NJSC «Kazakh national research technical university named after K.I. Satpayev»

K. Turysov Institute of Geology and Oil and Gas Business

Petroleum Engineering Department

EDUCATIONAL PROGRAM

Bachelor of engineering and technology in the educational program «DRILLING ENGINEERING»

2nd edition in accordance with the 2018 State Mandatory Educational Standards for Higher Education

Almaty 2022

СӘТБАЕВ УНИВЕРСИТЕТІ SATBAYEV UNIVERSITY

The program was developed by the head and faculty of the Department of Oil and Gas

Head of Department of Petroleum Engineering G.Yeligbayeva

agreed:
Director of the Institute GaOGB A.Syzdykov

From employers:
1. Pangereeva Sh., Deputy General Director for Geology and Development of «Ozenmunaigas» JSC.
2. Dzhaukenov A.A., Deputy Chairman of the Board for Production of «Volkovgeology» JSC
3. Ibrashov Zh.R., Leading engineer of the production and technical department of «KazGerMunai» LLP

From the partner university:
1. Kulchitsky Valery Vladimirovich, Deputy Head of the Department of Oil and Gas Well Drilling for Research, Gubkin Russian State University of Oil and Gas

Approved at a meeting of the Academic Council of the Kazakh National Research Technical University named after K. Satpayev. Minutes No 13, «28» April, 2022.

Qualification:
Level 6 of the National Qualifications Framework:
6B07 Engineering, manufacturing and construction industries
6B072 Manufacturing and manufacturing industries

Professional competence: Organization and management of processes and technologies for drilling oil and gas wells.

CONTENT

BRIEF DESCRIPTION OF THE PROGRAM

The purpose of developing an educational program

The educational program (hereinafter EP) is a set of documents developed by the Kazakh National Research Technical University named after K.I. Satpayev and approved by the Ministry of Education and Science of the Republic of Kazakhstan. The EP takes into account the needs of the regional labor market, the requirements of state bodies and relevant industry requirements and is based on the state educational standard for higher professional education in the relevant field.

The EP defines program educational goals, learning outcomes for students, necessary conditions, content and technologies for the implementation of the educational process, a report and analysis of the quality of students during training and after graduation.

The EP includes the curriculum, the content of disciplines and learning outcomes, and other materials to ensure a quality education for students.

The goal of developing the «Drilling Engineering» EP is to help students, teachers and industry experts understand the structure of the educational process and demonstrate how the curriculum and course content contribute to the formation of the necessary core competencies after graduation by students. Last but not least, the goal of the EP is to establish a common framework for the feasibility and necessity of a «Drilling Engineering» training program for all stakeholders, including government, government agencies, the oil and gas industry, universities, parents and students, and the community.

Normative documents used for the development of this EP

Legal framework and recommended methods used for the development of the EP «Drilling Engineering»:

- Law of the Republic of Kazakhstan dated July 27, 2007 No. 319-III «On Education»;
- Decree of the Government of the Republic of Kazakhstan dated August 23, 2012 No. 1080 «On the assessment of state compulsory education levels of education»;
- Decree of the bodies of the Republic of Kazakhstan dated May 17, 2013 No. 499 «On approval of the Model Rules for the Activities of Educational Organizations Corresponding to Types, including the Model Rules for Educational Organizations Implementing Additional Educational Programs for Children» (as amended on April 7, 2017);
- State obligatory standard of education SOSoE 03.08.334.-2006, specialty 050708 – «Oil and gas business»;
- Other normative and methodological documents of the Ministry of Education and Science of the Republic of Kazakhstan;

- Sectoral qualifications framework for oil and gas, oil refining and petrochemical networks, Astana, 2017, http://www.kazenergy.com/upload/document/industry-frame/ork.pdf (last accessed 10 December 2018.);
- Guidelines for the development and design of sectoral qualifications frameworks, Astana,2016,http://atameken.kz/uploads/content/files/Методика%20%20ОРК%202016.pdf (last accessed 10 December 2018.);
- State Classifier of the Republic of Kazakhstan SC RK 03-99. General Classifier of Types of Economic Activities (GCoToEA)
- National classifier of occupations of the Republic of Kazakhstan 01-2017
- Working curriculum for the specialty «Oil and gas business», approved by the rector of the Kazakh National Research Technical University named after K.I. Satpaev;
- Documents of the TQM system (Total Quality Management) on the organization of the educational process at the Kazakh National Research Technical University named after K.I. Satpaev;
- An example of the curriculum «Petroleum Engineering» SPE (Society of Petroleum Engineers), https://www.spe.org/members/docs/Model-Petroleum-Engineering-Curriculum.pdf (last accessed 10 December 2018.);
- SPE matrix on technical knowledge for engineering graduates, http://www.spe.org/training/docs/graduating_matrix.pdf **(**last accessed 10 December 2018.);
- Competence matrices SPE, https://www.spe.org/training/competency.php **(**last accessed 10 December 2018.);
- Accreditation criteria and ACSEaT supporting documents, http://www.abet.org/accreditation/accreditation-criteria/

General provisions in the development of an educational program

As shown in Figure 1, the provisions defining a quality EP start with clear and concise Program Educational Objectives, (hereinafter PEO), which are closely related to the mission of the program.

In addition, the PEO determines the expected knowledge and skills of students upon graduation.

EP "Petroleum Engineering" in the formation of knowledge and skills of students after graduation was based on Criterion 3 ABET (Accreditation Board for Engineering and Technology) – Student Outcomes, since among engineering courses, ABET accreditation is considered prestigious and highly recommended.

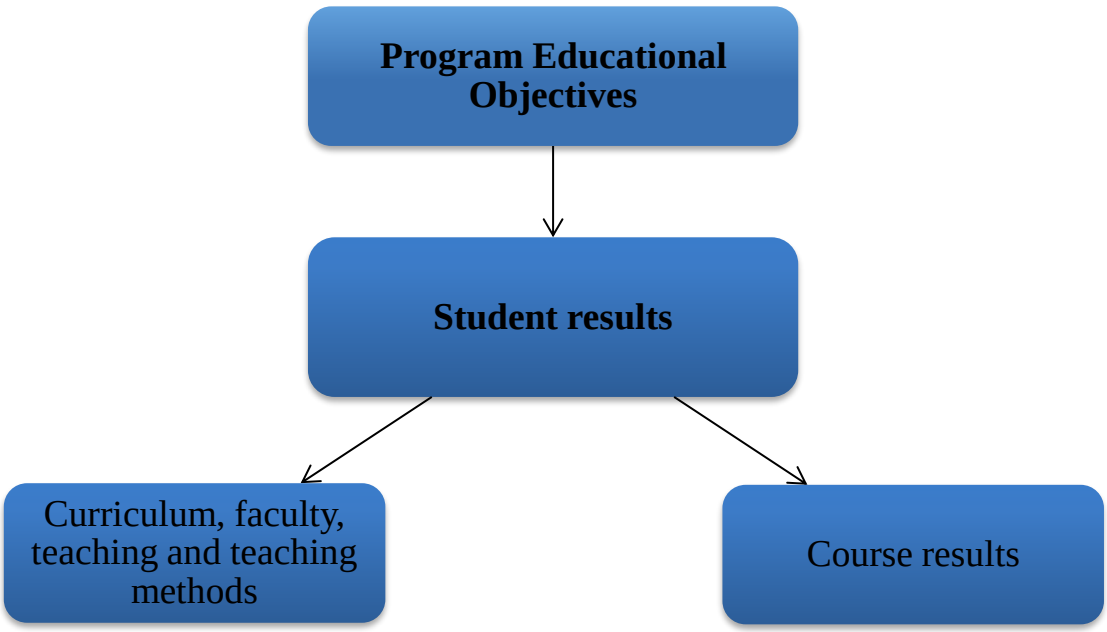

Figure 1 - The relationship of different components in the definition of the educational program

Professional and labor activities

An area of professional activity or a ***professional group*** is a set of types of labor activity in an industry that has a common integration basis (analagous or similar purpose, objects, technologies, including labor tools) and assumes a similar set of labor functions and competencies for their implementation.

The type of labor activity or ***professional subgroup*** is a part of a professional group, a set of professions, formed by an integral set of labor functions and the competencies necessary for their implementation.

In table. 1 shows 2 main areas of professional activity and 2 types of labor activity for graduates of the EP «Drilling Equipment», according to the industry qualification framework.

Professional and labor activity

An area of professional activity or a professional group is a set of types of labor activity that has a common integration essence (similar or similar goals, objects, technologies, including labor tools) and an expected set of labor functions and competencies for their performance.

A type of labor activity or a professional subgroup is a part of a professional group, a set of professions formed by a holistic set of labor functions and competencies common to their performance.

In table. 1 shows 2 main areas of professional activity and 2 types of labor activity for graduates of the EP «Drilling Equipment», according to the industry qualification framework.

Table 1 - Areas of professional activity and types of work in the oil and gas industry, according to the SFQ (6-level: undergraduate)

Professional group	**Professional subgroup**
Oil and gas exploration	Geological and geophysical work on oil and gas exploration
Drilling oil and gas wells	Drilling management

According to GCoToEA of the Civil Code of the Republic of Kazakhstan, graduates of the EP «Drilling engineering» can engage in the following activities in the economy of the Republic of Kazakhstan:

43.13.0 Exploration drilling;
09.00.0 Provision of services in the mining industry
09.90.0 Exploration drilling and development drilling in mining
06.10.0 Drilling of operational oil or gas wells;
42.21.0 Water well drilling

According to the National classifier of occupations RK 01-2017, graduates of the EP can have the following groups of professions:

2146-1-006 Well casing engineer
2146-1-011 Engineer for complex work in drilling (overhaul) wells
2147-1-001 Drilling engineer (drilling)
2147-1-002 Drilling Solutions Engineer
2147-1-004 Fluid preparation engineer
2147-9-002 Mud engineer
2146-1-008 Well sampling and testing engineer
2146-1-007 Well Services Engineer
2146-1-009 Well workover preparation engineer
2338-1-006 Oil and Gas Drilling Lecturer, College
2338-1-044 Offshore Drilling Lecturer, College
2338-1-094 Drilling Technology Lecturer, College

Contact Information

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ACADEMIC REQUIREMENTS

Requirements for applicants

Admission to a university is carried out according to the applications of an applicant who completed secondary, secondary- professional education in full on a competitive basis in accordance with the points of the certificate issued based on the results of a single national test with a minimum score of at least 65 points, including at least 5 points - in the History of Kazakhstan, quantitative literacy, reading literacy - the language of study, and at least 5 points in each profile subject.

Special requirements for admission to the program apply to graduates of 12-year schools, colleges, applied bachelor's programs, NIS, etc. These applicants must pass diagnostic testing in English, mathematics, physics, and special disciplines.

Table 2 - Rules for credit transfer for accelerated education based on 12-year secondary, secondary- technical and higher education

Code	Competency type	Description of competence	Competence Result	In Change
GENERAL (It implies full training with possible additional, depending on the level of knowledge)				
G1	Communicativeness	- fluent monolingual speaking, writing and communication skills - the ability to not fluently communicate with a second language - ability to use communicative capability in various situations - there are the basics of academic writing in the native language - diagnostic test for language level	Full 4-year study with a minimum of 240 academic credits (of which 120 contact classroom academic credits) with a possible transfer of credits in a second language, where students have an advanced level. The level of the language is determined by passing a diagnostic test	Department of Kazakh and Russian Languages, Department of English Language
G2	Quantitative Literacy	- Basic mathematical thinking at the communication level - the ability to solve situational problems	Full 4-year study with a minimum of 240 academic credits (of which 120 contact	Department of Math

		based on the mathematical apparatus of algebra and the beginnings of mathematical analysis - diagnostic test for mathematical literacy in algebra	classroom academic credits). With a positive passing of the diagnostic test, the level of Mathematics is 1, with a negative - the level of Algebra and the beginning of the analysis	
G3	Basic literacy in science disciplines	- basic understanding of the scientific picture of the world with an understanding of the essence of the basic laws of science - understanding of basic hypotheses, laws, methods, formulation of conclusions and estimation of errors	Full 4-year study with a minimum of 240 academic credits (of which 120 contact classroom academic credits). With a positive passing of the diagnostic test, the level of Physics 1, General Chemistry, with a negative - the level of the Beginning of Physics and Basic Foundations of Chemistry	Natural Sciences Departments
SPEFICIC (implies reduced training through credit transfer depending on the level of knowledge in competencies for graduates of 12-year schools, colleges, universities, including humanitarian and economic areas)				
S1	Communicativeness	- Fluent bilingual oral, written and communication skills - ability to communicate fluently with a third language - skills of writing text of different style and genre - skills of deep understanding and interpretation of one's own work of a certain level of complexity (essay) - basic aesthetic and theoretical literacy as a	Full credit transfer by language (Kazakh and Russian)	Department of Kazakh and Russian languages

		condition for full-fledged perception, interpretation of the original text		
S2	Quantitative Literacy	- Special mathematical thinking using induction and deduction, generalization and concretization, analysis and synthesis, classification and systematization, abstraction, and analogy - the ability to formulate, substantiate and prove assumptions - application of general mathematical concepts, formulas and extended spatial perception for mathematical problems - a complete understanding of the basics of mathematical analysis	Credit transfer in the discipline Mathematics (Calculus) I	Department of Math
S3	Special literacy in natural sciences (Physics, Chemistry, Biology and Geography)	- Broad scientific perception of the world, offering a deep understanding of natural phenomena - critical perception for understanding scientific phenomena of the surrounding world - cognitive ability to formulate a scientific understanding of the forms of existence of matter, its interaction, and manifestations in nature	Credit transfer for Physics I, General Chemistry, General Biology, Introduction to Geology, Introduction to Geodesy; Study practice, etc.	Natural Sciences Departments
S4	English Language	- readiness for further self-study in English in	Transfer of English credits above	Department of English Language

		various fields of knowledge - willingness to gain experience in design and research work using English	academic to professional level (up to 15 credits)	
S5	Computer skills	- Basic programming skills in one modern language - use of software and applications for training in various disciplines - existence of a global standard of language level certificate	Transfer of credits for the discipline Introduction to Information and Communication Technologies, Information and Communication Technologies	Department of Software Engineering
S6	Social and humanitarian competences and behavior	- understanding and awareness of the responsibility of each citizen for the development of the country and the world - Ability to discuss ethical and moral aspects in society, culture, and science	Credit Transfer for Modern History of Kazakhstan (except for state exam)	Department of Social Disciplines
		- Critical understanding and ability for polemics for debating on contemporary scientific hypotheses and theories	Recalculation of credits in philosophy and other humanitarian disciplines	
PROFESSIONAL (implies reduced training through credit transfer, depending on the level of knowledge in competencies for graduates of colleges, private schools, universities, including humanitarian and economic areas)				
P1	Professional competence	- critical perception and deep understanding of professional competencies at level 5 or 6 - Ability to discuss and argue on professional issues within the framework of the	Transfer of credits in basic professional disciplines, including an introduction to the specialty, the structure and design of systems and machines by	Petroleum Engineering Department

		mastered program	industry, after-sales service of machines by industry, educational and training practice	
P2	General engineering competencies	- basic general engineering skills and knowledge, the ability to solve general engineering problems and problems - be able to use software packages for processing experimental data, solving systems of algebraic and differential equations	Credit transfer for general engineering disciplines (Engineering graphics, descriptive geometry, fundamentals of mechanics, fundamentals of hydrodynamics, fundamentals of electrical engineering, fundamentals of microelectronics, fundamentals of thermodynamics, fundamentals of geology, etc.)	Petroleum Engineering Department
P3	Computer engineering competence	- basic skills of using computer programs and soft systems for solving general engineering problems	Credit transfer for the following computer graphics disciplines, CAD fundamentals, CAE fundamentals, etc.	Petroleum Engineering Department
P4	Engineering and working competencies	- skills and abilities to use technical means and experimental devices for solving general engineering problems	Transfer of credits for academic disciplines of the experimental direction: turning and locksmithing, repair work, welding, laboratory or analytical chemistry, laboratory physics, mineralogy, etc.	Petroleum Engineering Department

P5	Socio-economic competencies	- Critical understanding and cognitive reasoning ability on contemporary social and economic issues - Basic understanding of the economic assessment of objects of study and the profitability of industry projects	Recalculation of credits in socio-humanitarian and technical and economic disciplines in the offset of the elective cycle	Petroleum Engineering Department

The university may refuse to transfer credits if a low diagnostic level is confirmed or the final grades in completed disciplines were below A and B.

Requirements for completing studies and obtaining a diploma

Description of the generally obligatory standard requirements for graduating from a university and assigning an academic bachelor's degree: completing at least 240 academic credits of theoretical study and a final capstone project or a state exam, according to the specialty.

The form of education: Full-Time

The length of study: from 4 to 7 years.

The language of study: Kazakh, Russian, English (more than 50%)

The policy of obtaining an additional degree Minor (degree)

During the competing of at least 18 credits in the disciplines of the program, including the following compulsory subjects:

M1 – Drilling oil and gas wells (PET101);

M2 – Rock Properties (PET176);

M3 – Reservoir Fluid Properties (PET129);

M4 – Reservoir Engineering I. Primary Production (PET124);

M5 – Oil Production (PET134);

M6 – Petroleum Facility Design (PET169);

An additional specialty “Minor” is assigned with the issuance of a diploma supplement of the established form.

