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 higher education programme developer

COURSE SYLLABUS

Information technologies in the oil and gas industry / Информационные технологии в нефтегазовом комплексе

course title

Recommended by the Didactic Council for the Education Field of:

21.04.01 Oil and Gas Engineering

field of studies / speciality code and title

The course instruction is implemented within the professional education programme of higher education:

Oil and Gas Engineering / Технологии добычи и транспортировки нефти и газа

higher education programme profile/specialisation title

2026

1. COURSE GOAL(s)

The goal of the course "Information technologies in the oil and gas industry / Информационные технологии в нефтегазовом комплексе" is the mastery of theoretical and practical knowledge in the field of software for the design and operation of pipeline systems with the formation of the required level of professional competencies in this area.

The study of the course «Information technologies in the oil and gas industry / Информационные технологии в нефтегазовом комплексе» provides for the familiarization with modern software for the design and operation of pipeline systems; development of skills and abilities to use normative and technical documentation; development of skills and abilities to perform calculations in modern software systems.

2. REQUIREMENTS FOR LEARNING OUTCOMES

The course "Information technologies in the oil and gas industry / Информационные технологии в нефтегазовом комплексе" is designed for students to acquire 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-4	Able to carry out business communication in oral and written forms in the state and foreign language(s)	**GC-4.1.** Knows computer technologies and information infrastructure in the organization; factors for improving communication in the organization, communication technologies in professional interaction; characteristics of communication flows; the importance of communication in professional interaction; methods for studying the communicative potential of an individual; modern means of information and communication technologies. **GC-4.2.** Able to create written texts of scientific and official business styles of speech in Russian and foreign languages on professional issues; investigate the passage of information through managerial communications; determine internal communications in the organization; perform editorial and proofreading of texts of scientific and official business styles of speech in Russian and foreign languages; analyze the system of communication links in the organization. **GC-4.3.** Possesses the principles of oral and written communications, including in a foreign language; techniques for implementing the results of own and team activities using communication technologies; technology for building effective communication in the organization; transmission of professional information in information and telecommunication networks.
GC-7	Able to search for necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as using algorithms when working with data obtained from various sources in order to effectively use the information received to	**GC-7.1.** Knows technologies for collecting, processing, analyzing and interpreting information in digital environments; rights and obligations regulating relations between people, social communities, organizations. **GC-7.2.** Able to assess the risks and threats associated with the use of information and communication technologies in their professional activities, and neutralize them using available means; apply and adapt known methods and technologies for working with information to new tasks caused by changing socio-economic conditions; find and

Competence code	Competence descriptor	Competence formation indicators (within this course)
	solve problems; evaluate information, its reliability, draw logical conclusions based on incoming information and data	analyze relevant legal and economic information sufficient to make informed decisions; apply legal knowledge in analyzing conflict situations. **GC-7.3.** Possesses information technologies for communication, search, processing and storage of information; skills to prevent negative legal and economic consequences of own actions or inactions.
GPC-3	Able to develop scientific, technical, design and official documentation, prepare scientific and technical reports, reviews, publications, reviews	**GPC-3.1.** Knows the requirements, structure and content of the main types of scientific, technical, design and official documentation of oil and gas production (including technical reports, design layouts, technological regulations, passports, memos, acts); principles for preparing publications and reviews in accordance with current industry, corporate and state standards. **GPC-3.2.** Able to develop, analyze and prepare sections of scientific and technical reports, design documentation and official materials; systematize and summarize information from various sources to prepare reviews and publications; write reviews of technical proposals and reports; apply current regulatory documents in their work. **GPC-3.3.** Possesses skills in independently developing and preparing reports, reviews, certificates, acts and other official documents based on source data; skills in preparing texts for scientific and technical publications and reviews; methods of working with specialized software and document management systems.
GPC-4	Able to find and process information required for decision-making in scientific research and practical technical activities	**GPC-4.1.** Knows the technology for conducting typical experiments on standard equipment in the laboratory and in production; a set of modern methods for processing the results of research and practical technical activities using available equipment, instruments and materials. **GPC-4.2.** Able to independently search, analyze and select necessary information, organize, transform, store and transmit it; analyze the internal logic of scientific knowledge; substantiate their worldview and social position and apply acquired knowledge in areas not related to professional activities; assess innovative risks; compare and process the results of research activities using standard equipment, instruments and materials. **GPC-4.3.** Possesses experimentation techniques using software packages; main directions for the development of innovative technologies in the oil and gas industry; skills in developing innovative approaches in specific technologies using automated workstations.

