

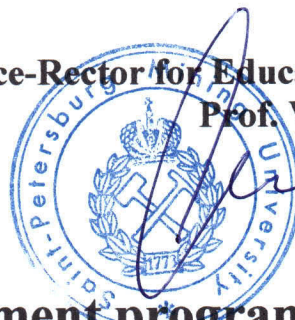
THE FIRST HIGHER TECHNICAL UNIVERSITY IN RUSSIA



MINISTRY OF EDUCATION AND SCIENCE OF THE RUSSIAN FEDERATION
Federal State Budgetary Educational Institution of Higher Education
"Saint-Petersburg Mining University"



Approved by
Vice-Rector for Educational Activity
Prof. V.A. SHPENST



01/12/2016

Professional development program

«Design, construction and operation of gas and
oil and gas storage»

Direction of training: «Oil and gas»

Attendance: full-time

Course leader:

Associate professor of the Department of oil
and gas transportation and storage

G. H. Samigullin

Course Developer:

Associate professor of the Department of oil
and gas transportation and storage

M. N. Nazarova

ST. PETERSBURG
2016

1. General Provisions.

1.1. Course objectives:

This training is the study of the theoretical and methodological issues of design and exploitation of gas and oil pipelines, gas systems, pumping and compressor stations, oil depots, gas storage facilities, constructions, repair and test operation.

1.2 Professional skills

For General Professional skills see Table 1.

Table 1 – Professional skills

№	Categories	Professional skills
1	Production and technology; Management; Research; Design.	The ability to develop technical documentation on main gas pipelines design, gas storages facilities.
2		Safety operations of gas and oil pipelines, gas systems, pumping and compressor stations, oil depots, gas storage facilities, constructions, repair and diagnostics.
3		The ability to perform operational and process calculations, to select the best different types of equipment for the implementation of safe operations of pipeline transportation and storage facilities.
4		Methods and ensuring of element safety of gas and oil pipelines, equipment, storage facilities, tank farms, pumping and compressor stations.
5		Design of the technological scheme and schedule of construction, selection of methods, techniques and technology.

1.3. Requirements for the training program

To achieve the professional skills specified in table 1.2 students should:

Gain knowledge of:

- on the General laws of the statics and kinematics of liquids and gases, their interaction with solids and surfaces, delineation, principle of operation and calculation methods of hydraulic machines and equipment;
- about the basic laws of thermodynamics and heat transfer;
- about physical and chemical properties of new materials;
- on the main problems of design, constructions, operations, repair and management of oil and gas equipment;

Gain skills to:

- design industrial facilities, carry out the calculations of construction designs and technological processes of construction, operation or repair of main pipelines;
- act in accordance with the requirements of standard design, technological and operational documents;
- develop and implement activities to improve environmental and industrial safety of oil and gas production;

Get practical experience of:

- evaluation of physical and mechanical properties of pipe-construction materials;
- evaluation of technical condition of pipelines, welds, assemblies and machines;
- application of the updated regulatory documents in the design, construction and operation of trunk oil pipelines and storage facilities.

1.4. Course description

Type of training activities	Hours
Program	216
Lectures	98
Laboratory and practical work	118
Individual work including preparation for the final exam	200
Individual Project	120

1.5. Course structure

№	Module	Total hours	Including		Competences list (tab. to 1.2)
			Lectures	Laboratory and practical work (room number)	
1.	Technical	60	28	32 (7206, 7301, 6209, 2015)	1, 3
2.	Professional	80	36	44 (7206, 7301, 6209, 2015)	2 - 3
3.	Special professional module	76	34	42 (7206, 7301, 6209, 2015)	4 - 5

1.6. Final examination

Final examination is taken in the form of Individual Project.

1.7. Certificates

Diploma of Professional Retraining of a standard form (after requalifying in Russia).

1.8. Training process staffing

№	Full name	Education, qualifications	Position, academic degree, academic rank, work experience (years)	Total number of publications
Course Leader				
1	Nazarova M.N.	Ufa State Petroleum Technological University, mechanical engineer	Ph.D., Associate professor, 16	30
Lecturers				
2	Voronov V.A.	Saint-Petersburg Mining University, engineer	Ph.D., Associate professor, 11	25
3	Dukhnevich L.N.	Tyumen State oil and gas University, mechanical engineer	Ph.D., Associate professor, 18	20

1.9 Course Program

Module	Content of training material, laboratory work and practical lessons, self-study	Hr.
Module 1. Technical		
1. Fundamentals of Oil- and Gas-Field Engineering	The value of oil and gas in the national economy of the Russian Federation; shale oil extraction as an industrial process for unconventional oil production; composition and properties of oils and natural gases; a summary of the of Geology of oil and gas; drilling of oil and gas wells; the concept of the well structure; oil and gas production; reliability physics of oil and gas; exploitation and evaluation of oil and gas fields; methods of increasing productivity of oil and gas wells; the collection, transportation and primary processing of oil and gas fields.	8
	<u>Practical work:</u> 1. Calculation of the basic properties of oil 2. Calculation of the basic properties of gas 3. Parameters calculation of wellhead equipment and pipelines	8
2. Hydromechanics of oil and gas	Physical properties of oil and gas; fundamentals of kinematics; Laws and Equations of Statics and dynamics of liquids and gas; one-dimensional flows of fluids and gases; elements of similarity to hydrodynamic processes; theory of hydrodynamic resistance; fluid rheology; viscous-fluid flow theory; fundamentals of filter theory; fluid mechanics in oil and gas.	8
	<u>Labor:</u> 1 Viscosity determination. 2 Fluid mechanics. 3 Calibration of the flowmeter. 4 The study on resistance along the length of the pipeline. 5. Pump head coefficient.	12
3. Engineering thermodynamics	Engineering thermodynamics; basic concepts and definitions; First and second laws of thermodynamics; thermodynamic processes; cycles: compressor, reciprocating engines, internal combustion, gas turbine, refrigeration systems and transformers; phase transitions; theory of heat transfer; thermal conductivity; convective heat transfer; thermal radiation; heat transfer; fuels; fundamentals of combustion theory; foundations of energy; renewable sources of energy.	8
	<u>Practical work:</u> 1 Parameters of a compression facility. 2 Gas-turbine facility parameters calculation.	8
4. Health, Safety and Environment	Introduction; Health, Safety and Environmental Policy; Health, Safety and Environment Management System; requirements for safe operation of gas equipment and its utilization; the protective device of oil and gas equipment; fire safety; environmental safety.	4
	<u>Practical work:</u> Fault identification. Analysis of risk operation processes.	4
2. Professional		
1. Basics of oil and gas processing	Oil and gas – hydrocarbons; classification of processes of oil refining and gas; refining, primary and secondary processes	20

