Документ подписан простой электронной подписью
Информация о владельце:
ФИО: Ястребов Олег Александрович
Должность: Ректор
Дата подписания: 23.05.2025 16:37:00
Уникальный программный ключ:
ca953a0120d891083f939673078ef1a989dae18a

Federal State Autonomous Educational Institution of Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA
NAMED AFTER PATRICE LUMUMBA
RUDN University

Academy of engineering
(educational division (faculty/institute/academy) as programme developer)

Department of Subsoil Use and Oil and Gas Engineering
(department realizing the PhD program)

COURSE SYLLABUS

Geophysics
(course title)

Scientific specialty:

1.6.9. Geophysics
(scientific speciality code and title)

The course instruction is implemented within the PhD programmes:

Geophysics
(PhD program title)

2025 г.

1. DISCIPLINE (MODULE) GOAL

The objective of mastering the discipline «Geophysics» is to prepare for surrender candidate exams, and same the acquisition of knowledge, skills and experience in obtaining by graduate students' knowledge about the physics of the Earth, geophysical methods of its study and their application in prospecting and exploration of mineral deposits.

The main objectives of the discipline are training of postgraduates in the skills of processing and interpretation of geophysical measurement results using various computer modeling methods, skills of geophysical monitoring of geological structure and field development, including in solving environmental problems, as well as skills of practical application of various measuring instruments, technologies, observation and geophysical data collection systems, geophysical radiating and measuring systems. While training postgraduates also receive knowledge about the basics of prospecting and exploration for oil, gas and solid minerals, as well as practical skills to substantiate the most promising areas for laying new prospecting and exploration wells, staging additional types of geophysical work to study the geological structure of the studied area of subsoil and skills of geophysical support of operational work in the conditions of mining enterprises.

2. REQUIREMENTS TO PHD-STUDENTS ON FINISHING THE COURSE

Mastering the discipline "Geophysics" is aimed at preparing for the candidate's examinations, as well as mastering the following competencies:

- knowledge of conditions of formation of mineral deposits
- ability to forecast and assess the prospects of their industrial development based on geological and geophysical methods
- ability to carry out geological and economic evaluation of deposits using mathematical modeling methods
- knowledge of methods of processing and interpretation of the results of geophysical field measurements as applied to geophysical exploration
- ability to analyze large volumes of multidimensional, multi-parameter and heterogeneous geophysical data
- Ability to conduct geophysical monitoring of geological structure and field development
- Ability to use geological and geophysical data to build digital geological, hydrodynamical, geomechanical, geodynamical and other models of the geological environment and fields
- ability to read and draw up structural maps and geological sections, calculate and analyze basic geostatistical data characteristics, describe oil and gas deposits correctly, analyze oilfield data, exploration drilling data and well geophysics data
- the ability to use technical means and technologies of geophysical support of well logging, geological-technological and workover operations.
- skills of working with spreadsheets, text and graphic editors, skills of designing engineering geological graphics (maps, sections).
- ability to control the development of mineral deposits based on the data of surface and well geophysical surveys, including monitoring of hydraulic fracturing of reservoirs….

3. WORKLOAD OF THE DISCIPLINE AND TYPES OF ACTIVITIES

The overall workload of the discipline «Geophysics» is 3 credit units (108 academic hours).

Types of activities	**Total ac. hrs.**	**Semesters**
		3
Classroom activities (total), including:	60	60
в том числе:		
Lectures (LC)	30	30
Laboratory activities (LA)	–	–
Practical lessons/Seminars (PC)	30	30
Independent work	48	48

Intermediate certification (test with assessment/exam)		36	36
Overall workload	ac. hrs.	108	108
	credits	3	3