ECTS Diploma Supplement

The European Diploma Supplement (hereinafter - the European Supplement), or the Diploma Supplement (DS), is, along with ECTS (European Credit Transfer System),

an effective tool for ensuring academic and professional mobility in the European Higher Education Area.

The aim of the DS is to provide comprehensive independent data in order to ensure international "transparency" and objective academic and professional recognition of qualifications (diplomas, degrees, certificates, etc.).

Requirements:

1. The European Diploma Supplement is issued by the Kazakh National Research Technical University named after K.I.Satbayev to graduates of accredited educational programs only in strict accordance with the model developed by the Joint Working Group of representatives of the European Commission, Council of Europe, and UNESCO.

2. The European Diploma Supplement does not contain any judgments of the assessment plan, comparisons with other study programs and recommendations regarding the possibility of recognition of this diploma or qualification.

3. The European Diploma Supplement consists of eight sections and must contain information on all sections. In the absence of information in any of the sections of the European Diploma Supplement, it is necessary to indicate the reasons for refusing to provide mandatory information.

4. The European Diploma Supplement must always accompany the original document of education, as it has no legal force. The presence of the European Diploma Supplement does not guarantee the status of an educational institution, its qualifications, or the fact that it is recognized as an integral part of the national higher education system.

5. Each European Diploma Supplement must begin with a preamble:

> “This Diploma Supplement follows the model developed by the European Commission, Council of Europe and UNESCO / CEPES. The purpose of the Supplement is to provide comprehensive independent data in order to ensure international "transparency" and objective academic and professional recognition of qualifications (diplomas, degrees, certificates, etc.). The application contains a description of the nature, level and status of training passed and successfully completed by the person named in the original qualification document. Judgments, statements of equivalence, or proposals for recognition are not permitted in the Appendix. Data should be reported for all eight sections. In the absence of such data, the reason must be indicated. "

6. The European Diploma Supplement must always contain the title and the degree of qualification; name and status of the awarding / managing institution and the classification of the qualifications. All these data must be presented in official and English languages, since an incorrect translation misleads those who make judgments about qualifications. In cases where an alphabet other than Latin is used, transliteration

is permitted. You can link the titles of degrees and qualifications to the description of the higher education system in the eighth section.

7. Educational institutions should take appropriate measures to reduce to a minimum the possibilities of fraud and misrepresentation of the European Diploma Supplements.

8. Special attention should be paid to translation and terminology. To overcome the problems arising in this area, it is essential that the original language is used where indicated in the document.

9. In the European Diploma Supplement, the assessment of qualifications obtained in other countries should focus on the knowledge, skills and abilities acquired, taking into account the fact that it is not exact equivalence but “fair recognition” that should be sought.

The diploma supplement consists of 8 mandatory items and is issued in English and Kazakh / Russian languages.

1. Information identifying the holder of the qualification
2. Information identifying the qualification
3. Information on the level of the qualification
4. Information on the contents and results gained
5. Information on the function of the qualification
6. Additional information
7. Certification of the supplement
8. Information on the national higher education system

CURRICULUM
EDUCATIONAL PROGRAM "Drilling engineering"

Discipline code	Name of disciplines	Cycle	Total amount in loans	Total hours	Classroom volume of lek/lab/pr	IWotS (including IWotS wtiH)	Form of control	Distribution of classroom classes by courses and semesters							
								I course		II course		III course		IV course	
								1 semester	2 semester	3 semester	4 semester	5 semester	6 semester	7 semester	8 semester
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)															
M-1. Language training module															
LNG 108	Foreign language	**GED**, MC	10	300	0/0/6	210	Э	5	5						
LNG 104	Kazakh (Russian) language	**GED**, MC	10	300	0/0/6	210	Э	5	5						
M-2. Physical training module															
KFK 101-104	Physical Culture	**GED**, MC	8	240	0/0/8	120	DC	2	2	2	2				
M-3. Information Technology Module															
CSE 677	Information and communication technologies (in English)	**GED**, MC	5	150	2/1/0	105	Э			5					
M-4. Module of socio-cultural development															
HUM 100	Modern history of Kazakhstan	**GED**, MC	5	150	1/0/2	105	ГЭ	5							
HUM 132	Philosophy	**GED**, MC	5	150	1/0/2	105	Э			5					
HUM 120	Module of socio-political knowledge (sociology, political science)	**GED**, MC	3	90	1/0/1	60	Э			3					
HUM 134	Module of socio-political knowledge (cultural studies, psychology)		5	150	2/0/1	105	Э				5				
M-5. Module fundamentals of anti-corruption culture, ecology and life safety															

HUM 133	Fundamentals of anti-corruption culture	**GED**, CC	5	150	2/0/1	105	Э				5				
MNG 488	Fundamentals of Entrepreneurship and Leadership														
CHE 656	Ecology and life safety														
CYCLE OF BASIC DISCIPLINES (BD)															
M-6. Module of physical and mathematical training															
MAT 101	Mathematics I	BD, UC	5	150	1/0/2	105	Э	5							
PHY 111	Physics I	BD, UC	5	150	1/1/1	105	Э	5							
MAT 102	Mathematics II	BD, UC	5	150	1/0/2	105	Э		5						
M-7. Basic training module															
PET499	Introduction to the specialty	BD, UC	4	120	1/1/1*	75	Э	4							
GEN429	Engineering and computer graphics	BD, UC	5	150	1/0/2	105	Э		5						
PHY112	Physics II	BD, UC	5	150	1/1/1*	105	Э		5						
GEN443	Resistance of materials	BD, UC	6	180	2/1/1*	120	Э			6					
CHE495	General chemistry	BD, UC	5	150	1/1/1*	105	Э			5					
GEN416	Machine Details	BD, UC	5	150	2/0/1*	105	Э			5					
GEO482	General and structural geology	BD, UC	5	150	2/1/0*	105	Э				5				
PET410	Fluid and gas mechanics	BD, UC	5	150	1/1/1*	105	Э				5				
CHE559	Chemistry of oil and gas	BD, UC	5	150	2/1/0*	105	Э				5				
GEO486	Geology of oil and gas	BD, UC	5	150	2/1/0*	105	Э					5			
PET409	Thermodynamics and heat engineering	BD, UC	5	150	1/0/2*	105	Э					5			
PET473	Well drilling technique and technology	BD, UC	5	150	2/0/1*	105	Э					5			
PET474	Destruction of rocks during drilling	BD, UC	5	150	2/0/1*	105	Э					5			
3214	Elective	BD, CC	5	150	2/0/1*	105	Э					5			
3215	Elective	BD, CC	5	150	2/0/1*	105	Э					5			
3216	Elective	BD, CC	5	150	2/1/0*	105	Э						5		
PET476	Fundamentals of development and operation of oil and gas	BD, UC	4	120	2/1/0*	75	Э						4		

	fields														
3217	Elective	BD, CC	5	150	2/1/0*	105	Э						5		
4218	Elective	BD, CC	6	180	2/1/1*	120	Э							6	
	Educational practice	BD, UC	2						2						
CYCLE OF PROFILE DISCIPLINES (PD)															
M-8. Professional activity module															
PET479	Geophysical studies of wells	PD, UC	4	120	2/1/0*	75	Э						4		
PET477	Drilling fluids	PD, UC	5	150	2/1/0*	105	Э						5		
3303	Elective	PD, UC	4	120	2/1/0*	75	Э						4		
PET481	Opening and development of wells	PD, UC	6	180	2/1/1*	120	Э							6	
PET480	Well wiring in difficult conditions	PD, UC	5	150	2/1/0*	105	Э							5	
4306	Elective	PD, CC	5	150	2/1/0*	105	Э							5	
4307	Elective	PD, CC	6	180	2/1/1*	120	Э							6	
4308	Elective	PD, CC	5	150	2/1/0*	105	Э							5	
PET482	Наклонное бурение	PD, UC	5	150	2/0/1*	105	Э								5
4310	Elective	PD, CC	5	150	2/1/0*	105	Э								5
4311	Elective	PD, CC	5	150	2/1/0*	105	Э								5
	Industrial practice I	PD, UC	2								2				
	Industrial practice II	PD, UC	3										3		
M-9. Module of final certification															
ECA003	Preparation and writing of a thesis (project)	FC	6												6
ECA103	Defense of the thesis (project)	FC	6												6
M-10. Module of additional types of training															
AAP500	Military training		0												
	Total by UNIVERSITY:							31	29	31	29	30	30	33	27
								60		**60**		**60**		**60**	

Number of credits for the entire period of study		
Cycle	**Cycles of disciplines**	**Credits**

code		required component (RC)	university component (UC)	component of choice (CC)	Total
GED	**CYCLE OF GENERAL EDUCATION DISCIPLINES**	51		5	56
BD	Cycle of basic disciplines		86	26	112
PD	Cycle of profile disciplines		30	30	60
	Total for theoretical training:	***51***	***116***	***61***	***228***
FC	Final certification	12			12
	total:	**63**	**116**	**61**	**240**

ELECTIVE DISCIPLINES OF THE EDUCATIONAL PROGRAM "Drilling engineering"									
Year of study	**Elective code according to the curriculum**	**Discipline code**	**Name of disciplines**	**Semestr**	Cycle	**Credits**	**Total hours**	**lek/lab/pr**	**IWotS (including IWotSwtiH) in hours**
3	**Basic Training module**								
	3214	PET475	Drilling machines and mechanisms	5	Б	5	150	2/0/1	105
		PET453	Fundamentals of the technology of drilling exploration wells					2/0/1	
	3215	PET454	Well Geonavigation	5		5	150	2/0/1	105
		PET456	Бурение скважин на жидкие и газообразные полезные ископаемые					2/0/1	
	3216	PET452	Offshore deepwater oil drilling	6		5	150	2/0/1	105
		PET457	Drilling of wells for solid minerals					2/0/1	
	3217	PET501	Formation geomechanics	6		5	150	2/0/1	105
		PET459	Hydromechanics in drilling					2/0/1	
4	4218	PET461	Reconstruction and overhaul of wells	7		6	180	2/1/1	120
		PET462	Drilling of geotechnological wells					2/1/1	
	Profile training module								

3	3303	PET460	Quality management in drilling	6	П	4	120	2/0/1	75
		PET483	Computer simulation of well construction					2/1/0	
4	4306	PET464	Grouting systems	7		5	150	2/1/0	105
		PET465	Measuring instruments in drilling					2/1/0	
	4307	PET470	Accidents during drilling of oil and gas wells	7		6	180	2/1/1	120
		PET471	Accidents during drilling of exploration and geotechnological wells					2/1/1	
	4308	PET468	Organization and management of oil and gas production	7		5	150	2/0/1	105
		PET469	Flushing fluids in exploratory drilling					2/1/0	
	4310	PET502	Methods of intensification of inflow into the well	8		5	150	2/0/1	105
		PET478	Fundamentals of drilling supervision					2/0/1	
	Module "R&D"								
	4311	PET503	Oil and Gas Engineering Workshop	8	P	5	150	2/1/0	105
		PET463	Fundamentals of scientific research and optimization in drilling					2/0/1	
			The number of credits in elective subjects for the entire period of study						
			Cycles of disciplines	**Кредиты**					
			Cycle of basic disciplines (BD)	26					
			Cycle of profile disciplines (PD)	30					
			total:	**56**					

OBJECTIVES OF THE DRILLING ENGINEERING EDUCATIONAL PROGRAM

1. Graduates of the program will be able and ready to apply the knowledge of mathematics, science and technology, as well as identify, formulate and solve engineering problems and problems to improve the technological processes of the oil and gas and geological industries.
2. Graduates of the program will be able to effectively convey information and thoughts to other people.
3. Graduates of the program will live and practice ethical, social, and environmental norms in their professional environments in a conscious and responsible manner.
4. Graduates of the program will show and demonstrate a high level of competence in engineering principles and in practice.
5. Graduates of the program will be able to work and work in various industry and multicultural teams.
6. Graduates of the program will serve society, the oil and gas and exploration industry, the state through activities in professional communities and in public organizations.
7. Graduates of the program will be successful professionals who intend to lead the team, the organization, the Republic of Kazakhstan and the world community to new achievements.

Table 3 – Relationship matrix of Student Outcomes and Educational Program Objectives

Student Outcomes (Descriptors of knowledge, skills and competencies)		EPO 1. Apply knowledge of mathematics, science and technology, as well as identify, formulate and solve engineering problems to improve the technological processes of the oil and gas industry.	EPO 2. Effectively convey information and thoughts to other people.	EPO 3. Practice ethical, social, and environmental standards in their professions in a responsible manner.	EPO 4. Exhibit a high level of competence in engineering principles and practice.	EPO 5. Be able to work in diverse industry and multicultural teams.	EPO 6. Serve society, the oil and gas industry, the country through participation in professional communities and public organizations.	EPO 7. Be successful professionals, ready to lead a team, organization, the Republic of Kazakhstan and the world community to new achievements.
(a)	apply knowledge of mathematics, science and technology	✓			✓			✓

(b)	design and conduct experiments, and analyze and interpret data	✓			✓			
(c)	design a system, component or process to meet the desired needs within realistic constraints	✓		✓	✓			
(d)	work in interdisciplinary teams		✓			✓	✓	
(e)	identify, formulate and solve technical problems	✓		✓				
(f)	understand professional and ethical responsibilities			✓	✓		✓	✓
(g)	communicate effectively		✓		✓	✓	✓	✓
(h)	understand the impact of technical solutions in a global, economic, environmental and social context			✓			✓	✓
(i)	recognize the need for lifelong learning and self-learning				✓			
(j)	know modern problems			✓	✓		✓	
(k)	use the techniques, skills and modern engineering tools required for engineering practice	✓			✓			

Table 3 shows the relationship between student outcomes and the reported EPO. The recommended way to interpret this table is to put before the EPO the expression "As Petroleum Engineering graduates ..." followed by the EPO itself, and then put the expression "Students must be able to…" before each of the indicated outcomes. For example, in the case of EPO 4:

As Petroleum Engineering graduates to ***exhibit a high level of competence in engineering principles and practice,*** students must be able to *apply knowledge of mathematics, science and technology; design and conduct experiments, and analyze and interpret data; design a system, component or process to meet the desired needs within realistic constraints; understand professional and ethical responsibilities; communicate effectively; recognize the need for lifelong learning and self-learning; know modern problems; use the techniques, skills and modern engineering tools required for engineering practice.*

DESCRIPTORS OF LEVEL AND SCOPE OF KNOWLEDGE, SKILLS AND PROFESSIONAL COMPETENCIES

The Dublin Descriptors adopted in the Dublin Agreement and used in the national higher education standard are comparable, although not identical to criteria, procedures and results of educational programs of the Washington Agreement (1989). These agreements recognize the significant equivalence of accreditation systems, thereby recognizing the significant equivalence of educational programs accredited by the signatories of the agreement.

Thus, the Washington Agreement developed requirements for the professional competencies of engineers and named them as the attributes of the graduate: “The attributes of the graduate form a set of individually assessed learning outcomes that indicate the potential ability of the student to acquire the competencies necessary to perform professional engineering activities at the proper level. Graduate Attributes serve as an example of the requirements that a graduate of an accredited program must meet. The attributes are characterized by clear statements of expected abilities and, where necessary, ranges are provided to indicate the required level of achievement depending on the type of program. "

As noted above, the Department of Petroleum Engineering, in the short term, aims to obtain ABET (Accreditation Council for Engineering and Technology) accreditation, according to which the minimum level of required competencies is Student Outcomes (a) - (k). A more detailed description of the results of students for students under the "Petroleum Engineering" program at KazNRTU named after K. Satpayev is given in Table 4.

At the lower end of the table, there are also descriptions of knowledge, skills and personal and professional competencies according to the industry qualifications framework and compared against the ABET competency requirements. Since knowledge implies a basic minimum level compared to skills and competencies, they are marked in white.

Such a classification of student outcomes is necessary in the future for clear detailing and comparison with the course outcomes, as noted in Fig. 1.

