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**Federal State Autonomous Educational Institution for Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA
NAMED AFTER PATRICE LUMUMBA
(RUDN University)**

Academy of Engineering

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

COURSE SYLLABUS

Mining Hydrogeology

course title

Recommended by the Didactic Council for the Education Field of:

05.04.01 Geology

field of studies / speciality code and title

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

Mining Geology

higher education programme profile/specialisation title

1. COURSE GOAL(s)

The goal of the course “Mining Hydrogeology” is acquiring knowledge, skills and experience in the field of methods and techniques for studying hydrogeological conditions of mineral deposits to prevent their negative impact in the process of development and exploitation, characterizing the stages of competence formation and ensuring the achievement of the planned results of the educational programme.

2. REQUIREMENTS TO LEARNING OUTCOMES

The course implementation is aimed at the development of the following competences (competences in part):

Table 2.1. List of competences that students acquire during the course

| Competence code | Competence descriptor | Competence formation indicators (within this course) |
|------------------------|--|---|
| GPC-1. | Capable of using the theoretical foundations of special and new sections of geological sciences to solve professional activity problems. | GPC-1.1. Knowledge of the basics of special and new sections of geological sciences; GPC-1.2. Selects a method or technique to solve a professional problem; GPC-1.3. Knows how to select a method or method of solving a professional problem. |
| PC-2. | Capable of justifying the need, choosing the best methodology, planning, implementing, interpreting results, and supervising geophysical work at various stages of mineral site development. | PC-2.1. Know the theoretical basics of geophysical research PC-2.2 Know how to select the best methodology, design, implement. |
| PC-3 | Capable of projecting, implementing, and managing a hydrogeological study of the territory during the exploration and development of a mineral deposit. | PC-3.1 Know the theoretical foundations and methods of hydrogeological study of the territory at the stage of exploration and development of mineral deposits; PC-3.2 Be able to apply methodological solutions in the design, implementation and management of hydrogeological study of the territory at the stage of exploration and development of mineral deposits; PC-3.3 Be able to apply the knowledge and skills obtained in the design, implementation and management of the hydrogeological study of the territory at the stage of exploration and development of mineral deposits. |
| PC-4. | Capable of designing, assisting with, and supervising a geologic study of a subsoil area at various stages of development. | PC-4.1 Know the theoretical basis and methods of geological study of the subsoil area at various stages of its development; PC-4.2 Be able to apply methodological solutions in the design and implementation of the geological study of a subsoil area at various stages of its development. |

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The course refers to the core component of (B1) block of the higher educational programme curriculum.

Within the higher education programme students also master other (modules) 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 |
|------------------------|--|--|---|
| GPC-1. | Capable of using the theoretical foundations of special and new sections of geological sciences to solve professional activity problems. | Mining Geology; Engineering and Geological Support of Subsoil Use; Geological and Geophysical Basics of Mineral Prospecting and Exploration | Research Work (Mining Geology). Part 2; Research Work (Geological and Geophysical Survey). Part 2; Final State Attestation |
| PC-2. | Capable of justifying the need, choosing the best methodology, planning, implementing, interpreting results, and supervising geophysical work at various stages of mineral site development. | Introduction Practical Training; Modelling of Mineral Deposits; Mining Geology; Geological and Geophysical Basics of Mineral Prospecting and Exploration; Regional Geology. Geology of Central and Southern Africa | Research Work (Geological and Geophysical Survey). Part 2; Research Work (Mining Geology). Part 2; Pre-graduation Practical Training; Final State Attestation |
| PC-3 | Capable of projecting, implementing, and managing a hydrogeological study of the territory during the exploration and development of a mineral deposit. | Mineralogy; Mining Geology | Research Work (Mining Geology). Part 2; Pre-graduation Practical Training; Final State Attestation |
| PC-4. | Capable of designing, assisting with, and supervising a geologic study of a subsoil area at various stages of development. | Modelling of Mineral Deposits; Mining Geology; Geological and Geophysical Basics of Mineral Prospecting and Exploration; Regional Geology. Geology of Central and Southern Africa; | Research Work (Geological and Geophysical Survey). Part 2; Pre-graduation Practical Training; Research Work (Mining Geology). Part 2; Final State Attestation |

| Competence code | Competence descriptor | Previous courses/modules | Subsequent courses/modules |
|-----------------|-----------------------|---------------------------------|----------------------------|
| | | Introduction Practical Training | |

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

The total workload of the course “Mining Hydrogeology” is 5 credit units.

