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**Federal State Autonomous Educational Institution of Higher Education
Peoples' Friendship University of Russia named after Patrice Lumumba
RUDN University**

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

COURSE SYLLABUS

SOIL FERTILITY MANAGEMENT

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:

GENERAL AGRICULTURE

higher education programme profile/specialisation title

1. COURSE GOAL(s)

The course "Soil Fertility Management" is part of the Master's programme "General Agriculture" in the field of study 35.04.04 "Agronomy" and is studied in the 1st, 2nd, 3rd, and 4th semesters of the 1st and 2nd years. The discipline is implemented by the Agrobiotechnology Department. The discipline consists of 9 sections and 21 topics and is aimed at studying the soil formation process, factors of soil formation, soil genesis, soil structure, and soil fertility.

The course aims to:

1. Address the development of students' awareness in the fundamental principles of soil science and understanding of soil-forming processes and factors;
2. Familiarize students with the theoretical background, terminology, and concepts of soil composition, properties, geographical distribution patterns, and interactions with the external environment;
3. Deepen students' knowledge in soil fertility assessment, soil degradation processes, and agroecological characterization of soils;
4. Enhance students' skills in applying rational soil use practices in agricultural production through practical laboratory work and field exercises.

The goal of mastering the discipline is to obtain basic knowledge of the main provisions of soil science regarding the soil-forming process and factors of soil formation, soil genesis and structure, composition and properties, patterns of their geographical distribution and processes of interaction with the external environment, their fertility and ways of rational use of soils in agricultural production. This subject provides an advanced study of soil fertility management strategies and technologies for their implementation in sustainable agricultural practices.

2. REQUIREMENTS FOR LEARNING OUTCOMES

Mastering the course "Soil Fertility Management" is aimed at the development of the following competences (or parts thereof) 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 | Ability to carry out critical analysis of problematic situations based on a systemic approach and to develop an action strategy | GC-1.1 Performs search for necessary information, its critical analysis, and summarizes the results of the analysis to solve the assigned task; |
| | | GC-1.3 Develops a strategy for achieving the set goal as a sequence of steps, anticipating the result of each of them and evaluating their impact on the external environment of the planned activity and on the relationships of the participants in this activity; |
| GC-2 | Ability to manage a project at all stages of its life cycle | GC-2.1 Develops a project concept within the framework of the designated problem, formulating the goal, objectives, relevance, significance (scientific, practical, methodological, etc., depending on the type of project), expected results and possible areas of their application; |

| Competence code | Competence descriptor | Competence formation indicators (within this course) |
|-----------------|--|---|
| GC-7 | Ability to search for necessary information sources and data, perceive, analyze, memorize, and transmit information using digital tools, as well as using algorithms when working with data from various sources to effectively use the obtained information for problem-solving; able to evaluate information and its reliability, and build logical conclusions based on incoming information and data | GC-7.2 Has practical experience in searching, perceiving, storing, analyzing, and transmitting information and data using digital tools, algorithms, and application software to solve assigned tasks; |
| GPC-1 | Ability to solve tasks related to the development of the professional field and/or organization based on analysis of achievements in science and production | <p>GPC-1.1 Demonstrates knowledge of main methods for analyzing achievements in science and production in agronomy;</p> <p>GPC-1.2 Uses methods for solving tasks related to the development of agronomy based on search and analysis of modern achievements in science and production;</p> <p>GPC-1.3 Applies available technologies, including information and communication technologies, to solve tasks of professional activity in agronomy;</p> |
| GPC-2 | Ability to convey professional knowledge taking into account pedagogical methods | <p>GPC-2.1 Knows modern educational technologies of professional education (professional training);</p> <p>GPC-2.2 Conveys professional knowledge in the field of agronomy, explains current problems and trends in its development, modern technologies for producing crop production;</p> |
| GPC-3 | Ability to use modern methods of solving tasks when developing new technologies in professional activities | <p>GPC-3.1 Analyzes methods and ways of solving tasks related to the development of new technologies in agronomy;</p> <p>GPC-3.2 Uses information resources, achievements of science and practice when developing new technologies in agronomy;</p> |

| Competence code | Competence descriptor | Competence formation indicators (within this course) |
|------------------------|---|--|
| PC-1 | Ability to organize experiments (field trials) to assess the effectiveness of innovative technologies (technology elements), varieties, and hybrids under production conditions | PC-1.1 Develops a research program to study the effectiveness of innovative technologies (technology elements), varieties, and hybrids; develops methodologies for conducting experiments; masters new research methods; |

3.COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The course refers to the core component of Block 1 "Disciplines (Modules)" of the higher educational programme curriculum.