Table 4 – ABET competencies (Criterion 3. Student outcomes), Petroleum Engineering educational program competencies' brief descriptions and their relationship to the industry qualifications framework

ABET competencies (Criterion 3. Student outcomes)										
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
ability to apply knowledge in mathematics, science and technology	ability to design and conduct experiments, and analyze and interpret data	ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability	ability to work in interdisciplinary teams	ability to identify, formulate and solve technical problems	understanding of professional and ethical responsibility	ability to communicate effectively	extensive education required to understand the impact of technical solutions in a global, economic, environmental and social context	recognition of the need for lifelong learning and the ability to learn independently	knowledge of modern problems	ability to use the techniques, skills, and modern engineering tools required for engineering practice.
Petroleum Engineering educational program competencies' brief descriptions										
Apply the methods and principles of engineering sciences to analyze and evaluate various elements, systems, processes of drilling, production and transportation and find the optimal	Understand the meaning, interpret and comment on the information received. Collect and organize a variety of information from multiple sources. Based on the information collected,	Use the fundamental sciences in modeling and calculating methods, modes of drilling oil and gas wells, operating and maintaining oil, gas, condensate production facilities, in designing the development of	The ability to correlate one's aspirations with the interests of other people and social groups; have the skills of working together in a group, the ability to find common goals, and contribute to a common cause. Be able	Be able to methodologically substantiate scientific research. To use the basic methods and techniques of scientific research and analysis of problems, which make it possible to distinguish facts from	Critically consider one or another aspect of the development of society, possess the ethics of labor and civil relations; have respect for the professional code of an engineer, a sense of intolerance for violations of the	The ability and readiness of the graduate to verbal communication in the professional (educational-professional) and official business spheres in compliance with all the norms of verbal	Analyze the current state of the domestic and world economy, oil and gas industry in a market economy, the ability to assess the adopted or accepted engineering decisions and their impact on public opinion.	Organize planning, analysis, reflection, self-assessment of their educational and cognitive activities; to formulate their own value orientations in relation to the studied subjects and the fields of	Be aware of the development of modern problems of technology and oil engineering in Kazakhstan and abroad, using the ability and possession of the methods of modern educational and information technologies.	Possess software skills in drilling, development, production, gathering and preparation of hydrocarbons, and oil and gas transportation, following the instructions of the management as part of a team of colleagues to participate in

(rational) conditions for their work.	identify trends, reveal causal relationships, determine goals, choose means, and put forward hypotheses and ideas. Collect and summarize field data necessary for drawing up projects for drilling, production, collection and preparation of hydrocarbons, and their further transportation onshore and offshore	oil and gas fields and in production activities. Know and comply with the basic principles of rational nature management and environmental protection rules during the operation and maintenance of oil, gas and condensate production facilities.	to deal with a variety of opinions, disagreements and conflicts, take into account the views of others, be able to negotiate and find compromises.	speculation, information from opinions, to propose alternative solutions based on the analysis of the current state, to remain open to new ideas, to demonstrate the ability to apply theoretical concepts in practice.	law. To give a legal and moral assessment of facts, events and actions (including your own). Assess social attitudes related to health, consumption and the environment.	communication : to state orally and in writing the results of their educational and research work; represent yourself, your university, region, country; fill out questionnaires, draw up applications, resumes, letters and other texts of an official business style; have the skills of interpersonal and group communication , public speaking, be able to ask questions, correctly conduct a dialogue, participate in discussions.		activity being mastered. Be able to be flexible in the face of rapid change. Through continuing education, strive to master new profiles of professional activity, expand professional opportunities. Make effective use of the labor market situation, act in accordance with personal and social benefit.		experimental research activities, to be able to compare, analyze and interpret the results of special software programs with alternative methods of obtaining data and with real data.
The industry qualifications framework for petroleum, refining and petrochemical industries 6-Level (Undergraduate)										
Characteristics of skills and abilities: 1) Solving	**Characteristics of skills and abilities:** 2)	**Characteristics of personal and professional competencies: 3) complexity** (process	**Characteristics of personal and professional competencies: 1)**	**Characteristics of skills and abilities:** 3) Abilities and	**Characteristics of personal and professional competencies:**	**Characteristics of personal and professional competencies: 2)responsibilit**	**Characteristics of knowledge:** 1) A wide range	**Characteristics of personal and professional competencies: 1) independence**	**Characteristics of knowledge:** 2) Independent	**Characteristics of skills and abilities:** 1) Solving

problems of a technological or methodological nature related to a certain area of knowledge, involving a choice from a variety of solutions.	Development, implementation, control, assessment and correction of technological process components	management, level of control / independence of execution, harmful and difficult working conditions, the use of complex equipment and technologies in the process of labor, work with partial or complete uncertainty).	**independence** (teamwork, focus on results, influence on the process, planning and organization / timeliness)	skills to carry out research and innovation activities to develop new knowledge and procedures for integrating knowledge of various fields, correctly and logically formulate your thoughts in written and oral form, apply theoretical knowledge in practice in a specific area	**2)responsibility** (labor safety and protection, development of subordinates, responsibility for quality, efficiency and timeliness of work)	**y** (labor safety and protection, development of subordinates, responsibility for quality, efficiency and timeliness of work)	of special (theoretical and practical) knowledge (including innovative).	(teamwork, focus on results, influence on the process, planning and organization / timeliness)	search, analysis and evaluation of professional information.	problems of a technological or methodological nature related to a specific area of knowledge, involving a choice from a variety of solutions (including innovative ones).

DESCRIPTION OF COURSES

MAT 101 – Math I
CREDIT – 5 (1/0/2/2)
PREREQUISITE – Elementary Mathematics-school course/diagnostic test

PURPOSE AND OBJECTIVES OF THE COURSE

The main purpose of the course is to give the future specialist a certain amount of knowledge in the sections of the course "Mathematics-I", necessary for the study of related engineering disciplines. To introduce students to the ideas and concepts of mathematical analysis. The main attention should be paid to the formation of basic knowledge and skills with a high degree of their understanding of differential and integral calculus.
The objectives of the course are to acquire the knowledge necessary for the effective use of rapidly developing mathematical methods; to acquire the skill of constructing and researching mathematical models; to possess fundamental sections of mathematics necessary for solving research and practical problems in the professional field.

BRIEF DESCRIPTION OF THE COURSE

The course "Mathematics-I" contains the following sections: introduction to analysis, differential and integral calculus

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Know linear algebra and analytic geometry			✓								
Apply the theory of differential equations and systems of differential equations, numerical and functional series	✓							✓			
Analyze the theory of functions of a complex variable, probability theory and mathematical statistics.						✓	✓				
Analyze analytical geometry									✓	✓	
Apply methods for solving problems of planimetry and stereometry using analytical geometry			✓								
Distinguish between works in Cartesian and polar coordinate systems					✓						

MAT 102 – Math II
CREDIT – 5 (1/0/2/2)
PREREQUISITE – Math I

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of teaching the course "Mathematics II" is to form bachelor's ideas about modern mathematics as a whole as a logically coherent system of theoretical knowledge.
The objectives of the course are to instill in students solid skills in solving mathematical problems with bringing the solution to a practically acceptable result. To develop primary skills of mathematical research of applied issues and the ability to independently understand the mathematical apparatus contained in the literature related to the student's specialty.

BRIEF DESCRIPTION OF THE COURSE

The course "Mathematics-II" provides an accessible presentation of the sections: elements of linear algebra and analytical geometry, differential calculus of functions of many variables, multiple integrals. "Mathematics II" is a logical continuation of the course "Mathematics I".

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Apply functions in the form of power series and Fourier series			✓								
Apply series in approximate calculations (of certain integrals and the solution of Cauchy problems) with an estimate of the errors allowed in this case	✓							✓	✓		
Evaluate the probabilities of random events and work with random variables and functions from them					✓						✓
Apply methods for solving differential equations by numerical methods (Euler's method) and using the operational method			✓	✓							
Differentiate functions of one and several variables, computing certain integrals of functions of one and several (double, triple integrals) variables, both in Cartesian and orthogonal curvilinear coordinates							✓		✓		

PHY 111-112 – Physics I, II
CREDIT – 5 (1/1/1/2)
PREREQUISITE – diagnostic test/PHY111

PURPOSE AND OBJECTIVES OF THE COURSE

The main goal of teaching the course Physics I is to form ideas about the modern physical picture of the world and the scientific outlook.

BRIEF DESCRIPTION OF THE COURSE

Disciplines Physics I is the basis of theoretical training for engineering and technical activities of graduates of a higher technical school and represent the core of physical knowledge necessary for an engineer operating in the world of physical laws. The course "Physics 1" includes sections: physical foundations of mechanics, structure of matter and thermodynamics, electrostatics and electrodynamics.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criteries 3. Student's results**										
Upon completion of the discipline, students should be able to	(a)	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Understand the basic physical phenomena and basic laws of physics, the limits of their applicability, the possibility of using them in practical applications		✓									
Know the basic physical quantities and physical constants, their definition, meaning, units of their measurement				✓	✓						
Analyze and explain natural phenomena and man-made effects from the standpoint of fundamental physical concepts			✓	✓					✓		
Use basic concepts, laws and models of physics, operate with them to solve applied problems.		✓				✓					
Justify which laws describe a given phenomenon or effect, highlight the physical content in applied problems, search and systematize the relevant information					✓				✓		
Compare the meaning of physical quantities and concepts				✓				✓			

HUM100 – Contemporary history of Kazakhstan
CREDITS – 5 (1/0/2/2)
PREREQUISITE – No

PURPOSE AND OBJECTIVES OF THE COURSE

The aim of the course is to familiarize students of technical specialties with the main theoretical and practical achievements of domestic historical science on the problems of the history of modern Kazakhstan, a comprehensive and systematic study of the main stages of the formation and development of Kazakhstani society.
Analyze the features and contradictions of the history of Kazakhstan during the Soviet period;
To reveal the historical content of the foundations of the laws of political, socio-economic, cultural processes at the stages of the formation of an independent state;
Promote the formation of students' citizenship;
To educate students in the spirit of patriotism and tolerance, belonging to their people, the country

BRIEF DESCRIPTION OF THE COURSE

The course Modern history of Kazakhstan is an independent discipline and covers the period from the beginning of the twentieth century to the present day. The modern history of Kazakhstan studies the national liberation movement of the Kazakh intelligentsia at the beginning of the 20th century, the period of creation of the Kazakh republic, as well as the process of formation of a multinational society.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

COURSE OUTCOMES	Criteries 3. Student's outcomes										
Upon completion of the discipline, students should be able to	(a)	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Know the events, facts and phenomena of the Modern history of Kazakhstan	□										
Know the history of ethnic groups inhabiting Kazakhstan			✓		✓						
Analyze the main stages of the formation of Kazakh statehood	□					✓					
Work with historical concepts						✓			✓		
Analyze complex historical events and predict their further development			✓	✓							

LNG104 – Kazakh/Russian language
CREDITS – 10 (0/0/6/4)
PREREQUISITE – Diagnostic test

PURPOSE AND OBJECTIVES OF THE COURSE

- To teach students to listen to statements on well-known topics related to home, study, free time;
- Understand texts on personal and professional topics containing the most common words and expressions;
- Be able to conduct a conversation on everyday topics; describe your experiences; tell your opinion; retell and evaluate the content of the book read, the film seen;
- Be able to create simple texts on well-known topics, including those related to professional activities.

BRIEF DESCRIPTION OF THE COURSE

The language material of the course is selected in such a way that the student, assimilating the lexical and grammatical minimum, had the opportunity to get acquainted with typical communicative situations and himself in such situations found himself, was able to correctly evaluate them and choose the appropriate model (strategy) of speech behavior.

At the same time, the main emphasis of teaching is transferred from the process of transferring knowledge to teaching the ability to use the target language during the implementation of various types of speech activities, which are reading (subject to reading comprehension), listening (under the same condition) and the production of texts of a certain complexity with a certain degree of grammatical and lexical correctness.

The material for classes is selected so that students, while studying the Kazakh / Russian language, acquire the skills of reading, writing and understanding sounding speech based on the simultaneous mastering of the basics of grammar (phonetics, morphology and syntax) and word usage in the course of constant repeated repetition with a gradual complication of tasks.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

COURSE OUTCOMES	Criteries 3. Student's outcomes										
Upon completion of the discipline, students should be able to	(a)	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Know the basics of grammar and apply	□										
Formulate a topic, determine the linguistic means of organizing the text and use them when producing your own speech works			✓	✓							
Know about the methods and techniques of linguosemantic analysis of a scientific text	□										
Distinguish the features of the compositional and semantic organization of a scientific text					✓				✓		
Determine the types, volume and types of additional scientific information contained in			✓								

the text											

LNG108 – English
CREDITS – 10 (0/0/6/4)
PREREQUISITE – Diagnostic test/LNG1051-1056

COURSE AIM AND OBJECTIVES

Provide students with the opportunity to acquire sufficient knowledge to become more free in their everyday social and academic settings. Students are working to improve pronunciation, vocabulary and grammar. Development of academic language skills. To teach students to work with texts, both audio and written, in their specialty. The discipline is a language style that is used when writing academic papers (paragraph, abstract, essay, presentation, etc.) This course is designed to help students become more successful and effective in their learning, developing critical thinking skills and independent learning.

SHORT DESCRIPTION OF THE COURSE

The courses are designed to teach English to university students who need English for work and communication. The courses are multi-level with the following levels: Beginner English, Elementary English, General English I, General English II, Academic English, Business English, Professional English

COURSE OUTCOMES: KNOWLEDGE, SKILLS AND ABILITIES

Course outcomes – student outcomes matrix

COURSE OUTCOMES	**Criteries 3. Student's outcomes**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Know the basics of grammar and apply	✓										
Formulate a topic, determine the linguistic means of organizing the text and use them when producing your own speech works			✓	✓							
Know about the methods and techniques of linguosemantic analysis of a scientific text	✓										
Distinguish the features of the compositional and semantic organization of a scientific text					✓				✓		
Determine the types, volume and types of additional scientific information contained in the text			✓								
Organize and participate in discussions on familiar topics, ask them to repeat and explain some words and phrases.						✓			✓		
Recognize, analyze grammatical structures and vocabulary of academic English in the text	✓				✓			✓			

CSE 677 – Информационно-коммуникационные технологии
КРЕДИТ – 5 (2/1/0/2)
ПРЕРЕКВИЗИТ – нет

PURPOSE AND OBJECTIVES OF THE COURSE

Training in the use of modern information technologies in the field of professional activity. The objectives of the course include:

- To reveal the basic concepts of the architecture of computer systems;
- To reveal the basic concepts of information and communication technologies and subject terminology;
- Teach how to work with software interfaces of operating systems;
- To teach how to work with data in various representations, both tabular structured and unstructured;
- Teach to apply the basic principles of information security;
- To reveal the concepts of data formats and multimedia content. Teach how to work with typical multimedia data processing applications. Use modern approaches to the presentation of the material;
- To reveal the concepts of modern social, cloud and mail platforms, and ways to work with them;
- Teach to use algorithmization and programming methods to solve business process automation problems.

BRIEF DESCRIPTION OF THE COURSE

The course contains a training program aimed at leveling the basic knowledge of students in the field of information and communication technologies. It contains a full range of topics with the predominance of educating practical skills in working with data, algorithmization and programming. The course is designed in such a way as to teach students not only the basic concepts of architecture and modern infrastructure of information and communication technologies, but also to teach them how to use these tools to solve problems of an applied nature. To teach how to optimize processes, apply adequate models and methods for solving practical problems using modern methods and tools of information technology, automate routine processes, be productive and efficient.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Know the architecture of computing systems and the infrastructure of information and communication technologies	✓										
Compare interfaces of modern operating systems		✓						✓	✓		
Distinguish between types of threats to information security, principles, tools and			✓			✓			✓		

methods of data protection											
Explain the work of modern tools with data of various nature and purpose		✓			✓						
Programming in an algorithmic programming language;					✓				✓		✓
Analyze, model, design, implement, test and evaluate information and communication technology systems			✓			✓					✓
Apply modern social, cloud, and email platforms to organize business processes	✓		✓					✓			

HUM132 – Philosophy
CREDITS – 5 (1/0/2/2)
PREREQUISITE – Modern History of Kazakhstan

COURSE AIM AND OBJECTIVES

The aim of the course is the formation of cognitive, rational, communicative, self-educational competencies, the tasks are:
- Promote the development of adequate world outlook guidelines in the modern world;
- To form creative and critical thinking in students;
- Distinguish the ratio of spiritual and material values, their role in the life of a person, society and civilization;
- Contribute to the definition of their attitude to life and the search for harmony with the surrounding world.

SHORT DESCRIPTION OF THE COURSE

"Philosophy" is the formation of a holistic worldview that has developed in the context of the socio-historical and cultural development of mankind. Acquaintance with the main paradigms of the methodology of teaching philosophy and education in the classical and post-classical traditions of philosophy. Philosophy is called upon to develop stable life guidelines, the acquisition of the meaning of one's being as a special form of spiritual production. Contributes to the formation of a moral character of a person with the ability to critical and creative thinking. The theoretical sources of this course are the concepts of Western, Russian, Kazakh scientists on the history and theory of philosophy.

COURSE OUTCOMES: KNOWLEDGE, SKILLS AND ABILITIES

Course outcomes – student outcomes matrix

COURSE OUTCOMES	**Criteries 3. Student's outcomes**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Know the basic terms, main concepts and problems of philosophy	✓										
Distinguish the main philosophical ways of			✓		✓						

solving worldview issues in the context of culture											
Analyze the history of the development of philosophical thought											
Determine alternative ways of posing and solving worldview issues in the history of human development			✓					✓			
Identify the main theoretical approaches in the relationship of a person with society		✓			✓						
Discuss and make rational decisions				✓				✓			

CHEE495 – Chemistry
CREDIT – 5 (1/1/1/2)
PREREQUISITE – no

AIM AND OBJECTIVES OF THE COURSE

The aim of studying the discipline is the fundamental preparation of students in chemistry, contributing to the preparation of the student for interdisciplinary experimental research activities aimed at creating competitive products based on the use of modern methods and design tools, mathematical, physical and computer modeling of technological processes.

BRIEF DESCRIPTION OF THE COURSE

The chemistry course is designed to form an understanding of the basic concepts and laws of chemistry, the properties of organic and inorganic substances, chemical reactions and how to control them.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

Course Outcome Matrix - Student Outcomes

Course Outcomes	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Understand basic chemical phenomena and basic laws of chemistry; the limits of their applicability, the application of laws in the most important practical applications;			✓								
Describe the main chemical quantities and chemical constants, their definition, meaning, methods and units of their measurement;			✓		✓						
Know chemical experiments and their role in the development of science; the purpose and principles of operation of the most important physical and chemical devices.					✓						

Explain the main observed natural and man-made phenomena and effects from the standpoint of chemical interactions;			✓		✓						
Understand the meaning of chemical quantities and concepts; write down the equations of chemical reactions;					✓						
Work with instruments and equipment of a chemical laboratory; use various techniques for processing experimental data.	✓				✓						
Master the use of basic chemical laws and principles in critical practical applications;		✓	✓								
Possess the use of basic methods of chemical analysis for solving natural science problems; correct operation of the main instruments and equipment of the chemical laboratory; processing and interpretation of the results of the experiment.	✓							✓	✓	✓	
Apply critical thinking and problem-solving skills to petroleum engineering problems	✓							✓			
Apply theoretical and practical skills to analyze petroleum engineering data				✓				✓	✓		

CHE559 - Chemistry of Oil and Gas
CREDIT - 5 (2/1/0/2)
PREREQUISITE - Chemistry

AIM AND OBJECTIVES OF THE COURSE

Formation and deepening of knowledge in the field of oil chemistry: about the composition and properties of oil systems, gases of various origins; on the methods of their research, familiarization with the technological classification of oil refining processes, acquaintance with the characteristics of oil as a raw material for distillation processes.

