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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 and Geophysical Basics of Mineral Prospecting and Exploration

(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 and Geophysical Basics of Mineral Prospecting and Exploration” is:

- acquiring knowledge, skills and experience in the field of types of minerals, on the classifications of mineral deposits, their geological structure and composition, on the variety of geological and geophysical methods of mineral prospecting and their rational choice, 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:

- obtaining knowledge about ore and non-metallic mineral raw materials;
- getting acquainted with the geological diversity of mineral deposits, classifications of deposits;
- training of students in the basic Training of students on basic geological and geophysical methods of prospecting and forecasting of mineral deposits learning how to use them in specific geological environments at different stages of the geological exploration process.

2. REQUIREMENTS TO LEARNING OUTCOMES

Mastering the discipline “Geological and Geophysical Basics of Mineral Prospecting and Exploration” 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-6.	Able to identify and implement the priorities of their own activities and ways to improve it based on self-assessment.	GC-6.1 Controls the amount of time spent on specific activities;
		GC-6.2. develops time management tools and methods for accomplishing specific tasks, projects, and goals;
		GC-6.3 Analyze one's resources and their limits (personal, situational, time, etc.) to successfully complete the assigned task.
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.
GPK-2.	Able of independently formulating the research objectives and establishing a sequence for resolving professional problems.	GPK-2.1. Knows the basics and methods of organizing research activities, methods of setting goals and methods of achieving them;
		GPK-2.2. is able to develop research methods;
		GPK-2.3. has methods of establishing cause-effect relationships and identifying the most significant among them and skills of independent formulation of research objectives.

Code	Competence	Competence Formation Indicators (within this discipline)
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-1.1. Knowledge of the basics of geological structure of ore deposits, the possibility of using specialized software;
		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;
SPC-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, interpret the results of geophysical works;
		PC-2.3 Know how to justify and select optimal methodology, manage geophysical work at different stages of subsoil area development.
SPC-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;
		PC-4.3 Be able to apply the acquired knowledge and skills in the design, support and management of the geological study of a subsoil area at various stages of its development.

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

Discipline “Geological and Geophysical Basics of Mineral Prospecting and Exploration” 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 “Geological and Geophysical Basics of Mineral Prospecting and Exploration”.

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-6.	Able to identify and implement the priorities of their own activities and ways to improve it based on self-assessment.		Final state attestation
GPK-1.	Capable of using the theoretical foundations of		Hydrogeology; Mining Hydrogeology;

Code	Competence	Previous Disciplines (Modules)*	Subsequent Disciplines (Modules)*
	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; Final state attestation
GPK-2.	Able of independently formulating the research objectives and establishing a sequence for resolving professional 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; Applied Groundwater Modeling; 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.		Research Work (Mining Geology). Part 2; 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; Final state attestation
SPC-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.		Pre-graduation Practical Training; Research Work (Geological and Geophysical Survey). Part 2; Research Work (Mining Geology). Part 2; Mining Hydrogeology; Research Work (Geological and Geophysical Survey). Part 1; Research Work (Mining Geology). Part 1;

Code	Competence	Previous Disciplines (Modules)*	Subsequent Disciplines (Modules)*
			Final state attestation
SPC-4.	Capable of designing, assisting with, and supervising a geologic study of a subsoil area at various stages of development.		Mining Hydrogeology; 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; 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 and Geophysical Basics of Mineral Prospecting and Exploration” 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	2	
<i>Contact academic hours</i>	70	36	34	
Lectures	-	-	-	
Lab work	-	-	-	
Seminars (workshops/tutorials)	70	36	34	
<i>Self-study (ies), academic hours</i>	164	108	56	
<i>Evaluation and assessment (exam or pass/fail grading)</i>	18	0 <i>fail grading with grade</i>	18 <i>Exam</i>	
Course workload	academic hours	252	144	108
	credits	7	4	3

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. Subject, history, main issues	1.1. Subject and objects of research. The place of the discipline in the system of sciences. Relationship of the course with the disciplines of the geological and economic cycles. The history of the development of the doctrine of search and exploration of mineral deposits. The	Sem

