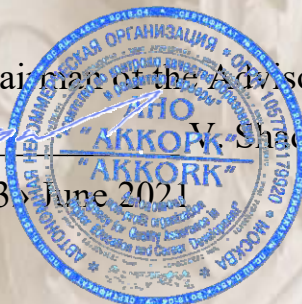


**Approved**

Chairman of the Advisory Council

 V. Shadrnikov

«03» June 2021



## **REPORT**

**on the results of the external evaluation of the educational programme  
Energy and resource-saving processes in Chemical technology,  
Petrochemistry, and Biotechnology,  
“Industrial ecology and rational use of natural resources” profile  
Master’s degree**

**Samara State Technical University (SamSTU)**

Reviewers:

Kurbatova A.I.

Yefimova I.I.

Basamykina A.N.

Korovin O.L.

Manager Soloveva Anna

**Moscow – 2021**

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## SUMMARY OF THE PROGRAM

The Master's degree program Energy and resource-saving processes in chemical technology, petrochemistry, and biotechnology, "Industrial ecology and rational use of natural resources" profile is implemented by the Chair of Chemical technology and industrial ecology of the Institute of Oil and Gas Technology, and allows awarding a Master's degree in industrial ecology and rational use of natural resources. The program is managed by the Rector of SamSTU, Doctor of Technical Sciences, Professor Dmitry Bykov.

A visit of a hybrid format (site/online) within the framework of the external evaluation of the program was conducted by AKKORK experts in the period from April 12 to April 13, 2021.

### *Strengths of the programme*

The educational programme Energy- and resource-saving processes in chemical technology, petrochemistry, and biotechnology was developed according to the Federal State Educational Standard of Higher Education in the field of training Energy- and resource-saving processes in chemical technology, petrochemistry, and biotechnology (Master's level), registered with the Ministry of Justice of the Russian Federation on 16.12.2014 № 35190, and corresponds to the 7<sup>th</sup> level of the European Qualifications Framework.

1. The emphasis on practice-oriented education helps to bring the expected learning outcomes closer to the requirements of the employers' community. Update of the program is implemented by including new academic disciplines and practices and is focused on the development of a variable practice-oriented component and appropriate educational activities coordinated with the educational request of students. The program objectives are aligned with the labor market demands. This is confirmed by the direct involvement of employer representatives (Giprovostokneft and Srednevolzhsky Research Institute for Oil Refining) in the educational program development and implementation.

2. A significant part of the academic staff of the educational institution has practical experience in the field of environmental safety, energy-, and resource-saving at chemical and petrochemical enterprises.

3. Advanced educational technologies, namely, project-based learning methods, practice-oriented methods of work on information platforms and with the use of software installed in employer organizations, and gamification methods are used in the training process.

4. A good teacher-student ratio, i.e. a limited number of students per teacher.

5. An effective supporting system for Masters has been created in the framework of the educational program, as well as effective academic advising is carried out. Masters are actively involved in the implementation of research projects carried out on the assignments of industrial enterprises of the Region (Kuibyshev Refinery, Syzran Refinery Plant, Novokuibyshev Refinery, Samaraneftegaz, KuibyshevAzot, and Tarkett).

6. The scientific and analytical Industrial Ecology Center that was created in 2000, contributes to the integration of scientific, educational, and project activities of the Chair. Continuing education and independent learning in the course of work is carried out as a result of the interdisciplinary project implementation.

7. According to employers, students/graduates have an advantage due to the acquired professional competencies (compared to students/graduates of other universities).

8. The system of motivation (opportunities for professional development, remuneration, etc.) of academic staff allows attracting university teachers with extensive work experience to the program.

9. Systematic and active career guidance aimed at attracting students from different regions of the Russian Federation. The educational program provides an inclusive component for people with disabilities.

### ***Weaknesses of the programme***

1. Weak involvement of the teaching staff and students in international academic mobility (lack of joint publications with leading foreign scientists, joint scientific projects, presentations at international scientific conferences).