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The course refers to the variable component of (B1) block of the higher educational programme curriculum.

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-4	Able to carry out business communication in oral and written forms in the state and foreign language(s)	Professional Russian (as a Foreign Language) / Русский язык (как иностранный) в профессиональной деятельности [англ.]	State Exam / Государственный экзамен [англ.]; Graduate Qualification Work / Выпускная квалификационная работа [англ.]
GC-7	Able to search for necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as using algorithms when working with data obtained from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, draw logical conclusions based on incoming information and data	Modern aspects of geological and geophysical research in the oil and gas industry / Современные аспекты геолого-промысловых и геофизических исследований в нефтегазовом деле [англ.]	State Exam / Государственный экзамен [англ.]; Graduate Qualification Work / Выпускная квалификационная работа [англ.]
GPC-3	Able to develop scientific, technical, design and official documentation, prepare scientific and technical reports, reviews, publications, reviews	Technological processes of pipeline transport / Технологические процессы трубопроводного транспорта [англ.] Technological practice (educational) / Технологическая практика (учебная) [англ.] Research work (obtaining primary skills in research work) / Научно-исследовательская работа (получение первичных навыков научно-исследовательской работы) [англ.] Technological practice (industrial) / Технологическая практика (производственная) [англ.]	State Exam / Государственный экзамен [англ.]; Graduate Qualification Work / Выпускная квалификационная работа [англ.]
GPC-4	Able to find and process information required for decision-making in scientific research and practical technical activities	Geoinformation Systems and Applications / Геоинформационные системы и их применение [англ.]	State Exam / Государственный экзамен [англ.]; Graduate Qualification Work / Выпускная квалификационная работа [англ.]

* To be filled in according to the competence matrix of the higher education programme

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

The total workload of the course "Information technologies in the oil and gas industry

/ Информационные технологии в нефтегазовом комплексе" is 4 credits.

Table 4.1 Types of academic activities during the period of the HE programme mastering

Type of study work		**TOTAL**, acc.hrs.	**Semester(s)**
			3
Contact academic hours, acc .		*36*	*36*
including:		18	18
Lectures			
Laboratory work			
Seminars (workshops/tutorials)		36	36
Self-study (ies), academic hours		*63*	*63*
Evaluation and assessment (exam or pass/fail grading)		*27*	*27*
The course total workload	acc.hrs.	**144**	**144**
	Credits	**4**	**4**

5. COURSE CONTENTS

Table 5.1. Course contents and academic activities types

Course module title		**Course topic title**		**Course module contents (topics)**	**Academic activities types**
1	Introduction to modules and interface of PC tNavigator, PC Petrel	1.1	Main modern PCs used for digitalization in oil and gas engineering	Introduction. Main modern PCs used for digitalization of technologies in the process of field preparation for development, operation, oil and gas refining, construction of pipeline transport facilities	LC, S
		1.2	Interface of PC tNavigator, PC Petrel	Introduction to modules and interface of PC tNavigator, PC Petrel	LC, S
2	Loading initial data into PC tNavigator (PC Petrel)	2.1	Goals and objectives of modeling oil and gas complex facilities	Goals and objectives of modeling oil and gas complex facilities. Basic concepts of modern three-dimensional digital (3D) models in the process of oil and gas field development	LC, S
		2.2	Use of geostatistics for inclusion in the geological model	Use of geostatistics for inclusion in the geological model. Loading initial data into PC tNavigator (PC Petrel). Loading inclinometry data and Las-files, etc. according to the option	LC, S
3	Modeling stages	3.1	Construction of summary and detailed	Working in PC tNavigator (PC Petrel). Construction of summary and detailed	LC, S

