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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**

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educational division (faculty/institute/academy) as higher education programme developer

**INTERNSHIP SYLLABUS**

**Research Work (Mining Geology) Part 2**

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internship title

**Industrial**

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internship type

**Recommended by the Didactic Council for the Education Field of:**

**05.04.01 Geology**

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field of studies / speciality code and title

**The student's internship is implemented within the Higher Education Programme of Higher Education (HEP HE):**

**Mining Geology**

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higher education programme profile/specialisation title

## 1. INTERNSHIP GOAL(s)

The goal of the internship «Research Work (Mining Geology). Part 2» is to acquire knowledge, skills and experience in the field conducting a holistic study or a separate part of it in order to increase the efficiency of mining technologies based on the development of new (improving existing) approaches to managing geological data. 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 internship are:

- fostering readiness for self-development, self-realization, and utilization of one's creative potential;
- developing skills to draft, according to established standards, reports on studies, evaluations, and publications derived from research findings;
- cultivating the capacity to address particular research and applied challenges aligned with the focus of scientific investigations.

## 2. REQUIREMENTS FOR LEARNING OUTCOMES

The internship implementation is aimed at the development of the following competences (competences in part):

*Table 2.1. List of competences that students acquire during the internship*

| <b>Competence code</b> | <b>Competence descriptor</b>                                                                                                                                              | <b>Competence formation indicators<br/>(within this course)</b>                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GPC-1                  | Capable of using the theoretical foundations of special and new sections of geological sciences to solve professional activity problems.                                  | GPC-1.1. Knows the fundamentals of special and new sections of geological sciences;<br>GPC-1.2. Selects a method or methodology for solving a professional problem;<br>GPC-1.3. Knows how to select a method or methodology for solving a professional problem.                                                                                                                                                                      |
| GPC-2                  | Able to independently formulating the research objectives and establishing a sequence for resolving professional problems.                                                | GPC-2.1. Knows the basics and methods of organizing research activities, methods of setting goals and methods of achieving them;<br>GPC-2.2. Knows how to develop research methods;<br>GPC-2.3. Has methods of establishing cause-effect relationships and identifying the most significant among them and skills of independent formulation of research objectives.                                                                 |
| GPC-3                  | Accomplished of totally independent generalizing the results obtained while solving professional problems and developing recommendations for their practical application. | GPC-3.1 Knows the theoretical foundations of the generalization of results and development of recommendations;<br>GPC-3.2. Knows how to summarize the results obtained in the process of solving professional tasks, develop recommendations for their practical use;<br>GPC-3.3. Has the skills to summarize the results obtained in the process of solving professional tasks and develop recommendations for their practical use. |
| GPC-4                  | Suitable of representing, protecting, and disseminating the outcomes of their professional activities.                                                                    | GPC-4.1 Knows the main results of his/her scientific activity, methods of their presentation, protection and dissemination;                                                                                                                                                                                                                                                                                                          |

| Competence code | Competence descriptor                                                                                                                                                                                                     | Competence formation indicators (within this course)                                                                                                                                                                                                                                                                                                     |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 |                                                                                                                                                                                                                           | GPC-4.2. Knows how to understand and analyze the results of professional activities, use own scientific achievements. discuss and disseminate the results of their professional activities;<br>GPC-4.3. Has the skills to analyze, discuss and disseminate the results of professional activities.                                                       |
| 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-1.3. Has the skills to process geological data and construct ore body models using modern software.                                                                                                                                                                                                                                                   |
| PC-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-2.2 Knows how to select the best methodology, design, implement, interpret the results of geophysical works;<br>PC-2.3 Knows how to justify and select optimal methodology, manage geophysical work at different stages of subsoil area development.                                                                                                  |
| PC-3            | Capable of projecting, implementing, and managing a hydrogeological study of the territory during the exploration and development of a mineral deposit.                                                                   | PC-3.3 Knows how to apply the knowledge and skills obtained in the design, implementation and management of the hydrogeological study of the territory at the stage of exploration and development of mineral deposits.                                                                                                                                  |
| PC-4            | Capable of designing, assisting with, and supervising a geologic study of a subsoil area at various stages of development.                                                                                                | PC-4.2 Knows how to apply methodological solutions in the design and implementation of the geological study of a subsoil area at various stages of its development;<br>PC-4.3 Knows how 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. INTERNSHIP IN HIGHER EDUCATION PROGRAMME STRUCTURE

The internship refers to the elective component of (B2) block of the higher educational programme curriculum.

Within the higher education programme students also master other disciplines (modules) and / or internships that contribute to the achievement of the expected learning outcomes as results of the internship.

