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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**

**Technologies of Development of Mineral Deposits**

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 “Technologies of Development of Mineral Deposits” is to acquire knowledge, skills and experience in the field of modern methods of extraction of mineral raw materials in various mining and geological conditions. Additionally, it involves 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 the scope of methods for developing mineral deposits depending on the mining and geological conditions of the subsoil area;
- forming knowledge, skills, and abilities in the field of design and planning of mining operations;
- acquiring knowledge in the field of applied mining systems for mineral deposits;
- analyzing the main technological processes in the development of deposits by various methods;
- studying technical means and methods of comprehensive mechanization of mining operations.

## 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)
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 Exchanges 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. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The course refers to the elective 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
GC-3	Able to organize and manage the work of the		Graduate Qualification Work

Competence code	Competence descriptor	Previous courses/modules	Subsequent courses/modules
	team, developing a team strategy to achieve the goal.		

#### 4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

The total workload of the course “Technologies of Development of Mineral Deposits” is 3 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
			2
<i>Contact academic hours</i>		51	51
Lectures (LC)		17	17
Lab work (LW)		-	-
Seminars (workshops/tutorials) (S)		34	34
<i>Self-studies</i>		57	57
<i>Evaluation and assessment (exam/passing/failing grade)</i>		0	0
<b>Course workload</b>	academic hours	<b>108</b>	<b>108</b>
	credits	<b>3</b>	<b>3</b>

#### 5. COURSE CONTENTS

*Table 5.1. Course contents and academic activities types*

Course module title	Course module contents (topics)	Academic activities types
Module 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.	LC, S
Module 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; 2.3. determination of the parameters and speed of sloping trenches in preparation for the development of a new horizon;	LC, S

<b>Course module title</b>	<b>Course module contents (topics)</b>	<b>Academic activities types</b>
	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.	
Module 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.	LC, S
Module 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.	LC, S
Module 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.	LC, S
Module .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; 6.5. substantiation of the choice of technology for the development of a uranium deposit.	LC, S
Module 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;	LC, S

<b>Course module title</b>	<b>Course module contents (topics)</b>	<b>Academic activities types</b>
	7.7. environmental protection and integrated development of subsoil using physical and chemical geotechnology.	

\* LC - lectures; LW - lab work; S - seminars.

## 6. CLASSROOM EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

*Table 6.1. Classroom equipment and technology support requirements*

<b>Type of academic activities</b>	<b>Classroom equipment</b>	<b>Specialised educational / laboratory equipment, software, and materials for course study (if necessary)</b>
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"> <li>• Micromine / GEOMIX</li> </ul>
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. Mostafa Mohamed Ali Elbeblawi, Hassan Ali Abdelhak Elsaghier, Mostafa Tantawy Mohamed Amin, Wael Rashad Elrawy Abdellah. "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 reading:*

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 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](http://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/](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 “Technologies of Development of Mineral Deposits”.
2. Guidelines for students on the development of the course “Technologies of Development of Mineral Deposits”.

\* 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**

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position, educational department

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

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position, educational department

**V. Cheskidov**

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name and surname

**A. Lipina**

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name and surname

## **HEAD OF EDUCATIONAL DEPARTMENT:**

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

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educational department

**A. Kotelnikov**

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name and surname

## **HEAD OF HIGHER EDUCATION PROGRAMME:**

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

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position, educational department

**A. Kotelnikov**

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name and surname