Within the higher education programme, students also master other disciplines 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* |
|------------------------|---|----------------------------------|------------------------------------|
| GC-7 | Ability to search for necessary information sources and data, perceive, analyze, memorize, and transmit information using digital tools... | | |
| GC-2 | Ability to manage a project at all stages of its life cycle | | |
| GC-1 | Ability to carry out critical analysis of problematic situations based on a systemic approach and to develop an action strategy | | |
| GPC-1 | Ability to solve tasks related to the development of the professional field and/or organization based on analysis of achievements in science and production | | |
| GPC-2 | Ability to convey professional knowledge | | |

| Competence code | Competence descriptor | Previous courses/modules* | Subsequent courses/modules* |
|-----------------|---|---------------------------|-----------------------------|
| | taking into account pedagogical methods | | |
| GPC-3 | Ability to use modern methods of solving tasks when developing new technologies in professional activities | | |
| PC-1 | Ability to organize experiments (field trials) to assess the effectiveness of innovative technologies (technology elements), varieties, and hybrids under production conditions | | |

* 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 workload of the course "Soil Fertility Management" amounts to 15 credits (540 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> | 168 | 51 | 36 | 51 | 30 | |
| including: | | | | | | |
| Lectures (LC) | 56 | 17 | 12 | 17 | 10 | |
| Lab work (LW) | 112 | 34 | 24 | 34 | 20 | |
| Seminars (workshops/tutorials) (S) | 0 | 0 | 0 | 0 | 0 | |
| <i>Self-studies</i> | 315 | 111 | 60 | 39 | 105 | |
| <i>Evaluation and assessment (exam/passing/failing grade)</i> | 57 | 18 | 12 | 18 | 9 | |
| Course workload | academic hours | 540 | 180 | 108 | 108 | 144 |
| | credits | 15 | 5 | 3 | 3 | 4 |

* 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 Soil Science with Fundamentals of Geology | Topic 1.1. Subject and history of soil science with fundamentals of geology. | LC, LW |
| Module 2: Soil Formation Process and Factors of Soil Formation | Topic 2.1. Soil formation | LC, LW |
| | Topic 2.2. Factors of soil formation | LC, LW |
| Module 3: Soil Compositions | Topic 3.1. Phase composition of soil | LC, LW |
| | Topic 3.2. Mineralogical and chemical compositions of soil | LC, LW |
| | Topic 3.3. Organic composition of soil | LC, LW |
| Module 4: Structure of Soil Profile. Morphological Signs of Soil | Topic 4.1. Structure of soil profile | LC, LW |
| Module 5: Physico-Chemical Properties of Soil | Topic 5.1. Soil colloid | LC, LW |
| | Topic 5.2. Acidity and alkalinity of soil | LC, LW |
| | Topic 5.3. Redox properties of soils | LC, LW |
| | Topic 5.4. Magnetic and radioactive properties of soil | LC, LW |
| Module 6: Soil Regimes | Topic 6.1. Water, air, thermal, chemical (redox) regimes of soil | LC, LW |
| Module 7: Soil Fertility. Degradation of Soil Cover. Agroecological Characterization | Topic 7.1. Soil fertility | LC, LW |
| | Topic 7.2. Soil erosion | LC, LW |
| | Topic 7.3. Agroecological characterization of soils | LC, LW |