BRIEF DESCRIPTION OF THE COURSE

The discipline gives an idea about the composition and properties of oil systems of various origins, about the methods of their study; the study of differences in the structure and physicochemical properties of individual hydrocarbons as the main components of oils, natural gases and other types of hydrocarbon raw materials, methods for separating multicomponent oil systems, the reasons for the formation of oil dispersed systems and their colloidal chemical properties, hypotheses of the origin of oil.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

Course Outcome Matrix - Student Outcomes

Course Outcomes	Criterion 3. Students' results

Upon completion of the discipline, students should be able to	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Understand the main production processes that represent a single chain of oil and gas processing;			✓								
Describe the main properties of oil and gas hydrocarbons;			✓		✓						
Know the hypotheses of organic and inorganic origin of oil and gas;					✓						
Know the principles of classification of oils and gases;			✓		✓						
Describe the properties and patterns of behavior of oil as a dispersed system.					✓						
Use knowledge about the composition and properties of oil and gas in the appropriate calculations.	✓				✓						
Master the methods of studying the physical, chemical and mechanical properties of oil and gas.		✓	✓								
Possess the use of basic methods of chemical analysis for solving natural science problems; correct operation of the main instruments and equipment of the chemical laboratory; processing and interpretation of the results of the experiment.	✓							✓	✓	✓	
Apply critical thinking and problem-solving skills to petroleum engineering problems	✓							✓			
Apply theoretical and practical skills to analyze petroleum engineering data				✓				✓	✓		

GEO482 – General and Structural Geology
CREDIT – 5 (2/1/0/2)
PREREQUISITE – no

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of this discipline is to acquire practical skills for students to read geological maps, build geological sections, stratigraphic columns, geological maps, qualitatively describe the geological structure of the area according to the geological map and the history of geological development.

BRIEF DESCRIPTION OF THE COURSE

The main methods of geological research, the material composition of the earth's crust - minerals and rocks, the organic world, tectonic processes in the geological history of the planet. Introduction to minerals.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Know the international geochronological and stratigraphic scale			✓								
To investigate the main rock-forming minerals and their physical properties			✓		✓						
Distinguish between the main types of sedimentary, igneous and metamorphic rocks;					✓						
Know the geological activity of exogenous geological processes			✓		✓						
Describe the main types of plicative and disjunctive dislocations					✓						
Use basic techniques for obtaining and processing special information, including using a computer	✓				✓						
Apply mathematical methods in solving typical geological problems; competently use regulatory legal acts when working with documentation..		✓	✓								
Be able to collect the necessary materials for the studied sections of the discipline	✓							✓	✓	✓	
Be able to widely apply the results of geological and analytical studies when analyzing materials and preparing conclusions (reports) on them;	✓							✓			
Apply methods of analytical studies of the substance (determination of physical and chemical characteristics of the substance)											✓

GEO 486 - Geology of oil and gas
CREDIT – 3 (2/1/0/2)
PREREQUISITE – General and Structural Geology

PURPOSE AND OBJECTIVES OF THE COURSE

The main purpose of studying the discipline is for students to acquire basic skills in oil and gas geology, including the ability to describe rocks, formations and the structure of the Earth's crust, which are associated with the occurrence, migration and accumulation of oil and gas deposits.

КРАТКОЕ ОПИСАНИЕ КУРСА

Natural combustible minerals, features of accumulation and transformation of organic compounds during the lithogenesis of sedimentary rocks; formation of deposits; zonality of oil formation processes; migration of hydrocarbons and problems of the origin of oil and gas.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Know the basics of the theory and practice of oil and gas geology;			✓								
Be able to study the movements of liquids and gases by physical and mathematical methods;			✓		✓						
Possess methods of obtaining information about geological objects and organizational and legal means of obtaining permits for subsurface use;					✓						
Know the trends in the development of prospecting, exploration and development of oil and gas fields			✓		✓						
To describe the methods of displaying information about geological objects obtained in the process of studying deposits					✓						
to use physical patterns in assessing the prospects of the territory in search of deposits	✓				✓						
Apply mathematical methods in solving typical geological problems; competently use regulatory legal acts when working with documentation. .		✓	✓								

Possess the skills of independent study and analysis of new theoretical developments in the field of oil and gas geology	✓							✓	✓	✓	
Apply methods of economic assessment of the efficiency of hydrocarbon extraction;	✓							✓			
Apply methods for monitoring the efficiency of field development and extraction of hydrocarbon reserves.											✓

HUM 133 - Fundamentals of Anti-Corruption Culture
CREDIT – 5 (2/0/1/2)
PRECONDITION – The modern history of Kazakhstan

PURPOSE AND OBJECTIVES OF THE COURSE
Study of the basics of anti-corruption culture, system, methods, principles of formation of the basis of anti-corruption culture. Methods of fighting corruption in the Republic of Kazakhstan and in world practice. Formation of a patriot and a citizen capable of living in a new democratic society; political, legal and anti-corruption culture of personality The increased level of formation of Kazakhstani patriotism, civic consciousness, legal and anti-corruption culture, tolerance and socially significant personality qualities among the students.

КРАТКОЕ ОПИСАНИЕ КУРСА
The discipline "Fundamentals of Anti-corruption culture" is an important component and belongs to the number of social and humanitarian disciplines. This discipline reveals the general patterns of the emergence, development and functioning of the anti-corruption culture, and organically related other social phenomena and processes.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
possess the skills of preparing legal documents aimed at shaping the anti-corruption behavior of civil servants;									✓	✓	
analyze the texts of the sources of the law of the Republic of Kazakhstan on anti-corruption issues; - competently interpret regulatory legal acts aimed at the formation of anti-corruption behavior of civil servants;									✓	✓	

regulatory legal acts, including to identify provisions that can create conditions for corruption;										✓	
to identify and assess the corrupt behavior of civil servants, as well as to contribute to its suppression;									✓		
to conduct an examination of constitutional legal acts for their corruption; to participate in the legal examination of draft										✓	
conduct scientific research on the problems of formation of anti-corruption behavior of civil servants;									✓		
constantly monitor current trends, the latest changes in the regulatory framework in the field of formation of anti-corruption behavior of civil servants of the Republic of Kazakhstan and its subjects										✓	
to perform official duties at such a professional level, excluding any corruption manifestations;									✓		
to use scientific and reference literature on the topic of the special course									✓	✓	
to present orally and in writing their conclusions about the patterns and contradictions of the formation of anti-corruption behavior of civil servants;									✓		
apply the acquired knowledge in direct practice in the implementation of the functions of a civil servant.										✓	

CHE 656 – Ecology and life safety
CREDIT – 5 (2/0/1/2)
PREREQUISITE – no

PURPOSE AND OBJECTIVES OF THE COURSE

The main purpose of the course is the formation of concepts, principles and laws of environmental protection and life safety, and the idea of the inseparable unity of professional activity with the requirements of human safety and security and environmental protection.

Tasks of mastering the academic discipline:
- study of the basic laws of the functioning of living systems;
- familiarization with the methods of studying the state of the natural and man-made environment;
- acquisition of skills in analyzing problems of sustainable development, ensuring the safety of life and reducing risks associated with human activities;
- formation of a culture of professional safety, the ability to identify hazards and assess risks in the field of professional activity.

BRIEF DESCRIPTION OF THE COURSE

The course "Ecology and LS" consists of two sections: the first section is the study of environmental issues (man and the biosphere, environmental pollution, environmental safety, environmental risks, international cooperation in the field of environmental protection) and the second section of the BZHD (natural and man-made emergencies, occupational safety, industrial safety)

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Analyze natural and anthropogenic ecological processes and possible ways of their regulation			✓							✓	
To use the acquired knowledge about the laws of interaction of living organisms and the environment in practice						✓		✓			
Apply the main provisions of environmental and labor legislation, sanitary-epidemiological and regulatory requirements for industrial ecology and industrial safety in the workplace		✓	✓								
ситуации To measure the levels of hazards in the environment, in the workplace, to process the results obtained, to make forecasts of the possible development of the situation						✓					✓
To carry out the selection of measures to reduce the negative impact of production processes			✓								

GEN416 - Machine Parts
CREDIT – 5 (2/0/1/2)
PREREQUISITE –

PURPOSE AND OBJECTIVES OF THE COURSE
The purpose of studying the discipline is to form the necessary initial knowledge base of students on the basics of theory, design calculation, design of parts and elements of machines, development and design of design documentation used in the field of future professional activity of the graduate. Development of knowledge, skills and selection skills, analysis of joints, bearings, shafts, gears and other machine elements, as well as their design using computer technology.

BRIEF DESCRIPTION OF THE COURSE
The course includes the concepts of parts and elements of machines, considers the main issues of ensuring their operability. The main objectives of the discipline are: the study of general principles of design and construction, the construction of models and calculation algorithms for typical parts and elements of machines, taking into account the main performance criteria, the development of design skills.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Choose a calculation model and perform an energy-kinematic calculation;	✓										
Choose an electric motor								✓			
Perform calculations of machine elements in the design process;										✓	
Carry out verification calculations of machine elements according to permissible voltages;					✓						
Use modern computer technologies in the calculation and design of machine elements;	✓										

GEN443 - Resistance of materials
CREDIT – 6 (2/1/1/2)
PREREQUISITE – Mathematical analysis I, II. Physics I: Mechanics. Molecular physics and thermodynamics.

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of the course: teaching the future engineer the basics of the science of strength, rigidity and stability of materials and structures, preparing him for the correct choice of calculation and design methods, familiarization with the latest achievements of science and technology in the field of solid deformable body mechanics, in the development of students' logical thinking, independent thinking skills necessary in further work when solving those or other tasks of natural science and technology.

- study of the fundamentals of the strength of materials (definitions, theorems, laws), practical methods of their application;
- in preparation for the study of other general engineering and special disciplines;
- in highlighting the general connection and motives of individual concepts, in replacing private research with more general systematic methods;
- in the development of students' logical thinking, skills of independent thinking and decision-making, necessary in further work when solving certain problems of natural science and technology.

BRIEF DESCRIPTION OF THE COURSE

The course "Strength of materials" examines the laws, theoretical provisions that underlie the mechanics of a deformable solid. Methods of calculation of structural elements for strength, rigidity and stability, methods of calculation and design for the general case of the action of forces, dynamic action of forces, calculation of structural elements beyond the limits of elasticity.

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Accurately and thoroughly argue the course of reasoning,	✓										
Apply the studied material in diverse areas;		✓									
Navigate the basic concepts of deformable solid mechanics;								✓			
Acquire skills in solving problems related to various types of deformations of mechanical systems;											✓
Acquire skills in the experimental study of the mechanical properties of materials, the stress-strain state of the simplest structural elements, handling modern testing machines and measuring equipment;									✓		

HUM 120 - Module of socio-political knowledge (sociology, political science) Political Science CREDIT – 3 (1/0/1/1)

PREREQUISITE – no

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of the course is the political socialization of students of the Technical University, ensuring the political aspect of training a highly qualified specialist on the basis of modern world and domestic political thought.

The aim of the course is to give the future specialist primary political knowledge that will serve as a theoretical basis for understanding political processes, for the formation of political culture, developing a personal position and a clearer understanding of the measure of their responsibility.

BRIEF DESCRIPTION OF THE COURSE

The course of political science is designed to introduce students to the basics of political science and form a general idea of politics, its main aspects, problems, patterns and interaction with other spheres of public life.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
analyze the features of political systems and the functioning of political institutions;	✓										
critically evaluate the theoretical approaches of political science;		✓									
compare political systems, institutions and actors in an inter-country and subnational context, based on the knowledge gained and the methods mastered;								✓			
make proposals and recommendations to public authorities.											✓

Sociology

CREDIT – 3 (1/0/1/1)

PREREQUISITE – no

PURPOSE AND OBJECTIVES OF THE COURSE

formation of theoretical knowledge about society as an integral system, its structural elements, connections and relationships between them, features of their functioning and development, as well as about existing sociological theories explaining social phenomena and processes.

Tasks of mastering the discipline:

- the study of the basic values of social culture and the willingness to rely on them in their personal, professional and general cultural development;

- study and understanding of the laws of the development of society and the ability to operate with this knowledge in professional activities;
- ability to analyze socially significant problems and processes, etc.

BRIEF DESCRIPTION OF THE COURSE

The discipline is designed to improve the quality of both general humanitarian and professional training of students. Knowledge in the field of sociology is the key to effective professional activity of a future specialist, which is impossible in modern society without understanding social processes, as well as without mastering the skills of their correct interpretation.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
to describe the processes taking place in society and the observed phenomena using sociological terminology;										✓	
explain differences in approaches to the definition of sociological concepts;										✓	
to consider social phenomena, institutions and processes from different points of view, to argue your own position on the problem, comparing and comparing some theoretical perspectives;									✓		
to find, analyze and present factual data, analytical information about social groups, institutions, processes and phenomena, revealing abstract concepts using examples involving data of various kinds;										✓	

HUM 120 - Module of socio-political knowledge (cultural studies, psychology)
Cultural studies
CREDIT – 5 (2/0/1/2)
PREREQUISITE – no

PURPOSE AND OBJECTIVES OF THE COURSE

to form undergraduate students' understanding of the specifics of the development of national culture in the context of world culture and civilization, the need to preserve the cultural code of the Kazakh

people, the ability in independent professional activity to pursue a strategy for preserving the cultural heritage of the Kazakh people in a dynamically changing multicultural world and society.
Course objectives:
- to describe the morphology and anatomy of culture as a system of parameters and forms in the contexts: nature, man, society;
- to explain the origin and essence of signs, meanings, archetypes, symbols as a system of cultural code through correlation with the type of material culture determined by the way of being;
- to organize information about the cultural heritage of the inhabitants of Kazakhstan and to determine the channels of their influence on the formation of the culture of the Kazakh people;
- to classify the cultural capital of the Turks, to organize the forms and channels of cultural interaction with the peoples of Western Europe, the Middle East, to identify their contribution to the intellectual and cultural history of mankind and the Kazakh people;
- provide reasoned and reasonable information about the various stages of the development of Kazakh culture as a factor in the preservation of cultural heritage;
- to give an objective assessment of the national cultural heritage from the position of maintaining the status of Kazakh culture, the Kazakh language and their role in the formation of cultural and national identity;

BRIEF DESCRIPTION OF THE COURSE
The course is intended for students of the OP "Cultural Studies" aimed at the development of a socio-humanitarian worldview as the basis for the modernization of public consciousness through the formation of cultural identity, the ability to analyze and evaluate cultural situations based on understanding the nature of cultural processes, the specifics of cultural objects, the role of cultural values in intercultural communication.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE
As part of the course, the student will master the practical use of methods of cultural studies in various aspects of life.
The basic knowledge and skills in the field of philosophy and cultural studies will be presented, as well as methods of comparison, analysis, synthesis, and resolution of the situation by the method of dialogue.
At the end of the course, the student should know:
– information about the cultural heritage of the inhabitants of Kazakhstan and determine the channels of their influence on the formation of the culture of the Kazakh people;
– classification of the cultural capital of the Turks, to organize the forms and channels of cultural interaction with the peoples of Western Europe, the Middle East, to identify their contribution to the intellectual and cultural history of mankind and the Kazakh people;
- provide reasoned and reasonable information about the various stages of the development of Kazakh culture as a factor in the preservation of cultural heritage and the Kazakh language, including modern state programs for its development and modernization.

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
the features of political systems and the functioning of political institutions;	✓										

ritically evaluate the theoretical approaches of political science;		✓									
ompare political systems, institutions and actors in an inter-country and subnational context, based on the knowledge gained and the methods mastered;								✓			
nalyze make proposals and recommendations to public authorities.											✓

Psychology
CREDIT – 2 (1/0/1/2)
PREREQUISITE – no

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of the discipline is the formation of psychological knowledge, skills and competencies necessary in professional activity; the development of psychological thinking of students and the systematization of their knowledge based on the study of general psychological patterns.

Tasks of mastering the discipline:

1) mastering the basic psychological concepts, theories and approaches to the study of personality and society;

2) formation of ideas about the basic principles of functioning of socio-psychological phenomena, psychological patterns of age and cultural socialization of a person, factors of his learning and cognitive development;

3) instilling the skills of using the knowledge gained in the process of mastering psychology in professional activity.

4) develop the skills and abilities of analytical and research thinking, creative development of the content of psychological sources of foreign and domestic authors and methods of obtaining psychological information;

5) formation of critical thinking skills and the ability to apply it in practice.

