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ФИО: Ястребов Олег Александрович
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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

BIOTECHNOLOGY IN PLANT PROTECTION

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 "Biotechnology in Plant Protection" is part of the Master's program "Integrated Plant Protection" under the field of study 35.04.04 "Agronomy" and is studied in the 4th semester of the 2nd year. The discipline is delivered by the Agrobiotechnology Department.

The discipline consists of 4 sections and 5 topics and is aimed at studying biotechnological methods and techniques of planting material production.

The purpose of mastering the discipline is: formation of theoretical knowledge and familiarization with the practical problems of implementing biotechnological methods and techniques in the production of healthy planting material for vegetatively propagated agricultural and ornamental crops, in obtaining plant forms with fundamentally new properties and qualities within economically significant species, in the mass production and use of biological products with antibacterial, fungicidal and insecticidal activity.

2. REQUIREMENTS FOR LEARNING OUTCOMES

Mastering the discipline "Biotechnology in Plant Protection" 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-1.3 Develops a strategy for achieving the set goal as a sequence of steps, anticipating the result of each of them and assessing their impact on the external environment of the planned activities and on the relationship between the participants in these activities;
GC-2	Able to manage a project at all stages of its life cycle	GC-2.1 Develops a project concept within the defined problem, formulating the goal, objectives, relevance, significance (scientific, practical, methodological, etc., depending on the project type), expected results and possible areas of their application; GC-2.2 Forms a schedule for the implementation of the project as a whole and a plan for monitoring its execution, organizes and coordinates the work of project participants; GC-2.3 Proposes possible ways (algorithms) for implementing the project results into practice (or implements it);
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-1.2 Uses methods for solving problems of agronomy development based on search and analysis of modern scientific and production achievements; GPC-1.3 Applies available technologies, including information and communication technologies, to solve professional tasks in agronomy;

Competence code	Competence descriptor	Competence formation indicators (within this course)
GPC-4	Able to conduct scientific research, analyze results and prepare reporting documents	GPC-4.2 Uses information resources, scientific, experimental and instrumental base for conducting research in agronomy;
PC-1	Able to collect, process, analyze and systematize scientific and technical information, domestic and foreign experience in the field of agronomy	PC-1.1 Performs critical analysis of the information received;
PC-2	Able to develop methodologies for conducting experiments, master new research methods	PC-2.1 Develops methodologies for conducting experiments;

3.COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The discipline "Biotechnology in Plant Protection" 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 "Biotechnology in Plant Protection".

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	Scientific research work; Scientific and Research Practice; Plant Protection in Organic Farming**; Organization of Integrated Plant Protection Systems;	
GC-2	Able to manage a project at all stages of its life cycle	Manuscript Design**; Organization of Integrated Plant Protection Systems; Information Technology; Pest Risk Analysis**; Forecast of Development of Agricultural Pests and Diseases**; Instrumental methods of research; History and methodology of scientific Agronomy; Scientific research work; Scientific and Research Practice;	
GPC-1	Able to solve problems of development of the	Scientific research work; Scientific and Research	

Competence code	Competence descriptor	Previous courses/modules*	Subsequent courses/modules*
	field of professional activity and/or organization based on the analysis of scientific and production achievements	Practice; Biological Method of Plant Protection; Instrumental methods of research; Mathematical Modeling and Design; Bacterial Diseases; Virology; Organization of Integrated Plant Protection Systems; Information Technology;	
GPC-4	Able to conduct scientific research, analyze results and prepare reporting documents	Scientific and Research Practice; Scientific research work; Instrumental methods of research; Mathematical Modeling and Design; Bacterial Diseases; Virology; Biological Method of Plant Protection; Organization of Integrated Plant Protection Systems;	
PC-1	Able to collect, process, analyze and systematize scientific and technical information, domestic and foreign experience in the field of agronomy	Scientific research work; Scientific and Research Practice; Pest Risk Analysis**; Forecast of Development of Agricultural Pests and Diseases**; Organization of Integrated Plant Protection Systems; History and methodology of scientific Agronomy; Information Technology;	
PC-2	Able to develop methodologies for conducting experiments, master new research methods	Scientific research work; Scientific and Research Practice; Biological Method of Plant Protection; Organization of Integrated Plant Protection Systems; Plant Protection in Organic Farming**; Instrumental methods of research; Molecular Methods of Diagnostics**;	

* 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 "Biotechnology in Plant Protection" is 3 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>	40	40
including:		
Lectures (LC)	20	20
Lab work (LW)	20	20
Seminars (workshops/tutorials) (S)	0	0
<i>Self-studies</i>	59	59
<i>Evaluation and assessment (exam/passing/failing grade)</i>	9	9
Course workload	academic hours	108
	credits	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
Module 1: Modern tasks of biotechnology in crop production and its biosafety	Topic 1.1. Modern achievements of biotechnology. The level of research in developed and developing countries of the world.	LC, LW, S
Module 2: Rehabilitation of vegetatively propagated plants, their reproduction and distribution	Topic 2.1. The harmfulness of plant viruses by economically important species, the symptoms of the manifestation of diseases.	LC, LW, S
	Topic 2.2. Methods, techniques and technologies of plant health improvement. Thermotherapy and chemotherapy. In vitro cloning technology.	LC, LW, S
Module 3: Increasing the resistance of agricultural plants to pathogens and environmental factors	Topic 3.1. Creation of forms and varieties resistant to diseases, pests, herbicides and adverse environmental factors using GMO technologies.	LC, LW, S
Module 4: Production of biological products, their effectiveness, preparative forms and application	Topic 4.1. Search and selection of the most aggressive strains of organisms in natural conditions-parasites of pests and diseases of agricultural plants.	LC, 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)
Lecture	A lecture hall for lecture-type classes, equipped with a set of specialized furniture; board (screen) and technical means of multimedia presentations.	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.
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, MIKMED-5 binocular medical microscope, microscopic preparations, Technical means: interactive whiteboard
Lab work	A classroom for laboratory work, individual consultations, current and mid-term assessment; equipped with a set of specialized furniture and equipment.	Set of specialized furniture, MIKMED-5 binocular 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. Biotechnology. Publisher: IntechOpen. Publisher website: <https://www.intechopen.com/>. Publication date and place: 2015. Imprint: IntechOpen. Classification: Biotechnology. Pages: 242.
2. Gryazeva, V.I. Fundamentals of biotechnology: a textbook / V.I. Gryazeva. — Penza: PSU, 2022. — 217 p. — Text: electronic // Lan: electronic library system. — URL: <https://e.lanbook.com/book/261539>

Additional readings:

1. Sapukova, A.Ch. Fundamentals of biotechnology: educational and methodical manual / A.Ch. Sapukova, A.A. Magomedova, S.M. Mursalov. — Makhachkala: DSAU named after M.M. Jambulatov, 2020. — 98 p. — Text: electronic // Lan: electronic library system. — URL: <https://e.lanbook.com/book/159406>
2. Biotechnology in horticulture. Growing fruit and rare berry plants in vitro culture. Laboratory workshop: a textbook for universities / S.S. Makarov, A.M. Antonov, E.I. Kulikova [et al.]. — 2nd ed., ster. — St. Petersburg: Lan, 2024. — 128 p. — ISBN

978-5-507-49209-1. — Text: electronic // Lan: electronic library system. — URL:
<https://e.lanbook.com/book/382385>

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 "Biotechnology in Plant Protection".

* 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:

Associate Professor of the Agrobiotechnology Department

Kornatsky S.A.

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