| Course module title | Course module contents (topics) | Academic activities types |
|--|---|---------------------------|
| Module 8: Genesis, Classification, Geography and Agricultural Use of Soils | Topic 8.1. Soil classification | LC, LW |
| | Topic 8.2. Soils of the post-lithogenic stem | LC, LW |
| | Topic 8.3. Soils of the syn-lithogenic stem | LC, LW |
| | Topic 8.4. Soils of the organogenic stem | LC, LW |
| Module 9: Soil Cartography and Its Practical Application | Topic 9.1. Soil cartography, its tasks and research methods | LC, LW |
| | Topic 9.2. Agro-production grouping and soil bonitation | LC, 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) |
|-----------------------------|---|--|
| Lecture | A lecture hall for lecture-type classes, equipped with a set of specialised furniture; board (screen) and technical means of multimedia presentations. | Set of specialised furniture; technical facilities: EPSON EB-965 multimedia projector, Laptop, internet access. Software: Microsoft products (OS, office applications package, including MS Office/Office 365, Teams, Skype) |
| Lab work | A classroom for laboratory work, individual consultations, current and mid-term assessment; equipped with a set of specialised furniture and equipment. | Set of specialised furniture; technical facilities: Levenhuk M1400 PLUS digital camera; Genesys 10S Vis spectrophotometer, Thermo; SPu TS-1/80 dry- |

| Type of academic activities | Classroom equipment | Specialised educational / laboratory equipment, software, and materials for course study (if necessary) |
|-----------------------------|--|---|
| | | air thermostat; Laminar flow cabinet BAVnp-01-"Laminar-S"-1.2 LORICA; Aquadistiller DE-4-02 EMO; Flame photometer Jenway PFP 7; KIOUS steam sterilizer; M1324R microcentrifuge; Pozis, Biryusa refrigerators; Heidolph Reax top tube shaker; Allsheng MiniT-H2C thermostat; CM-70M-07 vortex centrifuge; 5415 R Eppendorf benchtop centrifuge; Mettler Toledo scales; Heidolph MR 3001 magnetic stirrer; Haier DW-86W100 low-temperature freezer (100L); BAV-PCR-Laminar-S PCR box; Elf-4 power supply and electrophoresis chambers; ECX-15C transilluminator; Biometra Tgradient thermocyclers; TC1000-G DNA amplifier, gradient thermal block; Bioprep-6, Allsheng mechanical homogenizer |
| 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. Kurbanov, S. A. Soil Science with Fundamentals of Geology / S. A. Kurbanov, D. S. Magomedova. — 4th ed., ster. — Saint Petersburg: Lan, 2023. — 288 p. — ISBN 978-5-507-45740-3. — Electronic text // Lan: electronic library system. — URL: <https://e.lanbook.com/book/282395>

2. Glukhikh, M. A. Soil Fertility and Its Reproduction: textbook for higher education institutions / M. A. Glukhikh. — 2nd ed., ster. — Saint Petersburg: Lan, 2025. — 120 p. —

ISBN 978-5-507-50563-0. — Electronic text // Lan: electronic library system. — URL: <https://e.lanbook.com/book/447377>

Additional readings:

1. Bashkatova, L. N. Soil Science. Practical Workshop / L. N. Bashkatova, N. M. Nevenchannaya. — 2nd ed., ster. — Saint Petersburg: Lan, 2023. — 68 p. — ISBN 978-5-507-46200-1. — Electronic text // Lan: electronic library system. — URL: <https://e.lanbook.com/book/302207>

2. Mamontov, V. G. Practical Workshop on Reclamation Soil Science / V. G. Mamontov. — 2nd ed., ster. — Saint Petersburg: Lan, 2022. — 272 p. — ISBN 978-5-507-44334-5. — Electronic text // Lan: electronic library system. — URL: <https://e.lanbook.com/book/220496>

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): <https://mega.rudn.ru/MegaPro/Web>
- EL "University Library Online": <http://www.biblioclub.ru>
- EL "Yurait": <http://www.biblio-online.ru>
- EL "Student Consultant": www.studentlibrary.ru
- EL "Znanium": <https://znanium.ru/>

Databases and search engines:

- Techexpert (information and reference system of GOSTs): <http://www.cntd.ru/>
- "Selkhoztehnika" (automated reference system): <http://www.agrobase.ru>
- Sage: <https://journals.sagepub.com/>
- Springer Nature Link: <https://link.springer.com/>
- Wiley Journal Database: <https://onlinelibrary.wiley.com/>
- Bibliometric database Lens.org: <https://www.lens.org>

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

1. The set of lectures on the course " Soil Fertility Management".
- 2.

* 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, Agrobiotechnology Department

Gresis V. O.

position, department

name and surname

HEAD OF EDUCATIONAL DEPARTMENT:

Director, Agrobiotechnology Department

Pakina E. N.

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