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ФИО: Ястребов Олег Александрович
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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

Engineering and Geological Support of Subsoil Use

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 “Engineering and Geological Support of Subsoil Use” is acquiring knowledge, skills and experience in the field of modern methods of studying the properties of rocks and their and application of the obtained data to make design decisions and optimize technological chains of mining and optimization of technological chains of extraction and processing of mineral raw materials, characterizing the stages of competence formation and ensuring the achievement of the planned results of the educational programme.

The main objectives of the course are:

- studying methods of obtaining engineering and geological information at different stages of subsoil site development;
- acquiring the ability and skills of processing primary engineering and geological information;
- development of developing the skills of building geotechnical engineering models and their application at various building geotechnical engineering models and their application at various stages of the life cycle of a mining facility.

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-1	Capable of processing geological data, modeling ore bodies with modern software, resolving quality and mineral reserve management issues, and developing engineering and geological surveying measures for the territory.	PC-1.2. Is able to apply methods of geological data processing, build ore body models, solve problems on quality and mineral reserves management, develop measures for engineering and geological study of the territory

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The course refers to the variable 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		Research Work (Mining Geology). Part 1; Research Work (Geological and Geophysical Survey). Part 1; Research Work (Mining Geology). Part 2; Research Work (Geological and Geophysical Survey). Part 2; Hydrogeology; Mining Hydrogeology; Geological and Geophysical Basics of Mineral Prospecting and Exploration; Final state attestation
PC-1	Capable of processing geological data, modeling ore bodies with modern software, resolving quality and mineral reserve management issues, and developing engineering and geological surveying measures for the territory.		Pre-graduation Practical Training; Research Work (Geological and Geophysical Survey). Part 1; Research Work (Mining Geology). Part 1; Research Work (Geological and Geophysical Survey). Part 2; Research Work (Mining Geology). Part 2; Geological and Geophysical Basics of Mineral Prospecting and Exploration; Digital Technologies in Geology; Modelling of Mineral Deposits; Final state attestation

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

The total workload of the course “Engineering and geological support of subsoil use” is 7 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
		1
<i>Contact academic hours</i>	72	72
Lectures (LC)	36	36
Lab work (LW)	-	-
Seminars (workshops/tutorials) (S)	36	36

Type of academic activities		TOTAL, ac. hrs.	Semesters/ training modules
			1
<i>Self-studies</i>		144	144
<i>Evaluation and assessment (exam/passing/failing grade)</i>		36	36 <i>Exam</i>
Course workload	academic hours	252	252
	credits	7	7

5. COURSE CONTENTS

Table 5.1. Course contents and academic activities types

Course module title	Course module contents (topics)	Academic activities types
Module 1. Fundamentals of engineering geology	1.1. engineering-geological classification of rocks; 1.2. structural bonds in rocks; 1.3. rocky and semi-rocky rocks: main characteristics and features; 1.4. clay rocks: features and main characteristics; 1.5. separate-grained rocks: features and main characteristics; 1.6. the concept of "soil"; 1.7. soil classification; 1.8. technogenic soils formed at mining enterprises; 1.9. permafrost soils.	LC, S
Module 2. Physical and mechanical properties of rocks	2.1. classification of rock properties; 2.2. physical properties of rocks and deposits; 2.3. mechanical properties of rocks; 2.4. laboratory and field methods for determining the properties of rocks; 2.5. processing the results of experimental data, assessing their reliability; 2.6. rock strength passport and its main characteristics; 2.7. scale factor in assessing the properties of rocks; 2.8. engineering and geological surveys at various stages of development of a subsoil area: substantiation of the accuracy and reliability of data, frequency of measurements, modern methods of obtaining data; 2.9. engineering-geological monitoring at mining enterprises.	LC, S
Module 3. Engineering geodynamics	3.1. general characteristics of mining and geological processes; 3.2. gravitational processes in open mining of mineral deposits; 3.3. methods for assessing the stability of slope structures; 3.4. mining and geological processes in the underground method of subsoil development; 3.5. mining and geological phenomena when using physical and chemical geotechnology;	LC, S

Course module title	Course module contents (topics)	Academic activities types
	3.6. designing measures to protect mine workings from negative phenomena; 3.7. the influence of the seismic conditions of the territory on the conduct of mining operations.	
Module 4. Construction of engineering-geological models of rock masses	4.1. concept of engineering-geological model; 4.2. building 2D models; 4.3. Building 3D models using modern mining and geological information systems; 4.4. block engineering-geological models; features of the interpretation of physical and mechanical properties in engineering-geological models.	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.	
Computer Lab	A classroom for conducting classes, group and individual consultations, current and mid-term assessment, equipped with personal computers (in the amount of 24 pcs), a board (screen) and technical means of multimedia presentations.	Specialized software: <ul style="list-style-type: none"> • MS Office licensed software package, • Micromine, • GIS GEOMIX, • QGIS.
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.	Subject audience of the basics of geology (stationary multimedia computer 1 piece, a collection of minerals (300 samples), a collection of rocks (300 samples), a collection of minerals (200 samples), a set of demonstration equipment, a multimedia projector, a projection screen, a teaching board, a set of educational furniture for 30 seats.
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. Marjoribanks, Roger. "Geological Methods in Mineral Exploration and Mining". Springer, 2010 г - <https://www.geokniga.org/books/22451>
2. Moon, Charles J., Whateley, Michael K.G., and Evans, Anthony M. "Introduction to Mineral Exploration". Wiley-Blackwell, 2012 - <https://www.geokniga.org/books/22422>
3. Gangopadhyay S. "Engineering geology". Oxford university press, 2013 г - <https://www.geokniga.org/books/23310>

Additional reading:

1. Bell F.G. "Engineering geology". Elsevier, 2007 г - <https://www.geokniga.org/books/8578>
2. J. Wasowski, Daniele Giordan, Piernicola Lollino. "Engineering Geology and Geological Engineering for Sustainable Use of the Earth's Resources". Springer, 2017 - <http://dx.doi.org/10.1007/978-3-319-61648-3>
3. Paola Gattinoni, Enrico Maria Pizzarotti, Laura Scesi. "Engineering Geology for Underground Works". Springer Dordrecht, 2014 - <https://doi.org/10.1007/978-94-007-7850-4>

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 "Engineering and Geological Support of Subsoil Use".
2. Guidelines for students on the development of the course "Engineering and Geological Support of Subsoil Use".

* 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).

DEVELOPERS:

**Associate Professor, Geology
and Survey Department,
MISIS**

position, educational department

V. Cheskidov

name and surname

**Senior Lecturer, Geology and
Survey Department, MISIS**

position, educational department

A. Lipina

name and surname

HEAD OF EDUCATIONAL DEPARTMENT:

**Department of Subsoil Use and
Oil&Gas Engineering**

educational department

A. Kotelnikov

name and surname

HEAD OF

HIGHER EDUCATION PROGRAMME:

**Head of the Department of
Subsoil Use and Oil&Gas
Engineering**

position, educational department

A. Kotelnikov

name and surname