4. CONTENT OF THE DISCIPLINE

Name of the discipline section	Contents of the section (topic)	Type of study work
Section 1: Physical bases of geophysical methods	Topic 1.1. The force of gravity. Reductions of the force of gravity. Anomalies of gravity. Density of rocks - physical parameter of gravity exploration efficiency. Topic 1.2. The main elements of the magnetic field. Magnetization of rocks and ores. Magnetic susceptibility of rocks and ores. Residual magnetization of rocks and ores. Topic 1.3. Specific electric resistance of rocks. Electrochemical activity and polarizability of rocks. Dielectric and magnetic permeability. Topic 1.4 Fundamentals of elasticity theory. Thermal and optical properties of rocks. Theme Topic 1.5 Natural radioactivity. Radioactivity parameters. Nuclear-physical properties of rocks. Topic 1.6. Physical and geological classification of well geophysical surveys	LC, PC
Section 2: Geophysical research methods	Topic 2.1. Gravimetric and magnetometric methods Topic 2.2. Electrometric and seismic methods Topic 2.2. Geophysical well surveys	LC, PC
Section 3: Methods of processing and interpretation of results of geophysical field measurements	Topic 3.1. Types of approximation of geophysical fields. Topic 3.2. Methods of building approximation models.	LC, PC
Section 4: Modern technologies of complex analysis and interpretation of geophysical data	Topic 4.1. Qualitative complex interpretation. Pattern recognition in the presence of reference objects. Classification of geological objects on the principles of self-learning Topic 4.2. Quantitative complex interpretation. Geological interpretation of complex geophysical data. Study of morphology and position of objects. Study of material composition. Topic 4.3. Regional geophysical studies. Geological mapping. Combination of geophysical methods in prospecting for metallic mineral deposits. Combination of geophysical methods for prospecting and exploration of hydrocarbon deposits.	LC, PC
Section 5: Petrophysics in oil, gas and ore geophysics	Topic 5.1. Density, electrical, radioactive, thermal characteristics, and permeability of sedimentary rocks. Change of petrophysical properties during metamorphic processes. Definition and classification of petrophysical models. Modern laboratory methods of determining	LC, PC

	physical properties of specific samples of sedimentary and crystalline rocks.	
Section 6: Computer modeling in oil and gas and ore geophysics	Topic 6.1. The concept of computer model. Types of models. Block diagrams of solving typical geological problems. Stages of mathematical modeling process. Decomposition of the initial problem. Typical tasks of geophysical data analysis. Recognition methods. Decisive rules of recognition. Topic 6.2. Methods of cluster analysis. Solving classification problems of oil and gas and ore geology using cluster analysis methods. Theoretical foundations of neural network modeling. Topic 6.3. General provisions for coupled modeling. Geometric uncertainty. Uncertainties of static and dynamic models. Approaches to estimation of modeling uncertainties	LC, PC
Section 7: Modern geophysical technologies	Topic 7.1. The concept of linear problem. Initial model. Parameterization of the environment. General concepts. Discretization of continuous nonlinear inverse problems. Linearization of nonlinear inverse problems. Notion of correctness of problems. Influence of observation error on the solution results. Topic 7.2. Instability of inverse problems. Incorrectness of inverse problems. Existence and uniqueness in inverse problems of geophysics. Ways of overcoming incorrectness. Conditionally correct formulation of inverse problems.	LC, PC
Section 8: Geological and geophysical methods of control over oil and gas field development	Topic 8.1. Logging methods Topic 8.2. Vertical seismic profiling Topic 8.3. Nuclear magnetic resonance methods	LC, PC

5. EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Room Type	Room Equipment	Specialized educational / laboratory equipment, software and materials for mastering the discipline
Class for Seminars	Room for seminar-type classes, equipped with a set of specialized furniture, board (screen) and technical / multimedia gadgets	Not necessary
Self-Work Class	Room for self-working (can be used for lecture and seminars activities), equipped with a set of specialized furniture, board (screen) and technical / multimedia gadgets and computers with an access to EIPES	Not necessary

6. METHODOLOGICAL SUPPORT AND LEARNING MATERIALS

Main readings:

1. Соколов, А. Г. Геофизические методы поисков и разведки месторождений полезных ископаемых: учебное пособие / А. Г. Соколов, Н. Черных; Оренбургский

государственный университет. – Оренбург: Оренбургский государственный университет, 2015. – 144 с.: ил. – Режим доступа: по подписке. – URL: https://biblioclub.ru/index.php?page=book&id=439082 – Библиогр. в кн. – ISBN 978-5-7410-1277-2. – Текст: электронный.

