomic emission spectrometry, spectrometers for atomic emission spectrometry, possibilities of the atomic emission spectrometry method for the analysis of environmental objects	
	Topic 2.2. Theoretical foundations of the atomic absorption spectrometry method, the device of atomic absorption spectrometers, the possibilities of the atomic absorption spectrometry method, water analysis by atomic absorption spectrometry, air analysis by atomic absorption spectrometry, atomic absorption method for determining lead in air in accordance with the international standards	
Module 3: Spectral analysis methods	Topic 3.1. Infrared spectroscopy, ultraviolet spectroscopy, nuclear magnetic resonance spectroscopy, gas-liquid chromatography, high-performance liquid chromatography, mass spectrometry, chromato-mass spectrometry	
Module 4: Electrochemical methods of analysis	Topic 4.1. Theoretical foundations of electrochemical analysis methods, potentiometry, voltammetry, possibilities of electrochemical methods for the analysis of environmental objects, determination of the mass fraction of nitrate ions in plant products, fruit and vegetable processing products, feed, compound feeds and feed raw materials by potentiometric method, determination of the mass concentration of vitamin C in fruits and berries by voltammetric method, determination of iodine in food products and food raw materials by the voltammetric method	
Module 5: Chromatography	Topic 5.1. Theoretical foundations of chromatography as a method of separation and determination of chemicals, gas-liquid chromatography, high-performance liquid chromatography, ion chromatography, mass spectrometry, chromato-mass spectrometry, determination of essential oils, determination of anions.	

* - 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)
Lecture	A lecture hall for lecture-type classes, equipped with a set of specialized furniture; board (screen) and technical means of multimedia presentations.	Set of specialized furniture; technical means: EPSON EB-965 multimedia projector, Laptop ASUS F9E Core 2 DUO T5750, computers, internet access available. Software: Microsoft products (OS, office applications package, including MS Office/Office 365, Teams, Skype)
Seminar	A classroom for conducting seminars, group and individual consultations, current and mid-term assessment; equipped with a set of specialized furniture and technical means for multimedia presentations.	Set of specialized furniture; technical means: Interactive complex – Triumph Board interactive whiteboard with Optoma projector
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. Instrumental methods of analysis in agricultural research / V.D. Nagorny. — Moscow: PFUR, 2013. — 171 p. — Text: electronic.
2. Instrumental research methods: a textbook / S.A. Korostylev, E.A. Ustimenko, E.V. Golosnoy [et al.]. — Stavropol: SSAU, 2021. — 108 p. — ISBN 978-5-9596-1805-6. — Text: electronic // Lan: electronic library system. — URL: <https://e.lanbook.com/book/245774>

Additional readings:

1. *Instrumental research methods in agrochemistry: a textbook* / S.A. Korostylev, E.A. Ustimenko, N.V. Gromova [et al.]. — Stavropol: SSAU, 2024. — 109 p. — Text: electronic // Lan: electronic library system. — URL: <https://e.lanbook.com/book/400229>
2. Subbotina, M.G. *Instrumental methods for assessing the quality of agricultural products: laboratory practice: a textbook* / M.G. Subbotina. — Perm: PGATU, 2024. — 44 p. — ISBN 978-5-94279-627-3. — Text: electronic // Lan: electronic library system. — URL: <https://e.lanbook.com/book/420671>

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 " Nematodes".

* 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:

Professor of the Agrobiotechnology Department

Gins M.S.

position, department

name and surname

HEAD OF EDUCATIONAL DEPARTMENT:

Director of the Agrobiotechnology Department

Pakina E. N.

name of department

name and surname

**HEAD
OF HIGHER EDUCATION PROGRAMME:**

Director of the Agrobiotechnology Department

Pakina E. N.

position, department

name and surname