			geological and geophysical cross-section	geological and geophysical cross-section. Creating a Cod-coll curve (reservoir curve). Setting markers for BS10 formation	
		3.2	Starting work with the Classifier	Analysis of well logging data, creation of αPS curve. Starting work with the Classifier. Creating a classifier for automatic interpretation of "reservoir-non-reservoir". Working with the "calculator" function. Identification of 3 rock clusters	LC, S
		3.3	Classifier, cluster identification	Application of the Classifier to convert the PS curve into a Classifier, identification of clusters for detailing the inter-well space	LC, S
		3.4	Creation of porosity, permeability, oil saturation curves	Creation of porosity, permeability, oil saturation curves (calculation of values in the "calculator" tab taking into account Cod-coll and αPS) for subsequent assessment of fluid quality and preliminary selection of oil and gas refining process	LC, S
		3.5	Construction of reflecting seismic horizons	Construction of reflecting seismic horizons and a reference clay horizon (application of universal interpolation, set of well tops seismic points). Creation of attributes in markers	LC, S
4	Construction of 2D and 3D models in PC tNavigator	4.1	Construction of the structural framework of the deposit	Construction of the structural framework of the deposit. Selection of the number of cells horizontally and vertically depending on the type of occurrence, determination of pinch-out zones. Ranks. Calculation of residuals	LC, S
		4.2	2D maps	2D maps. Creation of maps based on the structural	LC, S

				model. Construction of the OWC map. Construction of 3D grids for a complexly structured BS10 formation (taking into account the bridge). Creation of grids based on the structural model. Modeling of zone properties by type of occurrence (parallel, proportional)	
		4.3	Working in the "Data Analysis" module	Working in the "Data Analysis" module. Construction of an isotropic variogram using Blocked wells. Properties of geometric objects (layer-by-layer interpolation)	LC, S
		4.4	Construction of 3D maps	Construction of 3D maps. Selection of grids. Calculation of hydrocarbon reserves	LC, S

6. CLASSROOM EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Classroom equipment and technology support requirements

Type of academic activities	**Classroom equipment**	**Specialised educational / laboratory equipment, software, and materials for course study** (if necessary)
Lecture	A lecture hall for lecture-type classes, equipped with a set of specialised furniture; board (screen) and technical means of multimedia presentations.	
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.	
Computer Lab	A classroom for conducting classes, group and individual consultations, current and mid-term assessment, equipped with personal computers (in the amount of 12 pcs), a board (screen) and technical means of multimedia presentations.	Virtual Reality Class for Oil and Gas Production Process Management
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.	

* The premises for students' self-studies are subject to **MANDATORY** mention

7. RESOURCES RECOMMENDED FOR COURSE STUDY

Main readings:

1. Zemlyansky, A.A., Bystrenina, I.E. Management of information resources in research work: textbook / Russian State Agrarian University – Moscow Timiryazev Agricultural Academy. – 4th ed. – Moscow: Dashkov and Co., 2025. – 110 p. – Access mode: by subscription. – URL: https://biblioclub.ru/index.php?page=book&id=720358
2. Seleznev, V.E., Aleshin, V.V., Pryalov, S.N. Modern computer simulators in pipeline transport: mathematical methods of modeling and practical application: monograph. – Moscow; Berlin: Direct-Media, 2014. – 199 p.

Additional(optional) reading (sources):

1. Seleznev, V.E. Mathematical modeling of pipeline networks and canal systems: methods, models and algorithms: monograph / V.E. Seleznev, V.V. Aleshin, S.N. Pryalov . - Moscow; Berlin: Direct-Media, 2014. - 694 p.
http://biblioclub.ru/index.php?page=book&id=260662

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
- EL "Lan" http://e.lanbook.com/

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/

*Training toolkit for self- studies to master the course *:*

1. The set of lectures on the course Information technologies in the oil and gas industry / Информационные технологии в нефтегазовом комплексе.
2. Guidelines for students on the development of the course Information technologies in the oil and gas industry / Информационные технологии в нефтегазовом комплексе.

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

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