2. The educational program does not provide for the study of special disciplines aimed at acquiring knowledge about global environmental challenges, international practices in solving these problems based on the principles of sustainable development.

3. The full-text databases, such as ScienceDirect, Springer, and Web of Science are used in the educational and research process insufficiently.

### ***Main recommendations***

1. To use interactive types of training sessions more widely when delivering lectures: lectures delivered by two lecturers at the same time; blended learning, to use MOOCs (Massive open online courses) in relevant disciplines, located on leading Internet platforms. It is necessary to expand the methods and forms of evaluation of Master students, focusing on evaluating specific learning outcomes (case studies, project development, model development, etc.)

2. To integrate the educational programme into the international environment, it is necessary to focus on a broad range of academic mobility: to attract leading specialists from advanced universities of the world to teach and double-supervise graduate works, implement joint international grants, organize joint programs, ensure academic mobility of students (within the framework of European Erasmus + programs), organize summer and winter schools with foreign universities. To increase the proportion of teaching staff taking part in scientific conferences in the country and abroad as invited (plenary) speakers, to reflect this indicator in the system of incentives for the employee of the educational program. To put defense of the graduation thesis in English and other foreign languages into practice.

3. To consider the possibility of implementing disciplines covering global environmental challenges into the educational programme, as well as to use international experience in solving them based on the principles of sustainable development. Involve international organizations in the implementation of the educational program.

4. To conduct explanatory work with students concerning more detailed acquaintance with the concept of the program, the importance of foreign language proficiency as a communicative tool for knowledge transfer.

5. To use informational video products about the achievements and prospects of the Master's program graduates, for example, in various social networks.

***Assessment profile of the learning outcomes and education quality assurance***

No.	Criterion	Assessment	
<i>I</i>	<i>Quality of the learning outcomes</i>		
	1.	Demand for the graduates of the program on the labor market	<i>good</i>
	2.	Satisfaction of all consumers	<i>excellent</i>
	3.	Results of direct assessment of competencies	<i>good</i>
<i>II</i>	<i>Quality assurance of education</i>		
	1.	Strategy, aims and program management	<i>good</i>
	2.	Program structure and contents	<i>excellent</i>
	3.	Teaching and learning aids	<i>excellent</i>
	4.	Educational technologies and methods	<i>excellent</i>
	5.	Teaching staff	<i>excellent</i>
	6.	Material, technical and financial resources	<i>excellent</i>
	7.	Information resources	<i>excellent</i>
	8.	Research work	<i>good</i>
	9.	Employers' participation in the program implementation	<i>excellent</i>
	10.	Students' participation in the program content determination	<i>excellent</i>
11.	Student services	<i>excellent</i>	



## QUALITY OF THE LEARNING OUTCOMES

### *1. Demand for the graduates of the program on the federal and regional labor markets*

*Criterion assessment: good*

#### *Analysis of the role and place of the programme*

According to the data of the medium-term forecast of human resources needs of the economy of the Samara Region by 2021 and until 2024 in the field of mining and chemical production, this needs to be increased. Despite the trends of economic diversification – the redistribution of employment to the service sector – the majority (22.8%) of the economically active population of the Samara Region is employed by manufacturing enterprises. The largest investment projects in the Samara Region are mainly related to the chemical industry (Kuibyshev Refinery, Syzran Refinery Plant, Novokuibyshev Refinery, Samaraneftgaz, KuibyshevAzot, and Tarkett). The study of human resources needs in the labor markets of educational districts and the region in whole, has shown that the annual forecast demand (the prospective number of specialists) at oil refineries and petrochemical enterprises is currently increasing and will continue increasing until 2024.