2. Физика Земли: учебное пособие / А. Г. Соколов, М. Нестеренко, О. В. Попова [и др.]; Оренбургский государственный университет, Оренбургский научный центр Уральского отделения Российской Академии Наук. – Оренбург: Оренбургский государственный университет, 2014. – 103 с. – Режим доступа: по подписке. – URL: https://biblioclub.ru/index.php?page=book&id=259122 – Текст: электронный.

3. Соколов, А. Г. Геофизические методы поисков и разведки месторождений полезных ископаемых: учебное пособие / А. Г. Соколов, Н. Черных; Оренбургский государственный университет. – Оренбург: Оренбургский государственный университет, 2015. – 144 с.: ил. – Режим доступа: по подписке. – URL: https://biblioclub.ru/index.php?page=book&id=439082 – Библиогр. в кн. – ISBN 978-5-7410-1277-2. – Текст: электронный.

4. Фоменко, Н. Е. Комплексирование геофизических методов при инженерно-экологических изысканиях: учебник / Н. Е. Фоменко; Южный федеральный университет. – Таганрог: Южный федеральный университет, 2016. – 291 с.: схем., ил. – Режим доступа: по подписке. – URL: https://biblioclub.ru/index.php?page=book&id=493048 – Библиогр. в кн. – ISBN 978-5-9275-2344-3. – Текст: электронный.

5. Гравимагниторазведка : лабораторный практикум : [16+] / авт.-сост. Л. С. Мкртчян, В. С. Крамаренко ; Северо-Кавказский федеральный университет. – Ставрополь: Северо-Кавказский Федеральный университет (СКФУ), 2017. – 117 с.: схем., табл., ил. – Режим доступа: по подписке. – URL: https://biblioclub.ru/index.php?page=book&id=494697 – Библиогр.: с. 105–106. – Текст: электронный.

6. Егоров, А. С. Геофизические методы поисков и разведки месторождений: учебное пособие / А. С. Егоров, В. В. Глазунов, А. П. Сысоев ; под редакцией А. Н. Телегин. — Санкт-Петербург: СанктПетербургский горный университет, 2016. — 276 с. — ISBN 978-5-94211-759-7. — Текст: электронный // Электронно-библиотечная система IPR BOOKS: [сайт]. http://www.iprbookshop.ru/71693.html

7. Спасский Б. А.,Герасимова И. Ю. Сейсмостратиграфия:учебно-методическое пособие/Б. А. Спасский, И. Ю. Герасимова.-Пермь,2012, ISBN 978-5-7944-1905-4.-1. https://elis.psu.ru/node/14379

8. Захарченко, Л. И. Геофизические методы контроля разработки МПИ : учебное пособие : [16+] / Л. И. Захарченко, В. В. Захарченко ; Северо-Кавказский федеральный университет. – Ставрополь: Северо-Кавказский Федеральный университет (СКФУ), 2017. – 249 с.: ил. – Режим доступа: по подписке. – URL: https://biblioclub.ru/index.php?page=book&id=483081 – Библиогр. в кн. – Текст: электронный.

9. Зеливянская, О. Е. Петрофизика: учебное пособие: [16+] / О. Е. Зеливянская ; Северо-Кавказский федеральный университет. – Ставрополь: Северо-Кавказский Федеральный университет (СКФУ), 2015. – 111 с.: ил. – Режим доступа: по подписке. – URL: https://biblioclub.ru/index.php?page=book&id=457781 – Библиогр. в кн. – Текст: электронный.

10. Сианисян, Э. С. Петрофизические основы ГИС : учебное пособие / Э. С. Сианисян, В. В. Пыхалов, В. В. Кудинов ; Южный федеральный университет, Астраханский государственный технический университет. – Ростов-на-Дону: Южный федеральный университет, 2013. – 124 с. – Режим доступа: по подписке. – URL: https://biblioclub.ru/index.php?page=book&id=241169 – библиогр. с: С. 97–98 – Текст: электронный.…

Additional readings:

Черепанцев, А. С. Аппаратура морской гравиметрии: учебное пособие / А. С. Черепанцев, Е. Е. Нестюрина ; Южный федеральный университет, Инженерно-технологическая академия. – Таганрог: Южный федеральный университет, 2016. – 62 с.: схем., ил. – Режим доступа: по подписке. – URL: https://biblioclub.ru/index.php?page=book&id=492990 – Библиогр. в кн. – ISBN 978-5-9275-1981-1. – Текст: электронный.