Table 4.1. Types of academic activities during the periods of higher education programme mastering

| Type of academic activities | TOTAL, ac. hrs. | Semesters/ training modules |
|---|-----------------|-----------------------------------|
| | | 3 |
| <i>Contact academic hours</i> | 54 | 54 |
| Lectures (LC) | 18 | 18 |
| Lab work (LW) | - | - |
| Seminars (workshops/tutorials) (S) | 36 | 36 |
| <i>Self-studies</i> | 90 | 90 |
| <i>Evaluation and assessment (exam/passing/failing grade)</i> | 36 | 36 <i>Exam</i> |
| Course workload | academic hours | 180 |
| | credits | 5 |

5. COURSE CONTENTS

Table 5.1. Course contents and academic activities types

| Course module title | Course module contents (topics) | Academic activities types |
|---|--|---------------------------|
| Module 1. Hydrogeological conditions at different stages of the mining life cycle | Topic 1.1. Hydrogeological works at the stage of preparation for exploitation. | LC |
| | Topic 1.2. Hydrogeological works at the stage of exploitation. | LC |
| | Topic 1.3. Hydrogeological works at the stage of development and liquidation | LC, S |
| Module 2. Hydrogeological investigations during the MD development by underground leaching | Topic 2.1 Hydrogeological investigations in the MD development by geotechnological methods (underground leaching of ore deposits). | LC, S |
| | Topic 2.2. Hydrodynamic calculations in the development of ore deposits by underground leaching | LC, S |
| Module 3. Hydrogeological investigations during the MD development by the open method | Topic 3.1 Methods of MD drainage. Drainage systems and drainage facilities for the MD development. | LC, S |
| | Topic 3.2 Methods of hydrogeological calculations of water inflows to open and underground mine workings under various geological and hydrogeological conditions | LC, S |

| Course module title | Course module contents (topics) | Academic activities types |
|---------------------|--|---------------------------|
| | Topic 3.3. Prediction of water inflows to mine workings. | LC, S |

* 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. | |
| Seminar | A classroom for conducting seminars, group and individual consultations, current and mid-term assessment; equipped with a set of specialised furniture and technical means for multimedia presentations. | |
| 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. | |

7. RESOURCES RECOMMENDED FOR COURSE STUDY

Main reading:

1. Kovalevsky V.S., Kruseman G.P., Rushton K.R. Groundwater studies. Paris, 2004 г., 430 стр., ISBN: 92-9220-005-4 <https://www.geokniga.org/>
2. Fetter C.W. Applied hydrogeology. Waveland Press, 2018 г., 621 стр., ISBN: 1-4786-3709-9 <https://www.geokniga.org/>
3. Hiscock K.M. Hydrogeology. Principles and practice. Blackwell science Ltd, 2005 г., 404 стр., ISBN: 0-632-05763-7 <https://www.geokniga.org/>

Additional reading:

1. Sanderson D.J., Zhang X. Numerical modelling and analysis of fluid flow and deformation of fractured rock masses. Elsevier, 2002 г., 300 стр., ISBN: 0-08-043931-4 <https://www.geokniga.org/>
2. Kirsch R. Groundwater geophysics. A tool for hydrogeology. Springer, 2006 г., 499 стр., ISBN: 978-3-540-29383-5 <https://www.geokniga.org/>
3. Di M.F., Ghosh S.K., Saha P.D. Recent Trends in Waste Water Treatment and Water Resource Management. Springer, 2020 г., 256 стр., ISBN: 978-981-15-0705- <https://www.geokniga.org/>

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 "Trinity Bridge" <http://www.trmost.ru>

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 *:*

1. The set of lectures on the course “Mining Hydrogeology”.
2. Guidelines for students on the development of the course “Mining Hydrogeology”.

* 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.

8. ASSESSMENT TOOLKIT AND GRADING SYSTEM* FOR EVALUATION OF STUDENTS’ COMPETENCES LEVEL UPON COURSE COMPLETION

The assessment toolkit and the grading system* to evaluate the competences formation level (competences in part) upon the course study completion are specified in the Appendix to the course syllabus.

* The assessment toolkit and the grading system are formed on the basis of the requirements of the relevant local normative act of RUDN University (regulations / order).

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