Graduates in the field of training Energy- and resource-saving processes in chemical technology, petrochemistry, and biotechnology are in demand at the enterprises of the chemical and petrochemical industry of the Region, including NK REFINERY, KNPZ, Syzran Refinery, Otradnensky Gas Processing Plant, Neftegorsky Gas Processing Plant, Samaraneftgaz, as well as at R&D institutes (Giprovostokneft, Samaraneftekhimpromekt, SamaraNIPIneft, Samaragiprotruboprovod – a branch of Giprotuboprovod). Graduates are in demand also by the state administration and control bodies of the Samara Region (the Ministry of Forestry, Environmental Protection and Nature Management of the Samara Region, the Ministry of Energy and Housing of the Samara Region, the Ministry of Industry and Trade of the Samara Region), the regional operator of the Samara Region for waste management – EcoSroyResurs, the interregional territorial administration of Rosprirodnadzor of the Samara and Ulyanovsk regions, and the Privolzhskoe Territorial Administration for Hydrometeorological and Environmental Monitoring.

According to the monitoring of the university effectiveness in 2019, the proportion of the contingent of SamSTU students trained in the Chemical Technologies training field, out of the total number of students studying in these specialties in the region is 79%. The programs of this training field and specialties in the Samara Region are implemented by two universities.

#### *Analysis of information indicators submitted by the higher education institution*

- The percentage of students combining study at the higher education institution with work in their specialization field 93%
- The percentage of graduates working in their specialization field within the region 66,6% (2019/2020)

- The percentage of graduates working in their specialization field outside of the region 0% (2019/2020)
- Number of complaints on graduates 0%

Graduates distribution data was provided according to the results of self-evaluation conducted by the educational institution. The data provided by the educational institution was verified during the study of relevant documents.

## 2. *Satisfaction of consumers with learning outcomes*

### ***Criterion assessment: excellent***

The percentage of employers who believe that the competencies of graduates of the program:

- are substantially compliant with the requirements for modern professionals in the industry 100%
- mostly meet modern requirements for professionals in this industry with minor deficiencies 0%
- there are few graduates whose competencies meet modern requirements for professionals in this industry 0%
- do not meet the requirements for professionals in this industry 0%

The percentage of graduates who are satisfied with their learning outcomes is 100%.

## 3. *Direct assessment of competencies by reviewers*

### ***Criterion assessment: good***

In the course of the site visit, a direct assessment of the competencies of first-year students was made. The direct assessment involved first-year master's students, numbering 3 people, which is 37.5% of the graduating course.

During the direct assessment of graduates, evaluation tools prepared by experts were used.

To analyze the development of competencies, the experts selected the following ones:

- Assessment of competencies that characterize personal qualities of a person, which are an integral part of his/her professional competence:

*GC-1 The ability of abstract thinking, analysis, and synthesis.*

*GC-3 Readiness for self-development, self-actualization, and use of creative potential.*

- Assessment of competencies aimed at the development, maintenance and improvement of communications:

*GPC-3 The ability to professionally operate modern equipment and devices according to the training area and profile.*



*GPC -4 Readiness to use methods of mathematical modeling of materials and technological processes, to carry out theoretical and experimental verification of theoretical hypotheses.*

• Assessment of professional competencies (core competencies), including competencies that reflect the requirements of the regional and/or federal labor market, depending on the main consumers of program graduates:

*PC-3 Readiness to search, process, analyze and systematize scientific and technical information on the research topic, to choose methods and means of solving the problem.*

*PC-4 The ability to apply contemporary methods and techniques when conducting experiments and tests, analyze obtained results, and implement their correct interpretation.*

In carrying out the procedure of direct assessment of competencies, the experts used the following testing and evaluation materials, which reflect the formation of master's students' competencies:

1. *The addition of the binding components to the waste is called...*
2. *There is a distinction between ... and ... pyrolysis*
3. *Thermal treatment of waste in an oxygen-free environment is ...*
4. *Thermal treatment of waste in an oxygen environment is ...*
5. *When disposing of waste, types of combustion are usually used, such as ...*
6. *If water is used as raw material, solvent, or reaction medium, then this function is called ...*
7. *If water is used for the extraction of components and waste treatment, then it performs the ... function*
8. *The destruction of the biodegradable part of the organic matter of sewage sludge is called ...*
9. *The destruction of the colloidal structure of the sludge is called ...*
10. *The production of sludge with a volume concentration of the solid phase up to 80% is called ...*
11. *According to the technological principle, there are the following recycling methods of solid municipal waste ...*
12. *Combustion refers to the .... method of solid municipal waste processing*
13. *Composting refers to the.... method of solid municipal waste processing*

**The following requirements apply to drinking water (exclude the wrong answer):**

1. According to the physical properties, the water should be clear, of a certain color, refreshing taste, and odorless;
2. The presence of substances usually dissolved in clear water should not exceed the limits above which the water is considered not usable;
3. Water must not contain substances harmful to health, for example, CN, Pb, As, etc., in quantities exceeding the limits established for these substances;
4. The water must be free of pathogens.