BRIEF DESCRIPTION OF THE COURSE

The discipline "Psychology" considers the laws of the emergence, development and functioning of mental processes, states, properties of a person engaged in a particular activity, the laws of the development and functioning of the psyche as a special form of vital activity. The study of this discipline is aimed at the formation of psychological culture, worldview, self-awareness, psychological thinking of the individual for social and professional interaction.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**

understand and explain the need for psychological and socio-psychological knowledge in professional activities;										✓	
analyze the main categories of psychology, interpersonal relationships in a group, the characteristics of the activities of various individuals;										✓	
apply psychological knowledge as a means of self-knowledge and self-development;									✓		
to design effective methods of work in various spheres of social communication based on the content of psychological theories and ideas;										✓	

MNG488 - Fundamentals of Entrepreneurship and Leadership
CREDIT – 5 (2/0/1)
PREREQUISITE – no

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of the discipline: to study, systematize and consolidate the foundations of the theory and practice of entrepreneurship in modern economic conditions; to familiarize students with the mechanism of work of business entities; to obtain a comprehensive understanding of the methodology of entrepreneurship. Formation of students' skills to effectively use various sources of power and influence in interaction with people to achieve organizational goals, as well as the development of their personal leadership qualities.

The objectives of the course are to form systematic knowledge about the basics of the organization of entrepreneurial activity, the development of organizational and managerial skills in conducting business, the formation of knowledge about the responsibility of business entities, accounting for assets, liabilities, financial and tax reporting, the study of models of effective communication and teamwork techniques, the formation of skills for effective presentation and public speaking.

BRIEF DESCRIPTION OF THE COURSE

The course "Fundamentals of Entrepreneurship and Leadership" provides a presentation of sections on leadership, business organization, financial accounting and reporting.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Know the basic definitions, functions and tasks of entrepreneurship, the stages of organizing your own enterprise, ethical standards of						✓					

entrepreneurial activity											
Own the mechanism of entrepreneurial activity,				✓					✓		
To characterize the types of entrepreneurial activity and the business environment											
Be able to model and adjust the entrepreneurial activities of small and medium-sized businesses.		✓	✓					✓			
Develop a business plan of the enterprise, determine the strategy of the business being opened, assess market conditions.		✓	✓								
Conduct an analysis of the management situation			✓		✓					✓	
Possess the skills of style formation taking into account situational factors							✓				
Determine business performance	✓										

GEN 429 - Engineering and Computer Graphics
CREDIT – 5 (2/0/1/2)
PREREQUISITE – no

PURPOSE AND OBJECTIVES OF THE COURSE

 study of the theoretical foundations of the execution and reading of design documents, methods of constructing spatial forms on the plane, methods of solving engineering and technical problems in the drawing, the development of students' spatial thinking and instilling skills of independent work;

 teaching students to work with graphic information of various types and content, the basics of graphical representation of information, methods of graphical modeling of geometric objects, rules for the development and design of design documentation, graphical models of phenomena and processes;

 mastering the methods and means of machine graphics by students, acquiring knowledge and skills to work with the AutoCAD computer-aided design system.

BRIEF DESCRIPTION OF THE COURSE

The study of ways to obtain certain graphical models of space based on orthogonal projection and the ability to solve problems related to spatial forms and relationships on these models. Mastering the basic principles and methods of geometric modeling and methodology for the development of graphical applications.

Mastering the knowledge of drawing construction, the ability to read and compose graphic and textual design documentation in accordance with the requirements of regulatory documents, state standards. Familiarization of students with the concept of computer graphics, geometric modeling, graphic objects, with modern interactive graphic systems for solving problems of automation of drawing and graphic works on the example of AutoCAD.

Formation of skills in the use of universal graphic systems for the development and editing of drawings using three-dimensional computer modeling, design automation in relation to the development and execution of design documentation.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
build complex and axonometric drawings of geometric images;						✓					
perform text and graphic design documentation;				✓					✓		
read the assembly drawing and execute working drawings and sketches in accordance with GOST;											
freely navigate in projections with numerical marks;		✓	✓					✓			
work in the universal AutoCAD environment with both 2M views and 3M objects.		✓	✓								
apply methods of graphical representation of objects of professional activity, for example, objects of mechanical engineering, schemes and systems;			✓		✓					✓	
use information technologies, including modern computer graphics tools, in their subject area;							✓				
participate in the development of design and working design documentation in accordance with standards, specifications and other regulatory documents.	✓										

CATALOG OF MANDATORY SPECIALIZED DISCIPLINES

PET499 – Introduction to the specialty
CREDIT – 3 (2/0/1)
PREREQUISITE – no

PURPOSE AND OBJECTIVES OF THE COURSE

This course provides general information about the oil and gas industry and its components: geological and geophysical exploration of oil and gas fields, drilling of oil and gas wells, development and operation of oil and gas fields, collection and preparation of well products, transportation of oil and gas, oil and gas processing. At the end of the course, students will have an idea of: the structure of oil and gas fields, equipment and technological operations for drilling, extraction, collection and preparation, transportation and processing of oil and gas.

BRIEF DESCRIPTION OF THE COURSE

Introduction to the basic concepts and concepts of petroleum engineering, including topics such as drilling and completion of wells, development of oil fields, surface system of collection and preparation of products, transportation and storage.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Describe the basis of the earth's structure, the geochemical carbon cycle, rock types, classification of sedimentary rocks, tectonic actions			✓								
Describe the oil deposit and its components, trap elements and their formation, parent rocks, temperature and maturity of organic rock, maturity of the parent rock, primary and secondary migration			✓		✓						
Understand the basic procedures and roles of all systems used in drilling					✓						
Development of understanding of various aspects in drilling operations, difficulties associated with the analysis and synthesis of various technical problems encountered during drilling operations			✓		✓						
Understand basic concepts for the development of oil fields, as well as methods and technologies of oil production					✓						
To know the basic properties of formation	✓				✓						

rocks and liquids, to know the methods of their calculations and measurements											
Analyze the main elements in the design and optimization of the mining process		✓	✓								
Demonstrating and understanding the difference between risks and uncertainty, and their impact on decision-making in the oil and gas industry	✓							✓	✓	✓	
Application of critical thinking and problem solving skills for petroleum engineering tasks	✓							✓			
Application of theoretical and practical skills for oil engineering data analysis				✓				✓	✓		

PET410 - Fluid and Gas Mechanics
CREDIT - 5 (1/1/1/2)
PREREQUISITE - no

AIM AND OBJECTIVES OF THE COURSE
Studying methods of calculation, analysis, design of hydraulic and gas systems, development of engineering calculation skills and mastering the technique of solving basic problems.

BRIEF DESCRIPTION OF THE COURSE
Continuous fluid model; ways of setting the motion of a continuous medium; decomposition of the motion of an elementary volume of a continuous medium into quasi-solid and deformation; mass conservation law and continuity equation; distribution of forces in a continuous medium; the law of change in the quantities of motion and the equations of dynamics in stresses; the law of moments and symmetry of the stress tensor; the law of kinetic energy change and the general law of conservation of energy in continuum mechanics.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

Course Outcome Matrix - Student Outcomes

Course Outcomes	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Know the conservation equations on which the theoretical study of hydromechanics is based;			✓								
Be able to investigate the movement of liquids and gases by physical and mathematical methods;			✓		✓						
Possess the theoretical foundations of fluid and gas mechanics.					✓						
Know the principles of classification of oils and gases;			✓		✓						

Describe the properties and patterns of behavior of oil as a dispersed system.					✓						
Be able to use knowledge of oil and gas properties in appropriate calculations.	✓				✓						
Master the methods of studying the mechanical properties of oil and gas.		✓	✓								
To be able to apply the fundamental laws of nature (conservation of mass, energy, momentum, etc.) to establish the basic laws of motion of liquids and gases.	✓							✓	✓	✓	
Apply the basic laws of fluid and gas mechanics to calculate the definition of head loss	✓							✓			

PET409 - Thermodynamics and Heat Engineering
CREDIT – 5 (1/0/2/2)
PREREQUISIT – PHY112 Physics II

COURSE AIM AND OBJECTIVES

The purpose of the course: the formation of students' fundamental knowledge on the assessment of the basic methods of transformation and transmission of energy, which are the basics of creating technologies for thermal effects on oil reservoirs, maintaining reservoir pressure in oil, gas, and gas condensate fields and processing the bottomhole zone of oil and gas wells, and designing thermal installations in the oil and gas industry.
The main objective of the course is to study the laws of thermal movement and its transformation into other types of movement and methods of obtaining heat, converting it into other types of energy, distribution, transportation, use of heat using heat machines, apparatus, and equipment in the oil and gas industry.

SHORT DESCRIPTION OF THE COURSE

The discipline describes the basic laws and design relationships of thermodynamics and heat transfer, the principle of operation of the working processes of heat engines, heat power plants, refrigeration machines, and steam generators.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

Course outcomes – student outcomes matrix

Course outcomes	**Criterion 3. Student outcomes**										
Upon completion of the course, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Understand the basic laws and design relationships of thermodynamics and heat transfer,			✓								
Describe the purpose, composition, and			✓		✓						

properties of working bodies of heat engines and refrigerating machines,											
Know the basics of determining the thermodynamic and thermophysical properties of gases, liquids, and solids					✓						
Know the principles of operation of heat and power and heat exchangers.			✓		✓						
Perform calculations and analysis of thermodynamic processes in energy technology equipment.	✓				✓						
Perform calculations and analysis of the temperature regimes of systems and equipment for production, transport, storage, and processing of hydrocarbons,		✓	✓								
Understand and apply the obtained theoretical knowledge in the development of special disciplines in the oil and gas direction.	✓							✓	✓	✓	
Understand and use the methods of drawing up energy and heat balances of energy technological processes in the oil and gas industry,	✓							✓			
Know the methods of calculating the thermal conditions of systems and equipment.				✓				✓	✓		

PET473 - Well drilling technique and technology
CREDIT – 3 (2/1/0/2)
ПРЕРЕКВИЗИТ – Resistance of materials

PURPOSE AND OBJECTIVES OF THE COURSE

Teaching students the basics of well construction technology, well design, scientific understanding of the main technological processes and works in oil production. The acquired knowledge contributes to the formation of the bachelor's skills in drilling both oil and gas wells.

BRIEF DESCRIPTION OF THE COURSE

The discipline describes modern methods and techniques of drilling oil and gas wells, drilling methods, well design, selection of drilling scheme and calculation of the influence of parameters on the drilling method and the influence of drilling fluid on the operation of the bit, as well as their impact on the operating costs of drilling 1 meter. Students will also learn about the difficulties and problems in drilling and methods of their elimination, about inclined drilling, about offshore drilling and platform construction, about technical and economic indicators during drilling, methods of occupational safety and the environment.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
To design and evaluate the drilling system, identify problems and propose solutions for the geometries of wells, including directional and horizontal	✓	✓	✓		✓						
To calculate the pressure from the pump to the bit at each stage of drilling based on rheological models and hydraulic drilling according to API standards.	✓	✓			✓						
To make a casing design, taking into account the pore pressure and the gradient of rock destruction	✓	✓	✓								
Establish a proper well control procedure to ensure the safety of personnel and environmental protection.	✓		✓		✓		✓				
To design a proper well cementing procedure, taking into account environmental and legal issues	✓		✓		✓	✓					

PET 476 - Fundamentals of development and operation of oil and gas fields
CREDIT – 3 (1/0/2/2)
PREREQUISITE –Thermodynamics and heat engineering

PURPOSE AND OBJECTIVES OF THE COURSE

Course objectives: to reveal the basic concepts underlying the development of oil fields; to demonstrate the application of the material balance method in the development of oil fields; to generalize knowledge about the modes of deposit development for use in the material balance equation; to demonstrate the derivation of the main differential equation of radial filtration, the equation of quasi-established and steady-state inflows into the well to reveal the concept of water inflow into the deposit; to demonstrate calculations for forecasting the production of oil and gas fields; to familiarize with the basics of immiscible displacement, to compare possible scenarios of immiscible displacement. Formation of students' knowledge of hydrocarbon extraction methods in the aspect of practical application in professional activity.

BRIEF DESCRIPTION OF THE COURSE

This course covers calculations of the material balance for natural gas, retrograde condensate, non-volatile (black oil) and volatile (volatile oil) oil systems with and without a gas cap, water pressure regime. Students will also learn analytical methods for predicting reservoir productivity using material balance and analysis of the production drop curve, fundamental principles of production engineering and technology, empirical models for analyzing the production drop curve, and future characteristics of natural oil and gas wells. Some topics include the design of mechanized mining methods, rod pumps, gas lift, screw pumps, electric submersible pumps, nodal analysis.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
To derive and use the equation of the material balance of gas systems in combination with forecasting		✓			✓						
To derive and use the equation of the material balance of oil systems in combination with forecasting		✓			✓						
To derive and describe the theory of immiscible frontal displacement and its application					✓						
Design a 5-point flooding and make a forecast of production and injection			✓								
To determine the mechanisms and appropriate conditions of application and their expediency of general auxiliary and tertiary methods of increasing oil recovery											✓

Introduction to performance analysis of unconventional hydrocarbon deposits					✓						
Evaluate the production performance of vertical and horizontal wells in oil, gas and two-phase deposits, including inflow in the formation and flow in the well	✓		✓		✓						✓
To assess problems in the bottomhole zone during oil and gas well production that occur during formation colmatation and well completion, and to assess the impact on production.	✓		✓	✓	✓						✓
Justify the choice of the well completion option, including perforation, filter, perforated shank and gravel filter			✓								
Diagnose problems during mining, identify the source of the problem in the mining system and choose the right method of mining intensification or a mechanized method to solve the problem			✓		✓						✓
Design and optimize the process of hydraulic fracturing in vertical and horizontal wells in traditional and unconventional deposits	✓		✓		✓						✓
Choose the right methods of production intensification to improve production performance in traditional and non-traditional deposits (hydraulic fracturing or acid treatment)	✓			✓	✓						✓
To recognize environmental problems in mining technology						✓		✓		✓	✓

PET481- Opening and development of wells
CREDIT – 3 (2/0/1/2)
PREREQUISITE – Equipment and technology of drilling wells

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of this course is to create an effective link between the process of completion of well drilling and further operation.

BRIEF DESCRIPTION OF THE COURSE

This course will allow students to acquire knowledge and skills in the field of well fastening and separation of formations: well design selection, casing pipes, casing design and calculation, casing cementing, materials and equipment for cementing, calculation of well cementing. Opening and testing of productive horizons. Development, testing and commissioning of wells. Technical project for the construction of a well at sea.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Understand the design of wells, methods, techniques and technology of their construction.	✓										✓
Calculate quantitative and qualitative indicators of well construction.	✓				✓						✓
Know the main problems of well completion and the possibilities of their solution;	✓			✓	✓						✓
Know the main problems of protection of the subsoil and the environment when drilling wells.	✓	✓			✓						✓
Be able to perform basic calculations related to the completion of wells using reference literature.	✓			✓	✓						✓
Master the basic methods of manual and computer calculations related to	✓		✓		✓					✓	✓
the completion of wells.											
Be able to formulate requirements for drilling companies to improve the quality of well construction.	✓			✓	✓						✓

PET479 - Geophysical research of wells
CREDIT – 3 (2/1/0/2)
PREREQUISITE – Physics I.II

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of this course is practical skills of analysis and interpretation of GIS data.

BRIEF DESCRIPTION OF THE COURSE

Fundamental principles of rock physics, types of logging tools, analysis of open shafts, determination of permeability, assessment of the formation without clay and clay sand formations, determination of water saturation, Archie equation, productive reservoir thickness, oil and gas saturation, recoverable reserves, principles of drilling mud logging, acoustic logging, neutron logging, resistivity logging both densities and lithological graphs.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
To determine the basic physical principles of logging an open borehole to assess the properties of the formation	✓										✓
To make an interpretation of the logging data of an open borehole to determine lithology, permeability, water saturation, taking into account limitations and uncertainties	✓				✓						✓
Calculate basic logging data on software	✓			✓	✓						✓
Integration of logging data and core analysis data to determine lithology, permeability, saturation and permeability	✓	✓			✓						✓
Work with logging data to create cross-sectional maps and calculate reservoir volumes and hydrocarbons	✓			✓	✓						✓
Determining how logging data can be used in an integrated tank assessment.	✓		✓		✓					✓	✓
Introduction to the assessment of parent rocks rich in organic substances and the assessment of the total organic content using logging data	✓			✓	✓						✓

PET480 - Well wiring in difficult conditions
CREDIT – 3 (2/0/1/2)
PREREQUISITE – Equipment and technology of drilling wells

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of the course is to gain knowledge about modern technologies, equipment and tools for drilling wells in difficult mining and geological conditions during the exploration of mineral deposits.
The main objectives of the discipline are to study the wiring of wells in fractured and fragmented rocks; in conditions of absorption of washing liquid; with significant natural curvature; drilling of wells in hard and very hard rocks, including rocks causing polishing of diamond drilling tools; drilling of deep wells (on the example of drilling conditions in); in conditions of complicating the selection of a core sample.