Modules	Topics	Type of academic activities*
	most important concepts and terms	
Section 2. Geology of mineral deposits	<p>2.1. Classification of mineral deposits</p> <p>2.2. Industrial types of metallic mineral deposits. General information about industrial deposits of metallic minerals. The principles of industrial classification of metallic minerals. Examples of classifications.</p> <p>2.3. Deposits of ferrous, non-ferrous, noble, rare and rare-earth, radioactive (including uranium) metals. The main (industrial) ore minerals. Characteristics of the most important geological and industrial types of deposits. The largest and unique deposits. The scale of mineral reserves. The state of the raw material base, the volume of production of minerals in the world; prices on the world market.</p> <p>2.4. Deposits of non-metallic minerals. General information about industrial deposits of non-metallic minerals. The principles of industrial classification of non-metallic minerals. Examples of classifications. Chemical and agronomic raw materials. Industrial and stone raw materials. Construction materials. Areas of industrial use. Industry requirements to the quality of raw materials, technological types and varieties of minerals. State of the raw material base, the volume of production in the world and Africa; prices on the world market. Characteristics of the most important geological and industrial types of deposits.</p> <p>2.5. Uranium deposits in Africa</p>	Sem
Section 3. Searching for minerals	<p>3.1. Stages and stages of geological exploration. Modern classification of stages and phases</p> <p>3.2. Searching geological criteria (prerequisites) and signs. Definition of the concept of criterion and trait. The meaning of these terms for search geology. Global and regional criteria. Geological and non-geological attributes.</p> <p>3.3. Search for mineral deposits, including uranium ores. Classification of searches according to the conditions and methods of work. Methods of prospecting (mineralogical,</p>	Sem

Modules	Topics	Type of academic activities*
	geochemical, geophysical, etc.). Searches of overlapped deposits.	

* - *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)
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.	Collection of educational geological maps; collection of minerals and rocks.
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.	Magnetometer MMP-203 (4 pcs); MERI station (1 pc); radiometer SRP-68 (2 pcs); cappameter KM-7 (2 pcs); densitometer (1 pc); electronic oscillograph ZET 302 (2 pcs).
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. Korobeinikov, A. F. Geology. Prognostication and search for mineral deposits: textbook for undergraduate and graduate / A. F. Korobeinikov. - 2nd ed. amended and supplemented - M.: Publishing house Yurait, 2018. - 254 c. - (Series : Universities of Russia). - ISBN 978-5-534-00747-3.— URL: www.biblio-online.ru/book/FF44F535-EBFF-4634-A5B8-4CF5514B6EAE

2. Pivnyak G. et al.(eds.) Mining of Mineral Deposits. Editors: Genadiy Pivnyak, Volodymyr Bondarenko, Iryna Kovalevs'ka and Mykhaylo Illiashov ,CRC Press,2013. — 382 p. — ISBN: 1138001082. URL: <https://sciarium.com/file/190886/>

3. Schluter T. Geological Atlas of Africa (with notes on stratigraphy, tectonics, economic geology, geohazards and geosites each country). New York, 2006 г., 255 стр., ISBN: 3-540-29144-x. URL: <https://www.geokniga.org/books/2719>

Additional (optional) reading (sources):

1. Varet J. Geology of Afar (East Africa). Springer, 2018. — 345 p. — (Regional Geology Reviews). — ISBN: 978-3-319-60863-1. URL: <https://sciarium.com/file/304532/>

2. Detay M., Detay A.-M. Geological Wonders of Namibia. Struik Nature, 2017. — 140 p. — ISBN: 9781775842941. URL: <https://sciarium.com/file/295481/>

3. Geology and mineral deposits : textbook for universities / J. V. Seminsky, G. D. Maltseva, I. N. Semeykin, M. V. Yakhno; under the editorship of J. V. Seminsky. - 2nd ed. amended and supplemented - M. : Publishing house Yurait, 2018. - 347 c. - (Series : Universities of Russia). - ISBN 978-5-534-07478-9. - URL: www.biblio-online.ru/book/1DF31DE8-685C-4F8D-A9D8-9969EC18C5B8

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 “Geological and Geophysical Basics of Mineral Prospecting and Exploration”.

* - 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 and Geophysical Basics of Mineral Prospecting and Exploration” 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 of the Department of Subsoil Use and Oil&Gas Engineering		M. Romero
Position, Department	Signature	Full name
Associate Professor of the Department of Subsoil Use and Oil&Gas Engineering		A. Kotelnikov
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