**According to the physicochemical composition and microbiological parameters, the composition of the underground waters of the Podolsk-Myachkovsky aquifer does not naturally meet the requirements for drinking water due to the lack of:**

1. iron;
2. fluoride;
3. manganese;
4. potassium.

**According to the physical condition, the composition of urban wastewater can contain (choose the wrong answer):**

1. insoluble impurities, including large suspended matter (particle sizes greater than 100 microns);
2. suspensions, emulsions, foams (from 100 to 0.1 microns);
3. colloidal impurities (from 0.1 to 0.001 microns);
4. insoluble substances – molecular-disperse particles (with size less than 0.001 microns).

**Photometric analysis is characterized by:**

1. high sensitivity;
2. high selectivity and low time spent on its implementation;
3. high selectivity;
4. low expressiveness.

**Universal gas chromatographic detectors include (exclude the wrong answer):**

1. flame ionization detector;
2. atomic emission detector;
3. mass spectrometry detector;
4. electronic gripper.

**The main electroanalytic methods used in water analysis are (exclude the wrong answer):**

1. voltammetry;
2. potentiometry;
3. conductometry;
4. mass spectroscopy.

**Conductometry is used (exclude the wrong answer):**

1. in the operation of detergent analyzers in wastewater;
2. when determining nitrate ions;
3. when determining the concentrations of synthetic fertilizers in irrigation systems;
4. when analyzing drinking water for sulfate anions.

**Mandatory requirements for the test equipment include: (exclude the wrong answer):**

- 1 availability of an approved certification procedure for each unit of test equipment;
2. timely certification and registration of results in the form of an act;
3. the presence of measuring instruments in the test equipment that allow monitoring the parameters of external impacts during the tests;
4. low water and energy consumption.

Based on the results of a direct assessment of competencies, experts identified a sufficient level of competency formation in the majority of students.

Level Share of students	Sufficient level (students coped with 80 % of the proposed tasks)	Acceptable level (percentage of the solved tasks is from 50 to 79 %)	Low level (percentage of the solved tasks is less than or equal to 49 %)
<b><i>Assessment of competencies that characterize personal qualities of a person, which are an integral part of his/her professional competence</i></b>			
100% (3 persons)	+		
0%			
<b><i>Assessment of competencies aimed at the development, maintenance and improvement of communications</i></b>			
2 persons (67%)	+		
1 person (33%)		+	
<b><i>Assessment of professional competencies (core competencies), including competencies that reflect the requirements of the regional and/or federal labor market, depending on the main consumers of program graduates</i></b>			
100% (3 persons)	+		
0%			

When assessing the quality of education, experts reviewed 3 GQWs, which was 37,5% of last year's GQWs in this field.

The experts conclude that the reviewed GQW meet the requirements stated below as follows:

### GRADUATE QUALIFICATION WORKS

<b>№</b>	<b>Assessment criteria</b>	<b>Reviewers' comments</b>
1.	Topics of GQW correspond to the field of training and the current level of development of science, engineering and (or) technology in the program field.	100% compliant
2.	Tasks and contents of GQWs are aimed at confirmation of formation of competencies of the graduate.	95% compliant, (add an international focus )
3.	Degree of use of the materials collected or received during the pre-degree internship and course projects in the implementation of independent research parts of the GQW.	100% compliant
4.	The topics of GQW are determined by the requests of industry organizations and the tasks of experimental activities, implemented by the teachers of the HEI.	100% compliant
5.	GQW results find practical application in industry.	100% compliant
6.	Degree of use of the research results of the Chair's, Faculty's and third-party research and production and / or research organizations in the implementation of independent research parts of the GQW.	100% compliance, the established scientific and analytical center "Industrial Ecology" and the active participation of students at the company contributes to this

### ***Reviewers' recommendations and conclusions***

#### ***Conclusions***

Based on the above grades, the following conclusions were drawn:

1. The subject of the GQWs corresponds to the direction of preparation to the modern level of development of science and technology in the subject area of the programme – 100%.

