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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

(name of the educational division - developer of the HEP HE)

COURSE SYLLABUS

Engineering and geological support of subsoil use

(Subject / Course title)

Recommended by the Didactic Council for the Education Field of:

05.04.01 Geology

(code and name of the Higher Education Field)

The development of the discipline is carried out within the framework of the implementation of the Higher Education Programme of Higher Education (HEP HE):

Mining Geology

(name (profile/specialization) of the Higher Education Program)

1. AIMS AND OBJECTIVES

The purpose of mastering the discipline “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 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 discipline 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

Mastering the discipline “Engineering and geological support of subsoil use” is aimed at developing the following competencies (parts of competencies) among students:

Table 2.1. The list of competencies formed by students in the course of mastering the discipline (the results of mastering the discipline)

Code	Competence	Competence Formation Indicators (within this discipline)
GPK-1	Capable of using the theoretical foundations of special and new sections of geological sciences to solve professional activity problems	GPK-1.1. Knowledge of the basics of special and new sections of geological sciences;
		GPK-1.2. Selects a method or technique to solve a professional problem;
		GPK-1.3. Knows how to select a method or method of solving a professional problem
SPC-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. THE PLACE OF DISCIPLINE IN THE STRUCTURE OF HEP HE

Discipline “Engineering and geological support of subsoil use” refers to the Variable Component of block B1 of the HEP HE.

As part of the HEP HE, students also master other disciplines and / or practices that contribute to the achievement of the planned results of mastering the discipline “Engineering and geological support of subsoil use”.

Table 3.1. The list of components of the HEP HE that contribute to the achievement of the planned results of the development of the discipline

Code	Competence	Previous Disciplines (Modules)*	Subsequent Disciplines (Modules)*
GPK-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
SPC-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

* - filled in in accordance with the matrix of competencies and academic curriculum of HEP HE

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

Course workload “Engineering and geological support of subsoil use” is 7 credit units.

Table 4.1. Types of academic activities during the period of the HE programme mastering

Type of academic activities		TOTAL, ac. hrs.	Semester
			1
<i>Contact academic hours</i>		72	72
Lectures		36	36
Lab work		-	-
Seminars (workshops/tutorials)		36	36
<i>Self-study (ies), academic hours</i>		144	144
<i>Evaluation and assessment (exam or pass/fail grading)</i>		36	36 <i>Exam</i>
Course workload	academic hours	252	252
	credits	7	7

5. COURSE MODULES AND CONTENTS

Table 5.1. Course Modules and Contents by types of academic activities

Modules	Topics	Type of academic activities*
Section 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.	Lec, Sem
Section 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;	Lec, Sem

Modules	Topics	Type of academic activities*
	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.	
Section 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; 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.	Lec, Sem
Section 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.	Lec, Sem

* - Lec – Lectures; Lab – Lab work; Sem – Seminars (workshops/tutorials).

6. CLASSROOM EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Classroom Equipment and Technology Support Requirements

Classroom for Academic Activity Type	Classroom Equipment	Specialized educational / laboratory equipment, software and materials for mastering the discipline (if necessary)
Lecture	Auditorium for lecture-type classes, equipped with a set of specialized furniture; blackboard (screen) and technical a set of specialized furniture, a board (screen), and technical means of	

	multimedia presentations.	
Computer Lab	Computer lab for conducting classes, group and individual consultations, current control and intermediate attestation, equipped with personal computers (21 pcs. computer class equipped with 21 personal computers, a blackboard (screen) and multimedia devices. technical means of multimedia presentations.	Specialized software: <ul style="list-style-type: none"> • MS Office licensed software package, • Micromine, • GIS GEOMIX, • QGIS.
Seminars	Auditorium for classes seminars, group and individual consultations, current control and intermediate attestation, equipped with a set of a set of specialized furniture and technical means of 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	Auditorium for independent work (can be used for seminars and consultations), equipped with a set of a set of specialized furniture and computers with access to the EITS of the university.	

7. RECOMMENDED SOURCES FOR COURSE STUDIES

Main reading(sources):

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 (optional) reading (sources):

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-(based) sources:

1. Electronic libraries with access for RUDN students:

- RUDN Electronic Library System – RUDN ELS <http://lib.rudn.ru/MegaPro/Web>
- ELS “University Library Online” <http://www.biblioclub.ru>
- ELS Yurayt <http://www.biblio-online.ru>
- ELS “Student Consultant” www.studentlibrary.ru
- ELS “Lan” <http://e.lanbook.com/>
- ELS “Trinity Bridge” <http://www.trmost.ru>

2. Databases and search engines:

- Electronic Fund of Legal and Normative-technical Documentation <http://docs.cntd.ru/>
- Yandex search engine <https://www.yandex.ru/>
- Google search engine <https://www.google.ru/>
- abstract database SCOPUS <http://www.elsevierscience.ru/products/scopus/>

*Learning toolkits for self- studies in the RUDN LMS TUIS *:*

1. Guidelines for students on the development of the subject “Engineering and geological support of subsoil use”.
2. Course of lectures on the subject “Engineering and geological support of subsoil use”.

* - all educational and methodological materials for independent work of students are placed in accordance with the current procedure on the page of the subject in LMS TUIS!

8. ASSESSMENT AND EVALUATION TOOLKIT AND GRADING CRITERIA

Assessment and Evaluation Toolkit (AET), Grading System (GS)* for assessing the level of competence (part of competence) for the subject “Engineering and geological support of subsoil use” are presented in the Appendix to the Course Syllabus of the subject.

* - AET and GS are formed on the basis of the requirements of the relevant local normative act of the RUDN University.

DEVELOPERS:

Associate Professor, Geology and Survey Department	_____	V. Cheskidov
Position, Department	Signature	Full name
Senior Lecturer, Geology and Survey Department	_____	A. Lipina
Position, Department	Signature	Full name

HEAD of Department:

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

Name of Department



Signature

A. Kotelnikov

Full name

HEAD OF HEP HE:

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

Position, Department



Signature

A. Kotelnikov

Full name