*Table 3.1. The list of the higher education programme components that contribute to the achievement of the expected learning outcomes as the internship results.*

| Competence code | Competence descriptor                                                                                                                    | Previous courses/modules, internships*                                                                                                          | Subsequent courses/modules, internships* |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| GPC-1           | Capable of using the theoretical foundations of special and new sections of geological sciences to solve professional activity problems. | Geological and Geophysical Basics of Mineral Prospecting and Exploration<br>Engineering and Geological Support of Subsoil Use<br>Mining Geology | Final State Examination                  |

| <b>Competence code</b> | <b>Competence descriptor</b>                                                                                                                                                                                              | <b>Previous courses/modules, internships*</b>                                                                                                                                                                                                                     | <b>Subsequent courses/modules, internships*</b>    |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
|                        |                                                                                                                                                                                                                           | Hydrogeology<br>Mining Hydrogeology                                                                                                                                                                                                                               |                                                    |
| GPC-2                  | Able to independently formulating the research objectives and establishing a sequence for resolving professional problems.                                                                                                | Geological and Geophysical Basics of Mineral Prospecting and Exploration<br>Modelling of Mineral Deposits<br>Applied Groundwater Modeling                                                                                                                         | Final State Examination                            |
| GPC-3                  | Accomplished of totally independent generalizing the results obtained while solving professional problems and developing recommendations for their practical application.                                                 | Sustainable Mining                                                                                                                                                                                                                                                | Final State Examination                            |
| GPC-4                  | Suitable of representing, protecting, and disseminating the outcomes of their professional activities.                                                                                                                    | Digital Technologies in Geology<br>Sustainable Mining                                                                                                                                                                                                             | Final State Examination                            |
| 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. | Geological and Geophysical Basics of Mineral Prospecting and Exploration<br>Engineering and Geological Support of Subsoil Use<br>Modelling of Mineral Deposits                                                                                                    | Pre-Graduation Practice<br>Final State Examination |
| PC-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.                              | Regional Geology. Geology of Central and Southern Africa<br>Geological and Geophysical Basics of Mineral Prospecting and Exploration<br>Mining Geology<br>Modelling of Mineral Deposits<br>Hydrogeology<br>Mining Hydrogeology<br>Introductory Practical Training | Pre-Graduation Practice<br>Final State Examination |
| PC-3                   | Capable of projecting, implementing, and managing a hydrogeological study of the territory during the exploration and development of a mineral deposit.                                                                   | Mining Geology<br>Hydrogeology<br>Groundwater Dynamics<br>Mining Hydrogeology<br>Applied Groundwater Modeling                                                                                                                                                     | Pre-Graduation Practice<br>Final State Examination |
| PC-4                   | Capable of designing, assisting with, and supervising a geologic study of a subsoil area at various stages of development.                                                                                                | Regional Geology. Geology of Central and Southern Africa<br>Geological and Geophysical Basics of Mineral Prospecting and Exploration<br>Mining Geology<br>Modelling of Mineral Deposits<br>Hydrogeology<br>Mining Hydrogeology<br>Introductory Practical Training | Pre-Graduation Practice<br>Final State Examination |

\* To be filled in according with the competence matrix of the higher education programme.

#### **4. INTERNSHIP WORKLOAD**

The total workload of the internship is 6 credits (216 academic hours).

## 5. INTERNSHIP CONTENTS

*Table 5.1. Internship contents\**

| <b>Modules</b>                                                                                                        | <b>Contents (topics, types of practical activities)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Workload, academic hours</b> |
|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <i>Semester 3 – Part 2</i>                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                 |
| Module 1. Goal setting and organization of RW                                                                         | Workplace safety instruction (in the laboratory and/or pro-duction site)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1                               |
|                                                                                                                       | Assignment of an individual task from the supervisor:<br>1.1. setting goals and objectives for ongoing research and development;<br>1.2. methods of analysis and generalization of domestic and international experience in the relevant field of research;<br>1.3. methods and means of planning and organizing research and development;<br>1.4. methods of conducting experiments and observations, generalization and processing of information;<br>1.5. formulating requirements for the structure, content and design of scientific and technical reports, publications, reviews based on the results of research. | 9                               |
| Module 2. Justification of the research methodology                                                                   | 2.1. substantiation of the relevance of the chosen topic of research work;<br>2.2. definition of the object and subject of research;<br>2.3. choice of method (methodology) of the study;<br>2.4. development of a research plan;<br>2.5. analysis of the state of the issue on the selected research topic;<br>2.6. preparation of a literature review                                                                                                                                                                                                                                                                  | 36                              |
| Module 3. Performing an experiment / building a model in accordance with the theme of the Graduate Qualification Work | 3.1. review of theoretical material on the chosen topic;<br>3.2. implementation of the experiment / model building;<br>3.3. analysis of the obtained experimental results;<br>3.4. assessment of the convergence of the obtained results with theoretical assumptions;<br>3.5. analysis of the prospects for further research in the chosen direction.                                                                                                                                                                                                                                                                   | 142                             |
| Module 4. Formation of the report                                                                                     | 4.1. evaluation of the effectiveness of the solutions proposed in R&D;<br>4.2. formulation of conclusions on R&D;<br>4.3. preparation of a research report.                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 18                              |
| Ongoing supervision of the internship by the supervisor                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1                               |
| Preparing for defence and defending the internship report                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 9                               |
| <b>TOTAL:</b>                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>216</b>                      |

\* The contents of internship through modules and types of practical activities shall be FULLY reflected in the student's internship report.