BRIEF DESCRIPTION OF THE COURSE

The discipline belongs to special disciplines and enables the future specialist to gain knowledge and skills in the application of modern wiring technologies that ensure high quality of exploration work in combination with high productivity of drilling operations carried out in difficult mining and geological conditions.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
independently acquire new knowledge using modern educational and information technologies			✓								
, use the basic laws of natural science disciplines in professional activities, apply methods of mathematical analysis and modeling, theoretical and experimental research	✓							✓			
Implement, operate and maintain modern machines and mechanisms for the implementation of technological processes in the oil and gas field, ensure their high efficiency, comply with health and safety regulations, comply with environmental protection requirements						✓	✓				
develop plans, programs and methods for testing, measuring and quality control of well products.									✓	✓	
implement and adjust technological processes when conducting wells in difficult conditions						✓	✓				

on land and at sea											

PET477 - Drilling fluids
CREDIT – 3 (2/0/1/2)
PREREQUISITE – no

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of studying the discipline is to transfer to students knowledge about drilling fluids as polydisperse heterogeneous systems obeying the basic laws of colloidal chemistry – the science of surface phenomena in dispersed systems. As a result of studying the discipline, the student must acquire knowledge of: the role of flushing during drilling and completion of wells; about the composition, characteristic properties, applications of various types of drilling fluids, methods of regulating drilling fluids, as well as materials used for this purpose.

BRIEF DESCRIPTION OF THE COURSE

The discipline includes topics such as the classification of drilling fluids, the main technological properties of drilling fluids, the influence of chemical treatment and external factors on the properties of drilling fluids, methods of property management, the choice of density of drilling fluids, programming and technological regulations, circulation system, preparation and cleaning of drilling fluids.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Know the basic technological properties of drilling fluids				✓		✓					✓
Measure the main parameters of washing liquids			✓				✓				
Master the methods of determining and regulating the main technological parameters of flushing					✓			✓			
To develop a complete description of the properties of clay rocks, polymer reagents and aqueous solutions		✓		✓							
Understand the properties of the interface of phases and analyze their effect on the physical and chemical processes in the well.			✓	✓				✓			
Know the structure formation in drilling rigs	✓							✓			✓
To evaluate the influence of chemical treatment and external factors on the properties of drilling fluids					✓						✓
Select the optimal density of drilling fluids		✓		✓						✓	

during the preparation and cleaning of drilling fluids.											

PET482 - Inclined drilling
CREDIT – 3 (2/0/1/2)
PREREQUISITE – Equipment and technology of drilling wells

PURPOSE AND OBJECTIVES OF THE COURSE
The purpose of teaching this discipline is to provide students with information about new technical and technological means of multi–hole and horizontally branched drilling of oil and gas wells, means and methods of designing their profiles, technologies for holding wells on a given trajectory.

BRIEF DESCRIPTION OF THE COURSE
The study of the discipline makes it possible to cross rock layers and mineral deposits in the most favorable direction, avoids the laying of inclined wells and drill vertically inclined wells according to a rational profile, makes it possible to cut mineral deposits at several points from the trunk, i.e. drill multi-barrel wells.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Carry out the necessary calculations	✓										
Interpret TVD, polar and rectangular coordinates and vertical section	✓	✓			✓						
Interpret the severity of the problem associated with the degree of curvature of the borehole		✓			✓				✓		
Design two-dimensional directional wells					✓			✓	✓		
Design horizontal wells					✓			✓	✓		
Determine the best types of completion of such wells					✓			✓			
Determine the deviation and non-magnetic selection of weighted drill pipes		✓			✓						
Directional drilling with rotating KNBC, jet, chipping devices, motors, controlled motors and rotating controlled systems	✓		✓					✓			✓
Drilling of horizontal wells in the depression	✓		✓					✓			
Interpret the torque and weight on the hook, determine which factors will affect the torque and weight		✓			✓				✓		
Determine the cementing requirements for		✓						✓			

directional wells											

PET474 - Destruction of rocks during drilling
CREDIT – 3 (2/0/1/2)
PREREQUISITE – Resistance of materials

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of the course is to form students' knowledge about rocks, about methods of studying the physical and mechanical properties of rocks that have a significant impact on drilling processes, the basic laws of rock destruction at the bottom of the well, about rock-destroying tools and shells for lifting the core, factors that wear out rock-destroying tools and the principles of choosing rock-destroying tools in specific mining-geological conditions.

The main objectives of the discipline are to instill in undergraduates the skills to determine the main indicators of physical and mechanical properties of rocks, to choose rational types of rock-breaking tools and to predict their effective operation in specific mining and geological conditions of drilling operations.

BRIEF DESCRIPTION OF THE COURSE

This course examines the methods of rock destruction; the properties of rocks that determine their strength and drillability; the mechanics of rock destruction; the processes of rock destruction by various rock-destroying tools and methods of intensification of destruction under the influence of various technological factors; the processes of removing the products of rock destruction from the well. Knowledge of this discipline allows you to analyze the phenomena occurring in the process of well formation, predict the performance of bits and drill bits.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
calculate the parameters of drilling modes, drilling indicators, penetration at the drilling site, the cost of one meter of drilling a well, depending on the conditions of working off crowns and bits, their restoration and repair, the competitiveness of the drilling site in comparison with advanced foreign analogues	✓		✓								
to know the physical and mechanical characteristics of rocks that determine the effectiveness of rocks, determine the efficiency of the drilling process, drilling indicators that evaluate productivity; modern methods of drilling wells, patterns of destruction in their application, analysis of application depending on mining and geological conditions;											

possess methods for determining the moment of failure of the bit; methods for choosing a rational type of bit; algorithms for determining rational drilling modes for rotary and downhole drilling engines	✓							✓			

ECA101, ECA102 – Writing and Defending a Thesis (Project)
CREDIT – 12
PREREQUISITE – no

PURPOSE AND OBJECTIVES OF THE COURSE

Development of students' skills to work both in a team and individually; analysis and interpretation of the data obtained; development of new solutions; justification of the decisions made, as well as the results obtained.

BRIEF DESCRIPTION OF THE COURSE

It is a mandatory component of the final certification of students.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Collect information, make calculations and/or analyze data to achieve specific objectives of the thesis and solve engineering problems in the oil and gas industry		✓	✓		✓				✓		✓
Summarize the results of the thesis in the appropriate text, tabular and graphic forms that comply with GOST standards		✓					✓				✓
Provide relevant conclusions from the thesis in accordance with the objectives of the project, confirmed by data, calculations and/ or analysis		✓	✓		✓		✓		✓		
Determine the limitations of the work performed and prepare recommendations for further research, if necessary, supported by evidence presented in the results and discussions of the study		✓	✓		✓		✓		✓		
Determine the significance, potential benefits and possible applications of the results and conclusions of the thesis			✓		✓		✓	✓	✓		
Title the project and write an abstract of the article / presentation of the thesis at the conference							✓				
Prepare thesis slides in Microsoft PowerPoint, which can be used in an oral presentation to demonstrate that the research results, conclusions and recommendations are correct and useful							✓				✓

To present the results of the thesis orally to a group of practical engineers from the oil industry and teachers in 15-20 minutes using PowerPoint slides							✓				

CATALOG OF ELECTIVE DISCIPLINES

PET464 - Grouting mixtures
CREDIT – 3 (2/0/1/2)
PREREQUISITE – General Chemistry

PURPOSE AND OBJECTIVES OF THE COURSE
The purpose of studying the discipline is to transfer to students knowledge about grouting solutions as polydisperse heterogeneous systems obeying the basic laws of colloidal chemistry – the science of surface phenomena in dispersed systems. As a result of studying the discipline, the student must acquire knowledge of: the role of cementing and grouting during drilling and completion of wells; about the composition, characteristic properties, applications of various types of grouting solutions, methods of regulating grouting solutions, as well as materials used for this purpose.

BRIEF DESCRIPTION OF THE COURSE
The discipline includes topics such as classification and basic technological properties of grouting fluids and cement stone, the influence of chemical treatment and external factors on the properties of grouting mixtures, methods of property management, programming and technological regulations, preparation of grouting mixtures.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Know the basic technological properties of grouting fluids and cement stone				✓		✓					✓
Measure the main parameters of grouting solutions			✓				✓				
Possess methods for determining and regulating the main technological parameters of grouting solutions					✓			✓			
Combine the kinetics of hydration and hardening of cement stone for the analysis and study of well data.		✓				✓					
Know the structure formation in grouting solutions	✓							✓			✓

PET501 - Formation Geomechanics
CREDIT – 3 (2/0/1/2)
PREREQUISITE – Resistance of materials

PURPOSE AND OBJECTIVES OF THE COURSE

The discipline "Geomechanics" forms a general idea of the physical processes occurring in the Earth's crust and rock massifs during the development of minerals and forms the skills of self-selection of rational methods of conducting and managing the physical processes of mining based on a comprehensive analysis of geomechanical and mining conditions for the development of deposits.

BRIEF DESCRIPTION OF THE COURSE

This class covers and answers the following questions: how drilling, production and reservoir development activities affect the stress balance in the oil and gas reservoir; how these stress changes can create various problems; how we can drill wells safely; where to place horizontal wells for better production; how geomechanics plays a role in reservoir development. The discipline also makes an introduction to the methodology of calculating the stability of the walls of the well, the construction of a 1D model of mechanical properties (MMC), the analysis of complications and stability of the walls of the well.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Understand the basic concepts of reservoir geomechanics			✓								✓
Apply well data to calculate reservoir and lithostatic pressures.			✓			✓				✓	
Build a summary map of complications on drilled wells.					✓						
Perform calculations to determine horizontal stresses, the angle of internal friction and the coefficient of friction.	✓		✓			✓					
To assess the consolidated risks associated with the stability of the wellbore		✓			✓						✓
Construct and analyze stereographic columns to assess the stability of the borehole		✓				✓					
Predict and optimize well performance using well modeling and uncertainty estimation.		✓			✓						✓

PET 461- Reconstruction and overhaul of wells
CREDIT – 6 (2/1/1/2)
PREREQUISITE –Technology and technique of drilling wells

PURPOSE AND OBJECTIVES OF THE COURSE

The main goal of mastering the discipline is to form students' knowledge and skills in the field of well overhaul, selection of optimal technical and technological solutions for carrying out repair work in wells, technical characteristics of equipment, operating rules, fundamentals of repair in the development of oil and gas fields.

BRIEF DESCRIPTION OF THE COURSE

Reasons for shutdowns of wells for underground repairs. Features of underground routine repairs of wells with various methods of operation. Selection and justification of working fluids for silencing wells. Equipment, aggregates, tools and technical means for underground repairs. Assessment of the quality of the underground repairs carried out. Types of work on the underground overhaul of wells. Repairs related to the troubleshooting of the casing string, with the restoration of the integrity of the cement stone behind the column. Isolation of water penetrating through an unpressurized cement ring. Isolation of waters penetrating through violations of the operational column. Isolation of plantar water in the presence of water cones. Insulation of waterlogged interlayers. Cutting and drilling of the second borehole. Fishing operations in wells and fishing tools. Liquidation of wells. Safety, protection of the subsoil and the environment when performing work on the underground routine overhaul of wells.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Selecting TUBING, packers, and flow control equipment		✓									✓
Evaluate/develop a suitable deposit limitation strategy	✓									✓	✓
Identify key design considerations for vertical and inclined wells, horizontal, multi-barrel, in high pressure/high temperature conditions.		✓			✓	✓					
Choose the appropriate downhole treatment strategy / equipment			✓		✓						✓
To determine the key features and applicability of the main parameters of sand control	✓		✓	✓							
Evaluate problems and measures to correct the causes of colmatation / removing the skin effect	✓		✓		✓			✓			

PET 502 - Methods of intensification of inflow into the well
CREDIT – 5 (2/0/1/2)
PREREQUISITE – Fundamentals of development and operation of oil and gas fields

PURPOSE AND OBJECTIVES OF THE COURSE
Formation of students' basic knowledge about the processes occurring in the bottom-hole zone of the formation during the development of hydrocarbon reserves, technologies for the intensification of inflow.

BRIEF DESCRIPTION OF THE COURSE
Technique and technology of impact on the bottom-hole zone of the formation in order to intensify the inflow into a single well. Reasons for reducing the permeability of the bottomhole zone. Classification of impact methods Fundamentals of the application of rock mechanics to solve problems of oil production technology. Hydraulic fracturing, hydrochloric acid treatment, modeling and diagnostics of hydraulic fracturing, hydrochloric acid treatment of terrigenous rocks, the fight against sand phenomena, and the stability of the borehole. Review of modern improvements and research.
KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Explain the basic geological properties of rocks for the purposes of inflow intensification	✓	✓									✓
Assess the deterioration of reservoir properties of the reservoir, explain how and why this happens	✓	✓									
To define a non-acidic method of combating formation colmatation	✓							✓			
Demonstrate the goals, types and basic principles of hydrochloric acid treatment								✓		✓	
Distinguish acid placement methods and explain pressure diagrams				✓						✓	✓
Explain the quality control and safety of the work		✓			✓						✓
List and explain hydraulic fracturing materials, their importance, including gels and water-based reagents		✓			✓						
Apply a fracturing schedule		✓						✓			
Explain the quality and safety control of hydraulic fracturing				✓			✓	✓			

PET 460 - Quality management in drilling
CREDIT – 4 (2/0/1/1)
PREREQUISITE – Equipment and technology of drilling wells; Wiring of wells in difficult conditions

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of studying the discipline "Quality Management in drilling" is to form students' professional competencies in the field of ensuring the quality of construction of oil and gas wells, as well as general cultural competencies provided for by the state educational standard of higher professional education in the bachelor's degree program.
The study of the discipline will allow students to expand and deepen their knowledge, skills, skills and competence in quality management of drilling wells.

BRIEF DESCRIPTION OF THE COURSE

The discipline "Quality Management in drilling" examines the theoretical and practical foundations of well drilling quality management. Basically, the theoretical foundations of product quality management, the theory and practice of well qualimetry, the methodology of quality management in drilling, theoretical and practical issues of creating quality management systems in drilling, as well as quality conformity assessment in drilling are studied.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Develop scientific and technical, project and service documentation, issue scientific and technical reports, reviews, publications based on the results of the performed research			✓		✓						
To evaluate the prospects and possibilities of using the achievements of scientific and technological progress in the innovative development of the industry, to propose ways to implement them (		✓		✓							
Plan and conduct analytical, simulation and experimental studies, critically evaluate data and draw conclusions	✓									✓	
Manage complex technological complexes (automated fisheries, dispatch control system, etc.), make decisions in conditions of uncertainty and multi-criteria						✓	✓				
Use the basic concepts and categories of production management, organization management systems and analyze possible innovation risks when introducing new					✓						✓

technologies, equipment, systems											
To carry out calculations on projects, technical-economic and functional-cost analysis of the effectiveness of the designed devices, structures, technological processes	✓		✓						✓		

PET 453 - Fundamentals of Exploration well drilling technology
CREDIT – 5 (2/0/1/2)
PREREQUISITE – Equipment and technology of drilling wells; Destruction of rocks during drilling

PURPOSE AND OBJECTIVES OF THE COURSE
The purpose of studying the discipline is to obtain and master knowledge, the formation of practical skills, on the basic terms and definitions of geological exploration; methods of drilling exploration, technical wells, water wells; the basics of drilling technology; possible complications arising from drilling wells and affecting their operation in the future; regulatory and technological and instructional documentation on geological exploration basic rules of industrial safety during geological exploration; features of the functioning of engineering and technical services for the control and management of geological exploration.
The main task of the presentation and study of the discipline is the deep formation of theoretical knowledge and practical skills in the field of technology and technology of geological exploration, for the successful solution of specific tasks, as well as the formation of skills of independent research and teaching activities.

BRIEF DESCRIPTION OF THE COURSE
The discipline "Fundamentals of the technology of drilling exploration wells" examines the issues of drilling operations in the exploration of minerals. The course examines well drilling modes, well construction technologies, well cleaning technologies in the drilling process, calculations for preparing wells for research, justification of well attachment and casing rigging, fundamentals of optimization of exploration drilling. The course examines in detail the issues of improving the core yield.
KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Use the physical and geological properties of rocks in the design of exploration wells	✓		✓								
Determine the mechanical properties of rocks, calculate the strength characteristics of rocks		✓		✓							
Use devices to determine the mechanical properties of rocks	✓									✓	

Analyze the results of determining the mechanical properties of rocks						✓	✓				
Calculate the design of wells					✓						✓
To select the necessary equipment for drilling wells in specific geological and technical conditions			✓						✓		

PET463 - Fundamentals of scientific research and optimization in drilling
CREDIT – 5 (2/0/1/2)
PREREQUISITE – Physics, Mathematics, Geology, general engineering disciplines

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of teaching the discipline is to transfer to students knowledge about methods of statistical processing of experimental data in drilling and the construction of appropriate dependencies, methods for solving optimization problems and methods for constructing mathematical models of real drilling processes and modeling the latter on a PC.

The main objectives of the discipline are the acquisition by students of the ability to carry out statistical processing of the results of observations of technological processes, to reasonably construct an experiment plan and build a mathematical model of a specific drilling process, to competently and promptly use the available software related to the technology of well construction**.**

BRIEF DESCRIPTION OF THE COURSE

The discipline "Fundamentals of scientific research and optimization in drilling" plays an important role in the preparation of bachelors of the Drilling engineering educational program. Knowledge of this discipline allows you to competently set up an experiment and process its results, learn how to represent real technological processes of drilling wells in the form of mathematical models. Processing the latter using a PC allows you to quickly, at the engineering level, solve various tasks that arise during the design and conduct of drilling operations.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Use methods of research of technological processes of drilling operations	✓		✓								
Apply methods and principles of measuring instruments functioning, and practical measurement skills in drilling operations		✓		✓							
Process the results of experiments and build regression equations that are subject to certain drilling processes	✓									✓	
Apply planning methods and conduct						✓	✓				

optimization studies and use practical skills in solving optimization problems related to the well drilling process											
Use the methods of computer modeling of drilling processes					✓						✓
Use the developed programs for PCs that simulate technological processes in the construction of wells.			✓						✓		

PET 503 - Oil and Gas Engineering Workshop
CREDIT – 5 (2/1/0/2)
PREREQUISITE – no

PURPOSE AND OBJECTIVES OF THE COURSE
The development of students' general skills and abilities necessary in research, writing research papers, as well as public speaking.