	of refining; petrochemical and organic synthesis; fuel and oil circuits of oil refining; processing of gas; refining of gas and gas condensate; refined products of oil and gas.	
2. Design and operation of petroleum storage depots and filling stations (filling stations)	Oil tank farm: facilities of oil tank farm, master plan, location of facilities; production operations; tank farms; reduction of losses of oil products during technological operations; heating of oil products transportation of oil products; oil products; petrol stations (gas stations); gas stations (gas stations).	30
	<u>Practical work:</u> Project of a vertical cylindrical tank	12
3. Booster Station	Theory of oil transfer pumping station and compress fluids and gas; pumps and compressors parameters; methods for adjustment of machinery; regulation of the joint operation of pump stations and pipeline; pumps and compressors installation; main equipment of pumping and compressor stations.	30
	<u>Practical work:</u> 1 Calculation of pumping equipment. 2 Calculation of compressor equipment.	12
4. Process automated control system	Automatic management of production processes; classification of systems of automatic control (SAC); sustainability, quality, characteristics of the SAR; methods and means of automatic control of technological parameters (TP); technical means of automation systems and industrial control, a block diagram of an automated process, technical means of automated control systems, microprocessors in the oil and gas industry; elements of industrial pneumatic automation, actuators, process control systems, hydrocarbons transport systems.	30
	<u>Practical work:</u> 1 Techniques, measures automatic control of technological parameters. 2 Technical means of automation systems and industrial control.	16
3. Special professional module		
1. Construction of oil and gas pipelines and storages	Construction of pipelines; calculations for strength and stability; scheme laying of pipelines, construction of pipeline crossings over natural and artificial obstacles, trenchless technology of laying pipes; restoration of pipelines; corrosion protection of pipelines; structural and insulating materials for oil and gas pipelines; technology of gas and oil pipelines repair; organization of construction of main pipelines, pumping, compressor stations and oil depots.	40
	<u>Practical work:</u> 1 Calculation of pipe wall thickness of main oil pipelines. 2 Calculation of the girder transition. 3 Stability analysis of underground piping. 4 Calculation of directional drilling parameters. 5 Calculation of parameters and selection of construction equipment.	16
2. Operation of oil pipelines and oil storage	Pipeline transportation of crude oil; construction; pump systems; pumping stations equipment; operation of pumping	40

tanks.	units and stations; main pipeline design; pumping stations along; choice of rational modes of operation of the trunk pipeline; mode of operation of the pipeline when disconnecting the intermediate pumping station; methods of increasing productivity of oil pipelines; cleaning of the pipeline. Pipeline transportation of gas; the composition of the structures and classification of main gas pipelines; technological calculation of the main gas pipeline; accumulating capacity of the gas pipeline; hydration forms in gas pipelines; Gas distribution networks, fundamentals of hydraulic calculation of gas networks; gas-distributing stations, main equipment of gas pipelines.	
	<u>Practical work:</u> 1 Process design of piping. 2 Arrangement of pumping stations along the route. 3 Hydraulic calculation of gas stub network. 4 Calculation of parameters of gas regulators.	14
3. Diagnostics engineering	Diagnostics overview of oil and gas facilities; physical and theoretical foundations of methods of non-destructive control of objects of production and storage of oil and gas; General information methods in diagnostics; diagnostics of linear parts of trunk pipelines; diagnostics of pump and compressor stations; tank diagnostics; probabilistic statistical assessment of residual life of the equipment pump and compressor stations and maintenance of pipelines.	44
	<u>Practical work:</u> 1 Calculation of residual life of the pipeline. 2 Calculation of probability of trouble-free operation.	10
	<u>Laboratory work:</u> 1 Foundation of ultrasonic testing. 2 The equipment for laser shaft testing alignment.	10
4. Organization and management of production	Principles of construction, operation and maintenance of oil and gas objects; modeling of production and operation; organization of material and technical provision of facilities, planning education and training; organization and planning in the reconstruction, repair and technical re-equipment of oil and gas facilities.	46
	<u>Practical work:</u> Calculation of schedule for construction of oil and gas pipelines and storages.	12

1.10 Individual projects of professional retraining program “Design, construction and operation of gas and oil and gas storage”

1. The construction of oil and gas pipelines and storages.
2. Engineering project of Booster Station.
3. Design and operation of petroleum storage depots and filling stations.

Internet resources:

1. <http://www.gazprom.ru>
2. <http://www.transneft.ru/>

3. <http://www.gazpromgr.ru/>