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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**

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

**COURSE SYLLABUS**

**Geological Support for Solid Minerals Extraction**

(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 “Geological Support for Solid Minerals Extraction” is:

- acquiring knowledge, skills and experience in the field of modern methods of extraction of mineral raw materials in various mining and geological conditions that characterize the stages of competence formation and ensuring the achievement of the planned results of the educational programme.

The main objectives of the discipline are:

- study of the scope of methods for the development of mineral deposits, depending on the mining and geological conditions of the subsoil area;
- formation of knowledge, skills and abilities in the field of design and planning of mining operations;
- acquisition of knowledge in the field of applied mining systems for mineral deposits;
- analysis of the main technological processes in the development of deposits by various methods;
- study of technical means and methods of complex mechanization of mining operations.

## 2. REQUIREMENTS TO LEARNING OUTCOMES

Mastering the discipline “Geological Support for Solid Minerals Extraction” 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)
GC-3	Able to organize and manage the work of the team, developing a team strategy to achieve the goal.	GC-3.1 Defines his/her role in the team based on a collaborative strategy to achieve the goal;
		GC-3.2 Exchange information, knowledge, and experience with team members;
		GC-3.3 Argues his/her point of view regarding the use of other team members' ideas to achieve the goal set.

## 3. THE PLACE OF DISCIPLINE IN THE STRUCTURE OF HEP HE

Discipline “Geological Support for Solid Minerals Extraction” refers to Elective Disciplines 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 “Geological Support for Solid Minerals Extraction”.

*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)*
GC-3	Able to organize and manage the work of the team, developing a team strategy to achieve the goal.		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 “Geological Support for Solid Minerals Extraction” is 3 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
		2
<i>Contact academic hours</i>	51	51
Lectures	17	17
Lab work	-	-
Seminars (workshops/tutorials)	34	34
<i>Self-study (ies), academic hours</i>	57	57
<i>Evaluation and assessment (exam or pass/fail grading)</i>	0	0 <i>fail grading with grade</i>
<b>Course workload</b>	academic hours	<b>108</b>
	credits	<b>3</b>

#### 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. Principles of open mining of mineral deposits	1.1. types of open pits and quarry fields; 1.2. use and protection of subsoil; 1.3. determination of the final depth of a quarry for steeply dipping mineral deposits; 1.4. types, periods and procedure for the development of open pit mining, preparation of a quarry field for development; 1.5. placement of dumps; 1.6. construction of a calendar schedule for the mining operations.	Lec, Sem
Section 2. Opening of working horizons	2.1. career cargo flows, their types, characteristics, technological processes and conditions of formation; 2.2. opening mine workings, methods of opening, routes of opening workings, schemes and systems of stripping routes;	Lec, Sem

Modules	Topics	Type of academic activities*
	2.3. determination of the parameters and speed of sloping trenches in preparation for the development of a new horizon; 2.4. features of the opening of working horizons for different types of transport; 2.5. determination of the parameters and speed of cutting trenches.	
Section 3. Development Systems Theory	3.1. general concepts about the development system; 3.2. main classifications of development systems and their principles; 3.3. calculation of the productivity of a quarry according to mining conditions for steeply dipping mineral deposits; 3.4. elements of the development system and their parameters.	Lec, Sem
Section 4. Theory of complex mechanization of open pit mining	4.1. general concepts and principles of complex mechanization of open pit mining; 4.2. technological classification of equipment complexes; 4.3. structural classification of mechanization links and equipment complexes; 4.4. the relationship of equipment within the complex, the basics of equipment configuration; 4.5. performance indicators of equipment complexes, scope of equipment complexes; 4.6. selection of an excavation and loading complex for mining operations and determination of the production capacity of a quarry with a simple non-transport scheme for transshipment of overburden rocks.	Lec, Sem
Section 5. Technological schemes of underground mining enterprises	5.1. technological schemes of mines; 5.2. technological schemes of mines; 5.3. cargo transportation processes; 5.4. production processes on the surface; 5.5. the relationship of the components of the technological scheme; 5.6. mineral extraction indicators.	Lec, Sem
Section .6. Uranium mining	6.1. genetic classification of uranium deposits; 6.2. morphological classification of uranium deposits; 6.3. review of uranium mining volumes by countries of the world; 6.4. analysis of the main technologies for uranium mining;	Lec, Sem

<b>Modules</b>	<b>Topics</b>	<b>Type of academic activities*</b>
	6.5. substantiation of the choice of technology for the development of a uranium deposit.	
Section 7. Uranium mining technologies by in-situ leaching methods	7.1. basics of physical and chemical technology: scope, main indicators; 7.2. organization of reserves development by underground leaching methods; 7.3. development of uranium deposits using physical and technical geotechnology; 7.4. reagents used in the development of various types of deposits; 7.5. the influence of hydrogeological and engineering-geological conditions of the subsoil area on the organization of mining operations using leaching methods; 7.6. modes of mining operations; 7.7. environmental protection and integrated development of subsoil using physical and chemical geotechnology.	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*

<b>Classroom for Academic Activity Type</b>	<b>Classroom Equipment</b>	<b>Specialized educational / laboratory equipment, software and materials for mastering the discipline (if necessary)</b>
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"> <li>• MS Office licensed software package,</li> <li>• Micromine,</li> </ul>

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. Mostafa Mohamed Ali Elbeblawi, Hassan Ali Abdelhak Elsaghier, Mostafa Tantawy Mohamed Amin, Wael Rashad Elrawy Abdallah. "Surface Mining Technology". Springer Singapore, 2022 - <https://doi.org/10.1007/978-981-16-3568-7>
2. Ahmed Hassan Ahmed. "Mineral Deposits and Occurrences in the Arabian–Nubian Shield". Springer Cham, 2022 - <https://doi.org/10.1007/978-3-030-96443-6>
3. Rustan A. "Mining and rock construction technology desk reference. Rock mechanics, drilling and blasting". CRC Press, London, 2011 - <https://www.geokniga.org/books/30944>

### *Additional (optional) reading (sources):*

1. Yong Wang, Suping Peng, Liang Wang "Guidelines for Green Mine Construction and Management". Springer Singapore, 2023 - <https://doi.org/10.1007/978-981-19-9760-0>
2. Hustrulid W., Kuchta M., Martin R. "Open pit mine planning and design". CRC Press, 2013 - <https://www.geokniga.org/books/28414>
3. Rinne M., Shen B., Stephansson O. "Modelling rock fracturing processes A fracture mechanics approach using FRACOD". Springer, 2014 - <https://www.geokniga.org/books/31023>

### *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](http://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 “Geological Support for Solid Minerals Extraction”.
2. Course of lectures on the subject “Geological Support for Solid Minerals Extraction”.

\* - 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 “Geological Support for Solid Minerals Extraction” 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:**

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

### **HEAD of Department:**

<b>Director of the Department of Subsoil Use and Oil&amp;Gas Engineering</b>		<b>A. Kotelnikov</b>
Name of Department	Signature	Full name

### **HEAD OF HEP HE:**

<b>Director of the Department of Subsoil Use and Oil&amp;Gas Engineering</b>		<b>A. Kotelnikov</b>
Position, Department	Signature	Full name