BRIEF DESCRIPTION OF THE COURSE
Introduction to scientific research; structure of the diploma project, ethical issues; choice of research direction; study of the state of the research issue; analysis of scientific literature; patent search; methodology of scientific research; experiment planning; determination of measurement error; structure and preparation of a scientific article; preparation of a presentation for defense; structure and preparation of a "Proposal for scientific research"; public speaking skills; informative presentation.
KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Prepare an introduction for an article/presentation consisting of the relevance of the research, a literary review of previous works, the need for further study and research objectives					✓		✓		✓		✓
Prepare the Methodology section for the article/presentation, including tasks, data and methods used, as well as assumptions made in the study			✓		✓		✓		✓		✓
Summarize the results in appropriate text, tabular and graphical forms that meet the presentation standards of the Society of Petroleum Engineers (SPE)		✓					✓				✓

Prepare the "Discussions" section for the report/presentation, including analysis and interpretation of the research results		✓			✓		✓		✓		✓
Prepare the section "Used literature" in accordance with the SPE style guide, including a listing of all the literature specified in the technical part of the report					✓	✓	✓		✓		

PET456 - Drilling wells for liquid and gaseous minerals
CREDIT – 5 (2/0/1/2)
PREREQUISITE – Physics, Mathematics, Geology, general engineering disciplines

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of teaching the discipline is to familiarize students with the basics of drilling wells for water, oil and gas, including the design of wells, insulation of permeable horizons, drilling technology, opening and development of productive horizons.

The objectives of the course are to acquire the knowledge and skills necessary for the effective use of the methodology for calculating the receiving part of the well, as well as knowledge about the principles of constructing well structures, about the methods of isolation of permeable horizons, about the basics of drilling technology and modes, about the methods of opening, development and exploration of productive horizons, about the most important elements of the design of drilling rigs and their characteristics.

BRIEF DESCRIPTION OF THE COURSE

The course covers issues related to the typification of geological conditions using small-scale classification sections, the choice of types and designs of bits, calculations of drill and weighted pipes, layouts of the bottom of drill strings, casing pipes, parameters of the drilling mode. It also includes topics on the justification of the choice of the design design of the well, the type of drilling rig, the type of drive of these installations, the selection of the receiving part of production columns, typical profiles of wells, as well as examples of solving typical problems in drilling wells for liquid and gaseous minerals.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Calculate the filter design	✓		✓								
Develop the design of wells for specific geological conditions	✓							✓			
Perform cementation calculations						✓	✓				

Choose rock-breaking tools and calculate the drilling mode									✓	✓	
Develop methods of opening and development of the well				✓				✓			
Make a geological and technical order for drilling wells					✓						✓

PET 452 - Offshore Deepwater Oil Drilling
CREDIT – 5 (2/0/1/2)
PREREQUISITE – Physics, Mathematics, Geology, general engineering disciplines

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose and objective of studying the discipline is to acquire students' knowledge about offshore deep-water oil drilling. This knowledge is needed for application at the objects of future professional activity, as well as for production and technological, managerial, research activities.
As a result of mastering the discipline "Deep-water offshore oil drilling", the following competencies are formed:
- the ability to implement and adjust technological processes when drilling wells for various purposes and the profile of the trunk at sea, transportation and storage of hydrocarbon raw materials.
- the ability to creatively apply drilling processes to problems with intersectoral features.

BRIEF DESCRIPTION OF THE COURSE

The course "Offshore Deepwater Oil Drilling" includes topics such as types of offshore platforms, offshore well construction, offshore well construction technology, offshore drilling platform equipment, offshore well operation, complications during offshore well drilling.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Know the types of platforms for the construction of offshore wells			✓								
Apply knowledge in the process of drilling underwater	✓							✓			
Determine the design of offshore wells	✓		✓								
Analyze the problems of offshore wells and identify ways to solve them									✓	✓	
Calculation of the well design trajectory and selection of appropriate technical and technological means for conducting a well along it		✓									

Selection of equipment for strapping the wellhead					✓						

PET457 - Drilling wells for solid minerals CREDIT – 5 (2/0/1/2)
PREREQUISITE – Equipment and technology of drilling wells

PURPOSE AND OBJECTIVES OF THE COURSE
The main purpose of the course is to give future specialists knowledge about drilling wells for solid minerals, which is carried out for preliminary exploration and industrial evaluation of the deposit. Objectives of the course - when drilling wells for solid minerals, the so-called "delineation" of reserves is performed, that is, the most accurate boundaries of the deposit are determined. To do this, it is necessary to conduct a chemical analysis of the rocks. When drilling, a column of rock is extracted from the well – a core. Core testing allows you to make an accurate "chemical portrait" of the deposit, which sets the general direction of mining operations. Drilling of wells for solid minerals should be carried out with special care, since the success of mining the entire field will depend on the quality of work at this stage.

BRIEF DESCRIPTION OF THE COURSE
The course examines the design of drilling operations in the exploration of ore minerals based on the mining and geological conditions of the deposit, the geological task and the application of modern technologies and techniques of exploratory drilling.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
to choose and justify the methods of drilling wells in specific geological and technical conditions, the	✓										
ability to choose a rock-crushing and auxiliary calibration-centering tool for drilling wells in various mining and geological conditions		✓			✓						
to calculate drill strings for strength and to choose layouts for drilling different intervals		✓									
to select and justify the parameters of drilling modes and evaluate their effectiveness				✓							
knowledge of modern problems of wiring wells of different mining andgeological conditions										✓	
selection of downhole motors for bit drive					✓						

PET462 - Drilling of geotechnological wells
CREDIT – 6 (2/1/1/2)
PREREQUISITE – Equipment and technology of drilling wells

PURPOSE AND OBJECTIVES OF THE COURSE

The main goal of the course is to increase the economic efficiency of prospecting, exploration and production operations during production largely depends on the introduction of new methods and technical means into the practice of drilling wells.

Course objectives:

Students should know:

- the history of development and the current state of well drilling technology and drilling equipment;
- device, operating principle, technical characteristics of modern drilling equipment;
- the main technological schemes and technical means used in drilling geological exploration and geotechnological wells.

BRIEF DESCRIPTION OF THE COURSE

The discipline considers issues related to the construction of geotechnological wells, that is, it covers in detail the technique and technology of drilling, construction and construction of wells for underground leaching of metals and salts, hydraulic extraction of ores, underground sulfur smelting, underground gasification of coal and shale, fastening, opening and development of productive horizons, downhole and wellhead equipment. The issues of safety and environmental protection were also considered.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Identify problems in the construction of technological and hydrogeological wells					✓						
Apply knowledge in the field of uranium deposits	✓							✓			
Determine well designs	✓		✓								
Analyze the problems of geotechnological wells and determine ways to solve them									✓	✓	
Establish a proper well control procedure to ensure the safety of personnel and protect the environment	✓		✓		✓						
Determine the pore pressure and the well rupture gradient based on geological information	✓		✓								

PET465 - Measuring instruments in drilling
CREDIT – 5 (2/1/0/2)
PREREQUISITE – Equipment and technology of drilling wells

PURPOSE AND OBJECTIVES OF THE COURSE

The main purpose of the course is to form students' understanding of modern views on system analysis and automation of well drilling processes, familiarization with the designs of sensors for drilling technological processes, training in theoretical and practical automation methods for solving well drilling problems, familiarization with the methods of managing the processes of field exploitation in difficult geological conditions. The knowledge gained as a result of studying the discipline will allow to form a knowledge base about modern measurement technology and control of technological processes during well drilling

BRIEF DESCRIPTION OF THE COURSE

Objects of control and automation in well drilling. Basic concepts and definitions of the theory of automatic regulation. Elements of automation and control and measuring equipment. Automation of technological processes in the construction of wells. General information about the drilling rig as an object of automation and regulation. Adjustable drive in well drilling. Criteria and algorithms for regulating the drilling process. General information about automatic bit feeding systems. Optimal automatic control of the well drilling process. Automation of descent and lifting operations. Operational reliability of controls and automation equipment. Instrumentation and Automation service, tasks to be solved.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Know the elements of equipment and automation tools	✓										
Be able to analyze and adjust the parameters of technological processes when conducting drilling operations using control and measuring complexes.					✓						
Possess methods for evaluating the parameters of technological modes of equipment operation											✓
Possess modern techniques for optimizing the technological parameters of the drilling process		✓									✓
Determine the technical capabilities of equipment and automation tools, rules for constructing structural schemes of drilling regulators, regulatory criteria					✓						✓
Know the features of drilling modes								✓			

PET 469 - Flushing fluids in exploratory drilling
CREDIT – 5 (2/1/0/1)
PREREQUISITE – Drilling fluids

PURPOSE AND OBJECTIVES OF THE COURSE

The main PURPOSE AND OBJECTIVES OF THE COURSE is to get acquainted with drilling flushing fluids used in exploration drilling for solid, liquid and gaseous minerals and representing heterogeneous and homogeneous dispersed systems of varying degrees of complexity and composition. Widely present drilling flushing fluids on a water and non-water basis. To give detailed information about modern materials and chemicals for the preparation and processing of drilling washing fluids, describes the methods used for their preparation, processing, quality control, cleaning and degassing. To present basic information on the preparation and use of aerated washing liquids and foams, their detailed classification is given.

BRIEF DESCRIPTION OF THE COURSE

This course includes topics such as the influence of the quality of drilling fluids and the mode of well flushing on the efficiency of drilling technology, structure formation and deformation of drilling fluids, equipment and methods for measuring the structural and mechanical properties of drilling mud, filtration of drilling fluids, indicators of properties and flow modes of drilling fluids, patterns of changes in structural and mechanical and filtration properties of drilling mud, types of drilling mud and materials for regulation, formulation and management of drilling mud properties.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Know the operating conditions of drilling fluids in the well	✓										
Know and apply the method of measuring the properties of drilling fluids			✓			✓					
Measure the structural and mechanical properties of drilling fluids					✓						
To investigate the structural and mechanical properties of drilling fluids with temperature changes										✓	
Choose the type of drilling mud for different drilling conditions											✓
Determine and calculate the formulation composition of drilling mud					✓						

PET471 - Accidents during drilling of exploration and geotechnological wells
CREDIT – 6 (2/1/1/2)
PREREQUISITE – Well wiring in difficult conditions

PURPOSE AND OBJECTIVES OF THE COURSE

The main PURPOSE AND OBJECTIVES OF THE COURSE is to get acquainted with the violation of the technological process of well construction caused by the loss of mobility of the drill pipe column

or its breakdown with the abandonment of the elements of the drill pipe column in the well, as well as various objects and tools that require special work to extract. Classification of complications:
- accidents with elements of the drill pipe column;
- tacks of drill and casing strings;
- accidents with chisels;
- **accidents with casing strings and elements of their equipment;**
- accidents due to unsuccessful cementing;
- accidents with downhole engines;
- accidents as a result of foreign objects falling into the well and other accidents.

The objectives of the course are to summarize information about possible accidents and areas of complications in the geological section, analysis and assessment of technological risk with the allocation of risk zones and indication of its degree by intervals, justification of measures to reduce the likelihood of complications.

BRIEF DESCRIPTION OF THE COURSE

The main topics of this course are: accidents when drilling wells, causes of accidents, accidents when fixing wells, accidents with downhole motors, accidents with drill bits, falling into the well of foreign objects, the procedure for investigating and accounting for accidents, accident prevention, prevention of emissions and open gushing, elimination of accidents, fishing tools, complications arising when wiring wells

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Classify tools and devices designed to prevent and eliminate accidents and complications			✓								
Analyze the causes of accidents and complications during drilling of oil and gas wells			✓		✓						
Evaluate accidents during well fixing			✓								
Investigate the causes of accidents	✓				✓						
Assess the consequences of accidents		✓									
Classify accident prevention methods					✓						

PET470 - Accidents during drilling of oil and gas wells
CREDIT – 6 (2/1/1/2)
PREREQUISITE – Well wiring in difficult conditions

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of the course is to study the types of complications and accidents during various technological operations in the process of drilling wells.

The objectives of the course are to study the types of complications and accidents during various technological operations in the process of drilling wells; documentation for complications and accidents, the place of the latter in the balance of the calendar time of well construction; fundamentals of heat and mass transfer and hydrodynamic processes in the "plast-well" system; mining and geological characteristics of the section and technical conditions of complications and accidents.

BRIEF DESCRIPTION OF THE COURSE

The main topics of this course are: general information about complications and accidents in the drilling process, absorption of flushing fluid, violations of the stability of the walls of the well, grabbing and tightening of the pipe column, guttering, gas and oil manifestations, griffins and annular manifestations, spontaneous curvature of the wellbore and methods of prevention and elimination of these complications and accidents.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
process statistical information obtained during well wiring;			✓								
solve technological problems of choosing the best algorithm for recognizing, preventing and eliminating complications and accidents based on the available forces and means;	✓							✓			
draw up projects of work to combat complications and accidents while						✓	✓				
preserving the ecology of the environment and subsoil and ensuring									✓	✓	

PET 478 - Fundamentals of Drilling Supervision
CREDIT – 5 (2/0/1/2)
PREREQUISITE – All major disciplines

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of the course is the acquisition by students of knowledge aimed at the development of disciplinary competencies related to the main technological processes in the construction of oil and gas wells and wells for solid minerals, the dependencies between the decisive parameters of these processes and their efficiency indicators, the technical means used, working conditions, labor organization and management, with methods of designing processes, operations and analysis of their results; formation of the ability to independently use knowledge and skills in this and related fields of knowledge in practice.

BRIEF DESCRIPTION OF THE COURSE
This course will allow students to acquire knowledge and skills in the field of technological control and management of construction, current and capital repairs of oil and gas wells and wells for solid minerals (supervision) in accordance with the technical project and work programs.
KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
to choose and justify the methods of drilling wells in specific geological and technical conditions			✓								
✓ justify the choice of rock-breaking and auxiliary	✓							✓			
calibration and centering tools for drilling wells in various mining and geological conditions						✓	✓				
, perform calculations of drill strings for strength and choose drilling schemes of different intervals											
, perform calculations of the wellbore profile and offer full-scale, technical and technological means	✓	✓								✓	✓

PET454 – Well Geonavigation
CREDIT – 5 (2/0/1/2)
PREREQUISITE – Technique and technology of drilling wells, Geophysical exploration of the reservoir; Inclined drilling

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of the course is to master the knowledge necessary for optimal well wiring, adjusting the drilling trajectory based on the data of the interpreted position of the wellbore relative to the expected geological conditions.

BRIEF DESCRIPTION OF THE COURSE
The course covers the basics of telemetry, measurements and logging during drilling and directional drilling technology, criteria for selecting the minimum required set of logging data before performing geonavigation, errors and uncertainties when drilling horizontal wells related to both geology and limitations of telemetry and logging tools, as well as methods for calculating the well trajectory,

modern methods of geonavigation, fundamentals of azimuth logging interpretation, modeling of various geonavigation scenarios before drilling for risk management.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – student results

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Be able to choose a method for identifying patterns of well deviation			✓				✓	✓			
To justify the choice of the profile of multi-hole and horizontal wells						✓	✓				
Calculate the parameters of the operation mode of downhole motors	✓	✓				✓	✓				

PET468 – Organization and management of oil and gas production
CREDIT – 5 (2/0/1/2)
PREREQUISITE –Geology of oil and gas

PURPOSE AND OBJECTIVES OF THE COURSE

The main purpose of the course is to form students' systematic economic thinking in the field of organization and management in the oil and gas industry as a basis for personal assessment and analysis of specific situations in the oil and gas business.

Course objectives. To gain theoretical knowledge of business planning, methods of control and implementation of business plans, to know the basic conditions of concluded agreements, contracts and contracts, to know the methodological tools for implementing management decisions in the field of operational management to achieve high consistency in the implementation of specific projects and works. Be able to gradually monitor the implementation of business plans and the terms of agreements, contracts and contracts concluded, coordinate the activities of performers with the help of methodological tools for the implementation of management decisions in the field of operational management to achieve high consistency in the implementation of specific projects and works. Possess the skills of step-by-step control of the implementation of business plans and the terms of agreements, contracts and contracts concluded, the ability to coordinate the activities of performers using methodological tools for the implementation of management decisions in the field of operational management to achieve high consistency in the implementation of specific projects and works.

BRIEF DESCRIPTION OF THE COURSE

The course includes the search, analysis and use of regulatory and legal documents, step-by-step control of the implementation of business plans and the terms of agreements, contracts and contracts, coordination of the activities of performers using methodological tools for the implementation of management decisions in the field of organization and management to achieve high consistency in the implementation of specific projects and works in the oil and gas industry.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – results of professional competence

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
To represent schematically the management of operations			✓				✓	✓			
Schematically depict change management						✓	✓				
Consider venture financing	✓	✓				✓	✓				
Evaluate the economy of knowledge-intensive production	✓	✓				✓	✓				
To manage the current processes of efficiently operating enterprises of the oil and gas complex	✓	✓				✓	✓				
Manage projects and programs for the comprehensive modernization of the production and technical base of the oil and gas enterprise	✓	✓				✓	✓				
Build, structure and evaluate business plans, financial models, justify investments in the development of oil and gas complex enterprises	✓	✓				✓	✓				
To organize measures aimed at ensuring the sustainability of the development of oil and gas complex enterprises, mitigating the impact on the environment, reducing the risks of man-made accidents and eliminating their consequences	✓	✓				✓	✓				
Manage projects for the development and implementation of technological innovations in the oil and gas complex	✓	✓				✓	✓				

PET458 – Drilling machines and mechanisms
CREDIT – 5 (2/0/1/2)
PREREQUISITE – Resistance of materials; Machine parts

PURPOSE AND OBJECTIVES OF THE COURSE
The purpose and objective of the discipline is to study drilling machines and complexes that provide drilling of deep wells for oil and gas extraction from the Earth's interior.