2. Полевая геофизика. Сейсморазведка и интерпретация материалов сейсморазведки: практикум / авт.-сост. А. А. Папоротная, С. В. Потапова; Северо-Кавказский федеральный университет. – Ставрополь: Северо-Кавказский Федеральный университет (СКФУ), 2017. – 107 с.: ил. – Режим доступа: по подписке. – URL: https://biblioclub.ru/index.php?page=book&id=467191 – Библиогр. в кн. – Текст: электронный.

3. Квеско, Б. Б. Основы геофизических методов исследования нефтяных и газовых скважин: учебное пособие / Б. Б. Квеско, Н. Г. Квеско, В. П. Меркулов. – Москва; Вологда: Инфра-Инженерия, 2018. – 229 с.: ил. – Режим доступа: по подписке. – URL: https://biblioclub.ru/index.php?page=book&id=493813 – Библиогр.: с. 224–225. – ISBN 978-5-9729-0208-8. – Текст: электронный.

4. Спасский Б. А., Герасимова И. Ю. Теоретические основы обработки геофизических данных: учебное пособие для студентов геологического факультета, обучающихся по специальности "Геофизика"/Б. А. Спасский, И. Ю. Герасимова.-Пермь: Издательство Пермского государственного университета,2011, ISBN 978-5-7944-1619-0.-190.

5. Митюнина И. Ю. Компьютерные технологии в геофизике: учебно-методическое пособие/И. Ю. Митюнина.-Пермь,2012, ISBN 978-5-7944-1902-3.-1. http://www.campus.psu.ru/library/node/25563

6. Долгаль А. С., Костицын В. И. Гравиразведка: способы учета влияния рельефа местности: учебное пособие для студентов специальности "Геофизика", бакалавров и магистров направления "Геология"/А. С. Долгаль, В. И. Костицын.-Пермь,2010, ISBN 978-5-7944-1483-7.-88.-Библиогр.: с. 82–85

7. Хмелевской В. К.,Костицын В. И. Основы геофизических методов: учебник для студентов вузов, обучающихся по специальности 020302 "Геофизика"/В. К. Хмелевской, В. И. Костицын.- Пермь:Изд-во Перм. гос. ун-та,2010, ISBN 978-5-7944-1428-8.-1.-Библиогр.: с. 397–399 http://k.psu.ru/library/node/201798

8. Гершанок Л. А. Магниторазведка: учебник для студентов вузов по специальности "Геофизика"/Л. А. Гершанок.-Пермь,2011, ISBN 978-5-7944-1740-1.-421.

Internet sourses:

ELS RUDN University and third party EBS, to which university students have accessbased signed contracts:

- RUDN Electronic Library System, http://lib.rudn.ru/MegaPro/Web ;
- ELS University Library Online, http://www.biblioclub.ru ;
- EBS Urayt, http://www.biblio-online.ru ;
- ELS Student Consultant, http://www.studentlibrary.ru ;
- EBS Lan, http://e.lanbook.com ;
- EBS Trinity Bridge http://www.trmost.ru

Databases and search engines:

- Electronic fund of legal and normative-technical documentation, http://docs.cntd.ru ;
- Yandex search system https:// www .yandex.ru ;
- Google search system https://www.google.com ;
- Reference database Scopus , http://www.elsevierscience.ru/products/scopus

Educational and methodological materials for students' self-work studying the discipline /

module:

A course of lectures on the discipline «Geophysics».

7. ASSESSMENT TOOLKIT AND GRADING SYSTEM FOR MIDTERM ATTESTATION OF STUDENTS IN THE DISCIPLINE (MODULE)

Assessment toolkit and a grading system to evaluate the level of competences (competences in part) formation as the course results are specified on the TUIS platform.

DEVELOPERS:
Associate Professor of the
Department of Subsoil Use
and Oil and Gas Engineering V.Yu.Abramov

HEAD OF THE DEPARTMENT
Associate Professor of the
Department of Subsoil Use
and Oil and Gas Engineering A.E.Kotelnikov