## **6. INTERNSHIP EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS**

During stationary internship at the partner university (MISIS University), depending on individual assignment, classrooms for lecture and/or practical classes, geological and mine-surveyor information technology laboratory, including computers with specialized software, geology basics classroom, including a collection of rocks and minerals, library of the partner university (MISIS), that comply with current sanitary and fire safety norms as well as safety requirements at the enterprise, workplace and when working with certain production/laboratory equipment can be used.

In case of stationary or offsite internship in Moscow or outside Moscow, students are provided with rooms that comply with current sanitary and fire safety norms, as well as safety requirements at the enterprise, workplace and when working with certain production/laboratory equipment.

The student can come up with the initiative of the place of internship. The direction of professional activity of the organization proposed by the student for the internship should correspond to the profile of the educational program and types of professional activity, for which the graduate of the program is preparing. The place of internship must be agreed with the head of the department with the subsequent (in the case of a positive decision) the conclusion of the relevant contract with the proposed organization of the student.

The SAFETY REQUIREMENTS at the enterprise, workplace (including the department of RUDN University and MISIS University) and during the work with certain production/laboratory equipment incorporate/ include applicable labor protection rules, fire safety rules and other applicable local regulations.

## **7. PRACTICE METHOD**

The internship «Research Work (Mining Geology). Part 2» can be carried out both at the structural divisions of the partner university (MISIS University) and at Moscow-based organisations (inside practice), and as well as those located outside Moscow (outside practice).

The internship at an external organisation (outside University) is legally arranged on the grounds of an appropriate agreement, which specifies the terms, place and conditions for an internship implementation at the organisation.

The period of the internship, as a rule, corresponds to the period indicated in the training calendar of the higher education programme. However, the period of the internship can be rescheduled upon the agreement with the Department of Educational Policy and the Department for the Organization of Internship and Employment of RUDN students.

## **8. RESOURCES RECOMMENDED FOR INTERNSHIP**

*Main readings:*

1. 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>

2. Rustan A. "Mining and rock construction technology desk reference. Rock mechanics, drilling and blasting". CRC Press, London, 2011 - <https://www.geokniga.org/books/30944>

3. Gangopadhyay S. "Engineering geology". Oxford university press, 2013 r - <https://www.geokniga.org/books/23310>

The basic literature can be expanded and recommended by the head of RW individually to each student in accordance with the individual assignment.

*Additional readings:*

1. Ye Zhang "Introduction to Geostatistics". University of Wyoming, 2011 - <http://geofaculty.uwyo.edu/yzhang/files/Geosta1.pdf>

2. Mohammad Ehteram, Zohreh Sheikh Khozani, Saeed Soltani-Mohammadi, Maliheh Abbaszadeh. "Estimating Ore Grade Using Evolutionary Machine Learning Models". Springer Singapore, 2022 - <https://doi.org/10.1007/978-981-19-8106-7>

3. United Nations Economic Commission for Africa. (2017). Impact of illicit financial flows on domestic resource mobilization: Optimizing revenues from the mineral sector in Africa. <https://repository.uneca.org/handle/10855/23862>

Additional literature may be expanded and/or modified and recommended by the supervisor of RW individually to each student in accordance with the individual assignment.

*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/>
- Google search engine <https://www.google.ru/>
- Scopus abstract database <http://www.elsevierscience.ru/products/scopus/>
- Geology Portal GeoKniga <http://www.geokniga.org>
- Geological Survey of Tanzania (GST) <https://www.gst.go.tz>
- Tanzania Geological Society (TGS) <https://www.tgs.or.tz>
- <https://www.gst-datashop.com>

*The training toolkit and guidelines for a student to do an internship, keep an internship diary and write an internship report\*:*

1. Safety regulations to do the internship (safety awareness briefing).

2. Guidelines for keeping an internship diary and writing an internship report.

\*The training toolkit and guidelines for the internship are placed on the internship page in the university telecommunication training and information system under the set procedure.

## **9. ASSESSMENT TOOLKIT AND GRADING SYSTEM\* FOR EVALUATION OF STUDENTS' COMPETENCES LEVEL AS INTERNSHIP RESULTS**

The assessment toolkit and the grading system\* to evaluate the level of competences (competences in part) formation as the internship results are specified in the Appendix to the internship 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 University**

position, educational department

**V. Cheskidov**

name and surname

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

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