BRIEF DESCRIPTION OF THE COURSE
Modern designs of equipment for drilling wells for the purpose of oil and gas production, the device and the main directions of further development of drilling machines and complexes in accordance with the trends of world technological progress; technological and regulatory requirements for drilling

machines and installations; rules for their installation and dismantling, operation and maintenance. Issues of evaluating the effectiveness of machines and equipment for choosing a rational way of their operation; the technical level and ways
to improve the designs and methods of operation of drilling machines and complexes**.**

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – results of professional competence

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
be able to calculate the technical parameters of drilling machines and installations according to the specified technological requirements;			✓				✓	✓			
perform, at the modern technical level, power, strength, kinematic and other engineering calculations of drilling machines;						✓	✓				
analyze designs and technical and economic indicators of known and projected drilling machines and installations;	✓	✓				✓	✓				
design and improve drilling machines using modern achievements of science and technology;	✓	✓				✓	✓				
effectively operate drilling machines and installations in various climatic and mining-geological drilling conditions	✓	✓				✓	✓				
to solve modern scientific and practical problems in the chosen field of work;	✓	✓				✓	✓				
successfully carry out research and management activities;	✓	✓				✓	✓				
process the results of experiments and give them explanations;	✓	✓				✓	✓				

PET459 – Hydraulic mechanics in drilling
CREDIT – 5 (2/0/1/2)
PREREQUISITE – Fluid and gas mechanics; Drilling fluids

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose and objective of the discipline is the acquisition by students of the necessary knowledge about the equations of the state of flushing fluids of various rheology; obtaining skills to determine the

flow rate of the flushing fluid for the removal of sludge to the day surface; the ability to calculate pressure losses in various elements of the circulation system; determine the flow modes of the flushing fluid in the circulation system; application of the acquired knowledge, skills and abilities in subsequent professional activity

BRIEF DESCRIPTION OF THE COURSE

The course "Hydromechanics in drilling" examines rheological models of drilling flushing fluids, thixotropy of liquids, the effect of solid phase concentration, temperature and pressure on the rheological properties of drilling fluids, the pressure of viscoplastic liquids on the walls and bottom of the well, the pressure on the bottom and walls of the well filled with carbonated liquid, the grip of the drill string due to hydrostatic pressure, flow modes liquids, hydraulic monitoring effect of bit nozzles, removal of drilling sludge.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – results of professional competence

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
Determine the flow rate of drilling mud required for the removal of sludge from the well.			✓				✓	✓			
Determine the flow modes of drilling fluids in the circulation system.						✓	✓				
Determine the diameter of drill bit nozzles for the implementation of high-quality well flushing.	✓	✓				✓	✓				
Perform hydraulic calculation of the well being drilled.	✓	✓				✓	✓				

PET483 – Computer simulation of well construction
CREDIT – 5 (2/1/0)
PREREQUISITE – Mathematics I, II

PURPOSE AND OBJECTIVES OF THE COURSE
The purpose and objective of the discipline is the formation of basic knowledge and skills in computer modeling of processes occurring during well drilling.

BRIEF DESCRIPTION OF THE COURSE
This course is designed to study the basics of well planning and drilling workflows on Petrel Well Design, which includes the main topics: analysis of reference wells, well design, well location and

real-time operations. As a result of the course, students receive the necessary skills and tools to improve the efficiency of work and joint activities of specialists. Also, this course presents in a new perspective an approach to visualization of the drilling process.

KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE

Course results matrix – results of professional competence

Course results	**Criterion 3. Students' results**										
Upon completion of the discipline, students should be able to	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
import, create, visualize and manage data from existing neighboring wells, including drilling events, BHA and risk information for planning a new well;			✓				✓	✓			
set up a drilling base and a drilling shaft on an offshore base for precise placement of the mouth and organize wells;						✓	✓				
create and import geological targets that are used at the well planning stage as key points of interest.	✓	✓				✓	✓				
Transmit real-time data to Petrel for quick decision-making, risk reduction and intervention in well drilling	✓	✓				✓	✓				

APPENDIX 1 – SPE COMPETENCE MATRIX

Competency Matrix for General Petroleum Engineering SPE Task Force on Minimal Competency			
TASK	**GENERAL KNOWLEDGE/SKILL**		
	MINIMUM COMPETENCE BREADTH	**MINIMUM COMPETENCE DEPTH**	**ABOVE MINIMUM COMPETENCE**
Understand and use petroleum engineering terminology.	Understand general terminology of all sub- disciplines.	Understand terminology specific to the sub-discipline.	Understand terminology in areas of expertise.
Identify and use relevant 22i9n3d4u2s/tsrpyea-nd company design standards.	Identify what design standards exist in all sub- disciplines.	Understand and use conventional design standards specific to the subdiscipline.	Help create design standards as well as apply standards to nonconventional applications.
Maintain regulatory compliance.	Identify what regulatory bodies have jurisdiction and where to find documentation of the applicable regulations. Understand the essential rules relevant to the work project.	Complete necessary regulatory compliance permitting and reporting specific to the sub- discipline.	Work with regulators on rule changes and exceptions.
Identify and use technical software and informational databases.	Identify what technical software and informational databases exist in all sub- disciplines.	Understand and use conventional technical software and informational databases specific to the subdiscipline.	Help create technical software and informational databases as well as apply technical software and informational databases to nonconventional applications.
Use project management skills.	Understand the elements of project management (costing, scheduling, contracting, logistics, etc.).	Apply project management skills to projects within sub-discipline.	Apply project management skills in larger projects and across subdisciplines.

Understand and apply geoscience principles.	Understand geoscience principles (e.g., fracture gradients, well bore stability, pore pressure prediction).	Understand and apply geoscience principles within sub-discipline.	Apply geoscience principles across sub-disciplines.
Perform decision and risk analysis and contingency planning.	Understand decision and risk analysis concepts and the value of contingency planning.	Conduct risk assessments within subdiscipline and prepare contingency plans to manage risks.	Conduct risk assessments across subdisciplines for a project and prepare contingency plans.
Monitor operations and optimize performance.	Understand basic monitoring and optimization techniques. Carry out directed well optimization plans or programs.	Perform conventional operations monitoring and engineering design specific to a sub-discipline and make optimization recommendations.	Perform operations monitoring in areas of expertise or across subdisciplines and make recommendations to optimize system performance.
Evaluate economics of project.	Understand basic economic principles (PV analysis, lease vs. purchase, etc.).	Perform economic evaluations of projects within the sub-discipline.	Perform economic evaluations across sub- disciplines or in specialty areas within a sub-discipline.
Participate in a multidisciplinary/cultural team.	Understand the purposes and value of a multi- disciplinary/ cultural approach to a project.	Perform all the conventional duties of the sub-discipline team member.	Lead a multi-disciplinary/ cultural team and be able to perform the duties of two or more sub-disciplines.
Perform duties in ethical manner.	Demonstrate the ethical code of behavior for the general practice of engineering.	Demonstrate ethical behavior in subdiscipline.	Demonstrate ethical behavior and provide leadership in ethical behavior across disciplines.
Promote engineering professionalism.	Maintain membership in technical and professional societies and pursue professional license and/or certification.	Participate actively in technical and professional societies and obtain professional license and/or certification.	Encourage othersin industry to join and actively participate in technical and professional societies and to

			become licensed or certified.

APPENDIX 2 – REVIEWERS' WORK

Рецензия на образовательную программу по специальности "Drilling Engineering" для уровня бакалавриата,
разработанную коллективом преподавателей кафедры Нефтяная инженерия ИГиНГД им.К.И.Турысова КазНИТУ имени К.И.Сатпаева

Образовательная программа «**Drilling Engineering**» бакалавриата составлена для подготовки специалистов широкого профиля в нефтяной промышленности, управления безопасным и эффективным бурением скважин для добычи нефти или газа с фундаментальной подготовкой по базовым дисциплинам – Математика, Физика, Сопротивление материалов, Механика жидкости и газа.

Вместе с тем предусмотренные в образовательной программе общетехнические и инженерные дисциплины, а также спец. дисциплины способствуют успешному формированию у студентов профессиональных компетенций и хорошего технического понимания научных принципов таких дисциплин, как Техника и технология бурения скважин, Геология нефти и газа, Разрушение горных пород при бурении, Геомеханика пласта.

Программа направлена на подготовку специалистов, которые наряду с профессиональными компетенциями приобретают социально-гуманитарную подготовку на основе законов социально-экономического развития общества, истории, основ предпринимательства и лидерства, современных информационных технологий.

Считаю, что образовательная программа «**Drilling Engineering**» уровня бакалавриата отвечает потребностями рынка труда, задачам индустриально-инновационного развития страны и может быть рекомендована к внедрению в учебный процесс.

Заместитель генерального директора по геологии и разработке АО «Озенмунайгаз» **Ш. Пангереева**

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Рецензия на образовательную программу по специальности "Drilling Engineering" для уровня бакалавриата,
разработанную коллективом преподавателей кафедры Нефтяная инженерия ИГиНГД им.К.И.Турысова КазНИТУ имени К.И.Сатпаева

Образовательная программа «**Drilling Engineering**» бакалавриата составлена для подготовки специалистов широкого профиля в нефтяной и геологоразведочной отраслях, управления безопасным и эффективным бурением скважин для разведки и добычи нефти, газа, твердых полезных ископаемых, воды с фундаментальной подготовкой по базовым дисциплинам – Математика, Физика, Сопротивление материалов, Гидромеханика в бурении и т.д.

Из представленной образовательной программы (ОП) видно, что предусматривается подготовка специалистов по двум направлениям: бурение скважин на нефть и газ, а также бурение скважин на твердые полезные ископаемые и воду.

Большим достоинством представленной образовательной программы является то, что возобновляется подготовка специалистов-буровиков для геологоразведочной и горной отраслей, так как на сегодняшний день ни один ВУЗ Республики Казахстан не готовит специалистов по данному направлению и ощущается острый дефицит специалистов по данному направлению.

С этой целью в образовательной программе предусмотрены такие специальные дисциплины как «Бурение скважин на твердые полезные ископаемые», «Бурение геотехнологических скважин», «Разрушение горных пород при бурении скважин», «Основы научных исследований» и т.п.

Вместе с тем предусмотренные в образовательной программе общетехнические и инженерные дисциплины, а также специальные дисциплины способствуют успешному формированию у студентов профессиональных компетенций и хорошего технического понимания научных принципов.

Программа направлена на подготовку специалистов, которые наряду с профессиональными компетенциями приобретают социально-гуманитарную подготовку на основе законов социально-экономического развития общества, истории, основ предпринимательства и лидерства, современных информационных технологий.

Считаю, что образовательная программа «**Drilling Engineering**» уровня бакалавриата отвечает потребностям рынка труда, задачам индустриально-инновационного развития страны и может быть рекомендована к внедрению в учебный процесс.

С уважением:
Заместитель Председателя Правления
по производству АО «Волковгеология» **Джаукенов А.А.**

Рецензия на образовательную программу по специальности "Drilling Engineering" для программы «Бакалавриат»

Специалисты-буровики, управляя безопасным и эффективным бурением скважин для добычи нефти или газа, жизненно важны для нефтяной промышленности. Буровики непосредственно планируют, разрабатывают и контролируют все операции по бурению нефтяных и газовых скважин. Они работают на суше, на морских платформах или на мобильных буровых установках, нанятых либо эксплуатирующей нефтяной компанией, специализированным буровым подрядчиком, либо сервисной компанией.

При разработке и формировании образовательной программы "Drilling Engineering", коллектив авторов кафедры Нефтяная инженерия использовал нормативные документы, а также материалы Международного общества инженеров нефтяников (Society of Petroleum Engineers).

Основной целью образовательной программы является предоставление студентам необходимых знаний и навыков, соответствующие требованиям современной индустрии и ведущим нефтяным образовательным программам мира. Это наглядно представлено в Основных критериях и Результатах обучения. Структура ОП и содержание модулей отражают необходимые условия для формирования базовых знаний в естественно-научных дисциплин, способствующих формированию высокообразованной личности с широким кругозором и культурой мышления.

Согласно формируемым в ОП компетенциям, выпускник будет способен составлять и оформлять технико-технологическую документацию, применять процессный подход в практической деятельности, сочетать теорию и практику, использовать метод технико-экономического анализа; уметь осуществлять, эксплуатировать и обслуживать технические процессы и оборудование, используемое при строительстве и ремонте нефтяных и газовых скважин; организовывать работу структурных подразделений, осуществляющих бурение и ремонт скважин для достижения поставленной цели, осуществлять сбор данных для выполнения работ по проектированию бурения скважин.

ОП предусматривает проведение учебной и производственных практик и выполнение итоговой работы в виде дипломного проекта, который также предусматривает изучение и анализ отечественной и зарубежной научно-технической литературы по направлению исследований в области бурения.

Данная образовательная программа по специальности "Drilling Engineering" отражает лучшие мировые практики в области технологии и техники бурения скважин и гармонично сочетает опыт и знания казахстанских ученых и инженеров.

Разработанная ОП в полной мере соответствует заявленному уровню подготовки бакалавра.

Ведущий инженер производственно-технического отдела **Ибрашов Ж. Р.**

APPENDIX 3 – REVIEW OF THE PARTNER UNIVERSITY

Рецензия
на модульную образовательную программу «Drilling Engineering» уровня бакалавриата, разработанную коллективом преподавателей кафедры Нефтяная инженерия Института геологии и нефтегазового дела Казахского национального исследовательского технического университета имени К.И. Сатпаева

Нефтегазовый комплекс Республики Казахстан является основой национальной экономики, предопределяющей темпы развития страны, создающей предпосылки для эффективного использования различных видов ресурсов, а также генерирующей технологические импульсы для инновационных разработок как внутри комплекса, так и в смежных отраслях. Реализация инновационных разработок в области бурения и обеспечения добычи нефти или газа, требует высококвалифицированных специалистов, обладающих знаниями, умениями, навыками и компетенциями, позволяющими видеть, анализировать и находить пути решения инженерных проблем в области профессиональной деятельности с использованием современных технологий и результатов экспериментально-исследовательских работ.

В характеристике модульной образовательной программы «Drilling Engineering» (далее – МОП) указаны: миссия, цели и задачи МОП; срок освоения МОП; квалификация, присваиваемая выпускникам; виды профессиональной деятельности, к которым готовятся выпускники; планируемые результаты освоения МОП, и др.

МОП обеспечивает: проведение учебных занятий в различных формах по дисциплинам (модулям); проведение практик, проведение контроля качества освоения образовательной программы посредством текущего контроля успеваемости, промежуточной и государственной итоговой аттестации обучающихся.

Базовая часть МОП является обязательной и обеспечивает формирование у обучающихся компетенций, установленных ГОСО высшего образования.

Вариативная часть образовательной программы направлена на расширение и углубление профессиональных компетенций и включает в себя дисциплины, установленные с учетом требований работодателей.

В образовательной программе определены планируемые результаты обучения по дисциплинам и модулям, а также компетенции, формируемые у обучающихся при интеграции результатов обучения.

Структура модульной образовательной программы в целом логична и последовательна. МОП обеспечивает последовательность изучения дисциплин, основанную на их пререквизитности, рациональное распределение дисциплин и практик по семестрам с позиций равномерности учебной нагрузки студента.

Дисциплины, включенные в общие модули и дополнительные модули, способствуют формированию духовного и общественного сознания, социально-ответственного поведения в обществе, понимания значимости профессиональных этических норм и следование этим нормам, а также формированию полиязычного высококвалифицированного, конкурентоспособного специалиста, владеющего языковой компетенцией на основе параллельного овладения казахским, русским и английским языками, мобильного в международном образовательном пространстве и на рынке труда, способного коммуницировать в поликультурном сообществе.

Дисциплины, входящие в междисциплинарный модуль, формируют фундаментальные знания, необходимые для усвоения профессиональных умений и навыков. Дисциплины, входящие в модули специальности, способствуют формированию теоретических и практических знаний, умений и навыков, необходимых для профессиональной деятельности.

Модули специальности обеспечивают теоретическую и практическую подготовку по всем аспектам буровых работ от начала до завершения.

Модуль «Итоговая аттестация» способствует закреплению и углублению у студентов теоретических знаний в области профильных дисциплин; приобретению практического опыта и навыков по специальности.

Практика является обязательным элементом МОП. В период практики студенты изучают общие сведения о предприятии, его историю, схему управления и структуру предприятия, основные и вспомогательные цеха и их взаимодействие, химизм основного технологического процесса, устройство и назначение основных аппаратов, а также приобретают навыки работы на технологических установках.

В связи с вышеизложенным, считаю, что рассматриваемая модульная образовательная программа «Drilling Engineering» в полной мере соответствует заявленному уровню подготовки бакалавров, обеспечивает решение одной из актуальных задач Республики Казахстан - подготовку высококвалифицированных специалистов в области инженерии бурения.

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