2. The considered graduation theses contain a set of results and scientific statements, have internal unity, which indicates the ability of the authors to independently conduct a scientific search, using theoretical knowledge and practical skills, to see professional problems, to be able to formulate research problems and proper solving methods. The graduation theses are aimed at solving the targets of the Decree of the President of the Russian Federation V. Putin of 08.02.2021 №. 76 on the reduction of

greenhouse gas emissions and the development of innovative energy- and resource-saving technologies – 100%.

3. The extent to which materials collected or obtained through undergraduate practice and course projects are used in independent research parts of the GQWs – 100%.

4. The subject of the GQWs is determined by the requests of industrial organizations and the tasks of experimental activities, solved by the teachers of the educational organization – 100%.

5. The results of the GQWs find practical application in industries – 100%.

6. Usage the results of scientific research of the department, faculty and third-party research and production and / or scientific research organizations in the independent research parts of the GQWs – 100%.

### ***Recommendations***

1. To expand the problematic issues of graduate theses to international (near/cross-border) levels, to increase the use of materials related to international projects and organizations (FAO, UNESCO, UNIDO, UNEP, etc.).

2. To implement in the framework of the educational program the provision of certificates of implementation or inclusion in the implementation plans of proposals developed by graduates in their master's theses.

3. To implement processing of large databases using modern digital tools when carrying out analysis.

4. When conducting research, it is necessary to increase the use of contemporary scientific literature, including literature and articles in English, published in full-text databases.

### ***Additional information***

Based on the results of the student survey, the educational organization presented the data, which were verified by reviewers during the site visit. The data provided by the educational organization were confirmed by the reviewers.

## QUALITY ASSURANCE OF EDUCATION

### *1. Strategy, aims and program management*

*Criterion assessment: good*

#### *Strengths*

The development strategy of the educational program in this field of training is formed on the basis of the following documents:

1. Development Program of the Federal State Budgetary Educational Institution of Higher Education "Samara State Technical University" (SamSTU) until 2020;
2. Draft Development Program of SamSTU till 2025;
3. Strategy for socio-economic development of Samara region for the period up to 2030;
4. National Project "Education" (Federal Project "Young Professionals" (competitiveness increase of professional education));
5. National Project "Science" (Federal Project "Development of Scientific and Scientific-Production Cooperation", "Development of personnel potential in the sphere of research and development");
6. Forecast of staffing needs of Samara region economy for the medium term in the context of the main professional EP;
7. Program of world-class scientific and educational center activity "Engineering of the Future".

The analysis of the programme is carried out based on the results of monitoring and discussion of the program at extended meetings of the graduate chair, the T&L Council of the faculty with the involvement of employers.

The update of the program is implemented by including new academic disciplines and practices and is focused on the development of the elective practice-oriented component, and corresponding educational activities depending on the educational request of students (strategic objectives of SamSTU in terms of modernization of educational activities).

Based on the analysis, the educational program is reviewed annually and approved by the Academic Council of the University.

The program objectives are aligned with the demands of the labor markets. This is confirmed by the direct involvement of employer representatives (Giprovostokneft and Srednevolzhsky Research Institute for Oil Refining) in the development and implementation of the educational program.

The percentage of employers who believe that the program objectives fully or mainly meet the requirements of the labor market is 100%.

The implementation of the educational programme is carried out by the scientific and pedagogical staff of chairs, as well as lecturers who are managers and employees of organizations whose activities are related to the profile of the Master's programme being implemented (having at least three years of work experience in this professional field).

## ***Recommendations***

To form a special strategy for the program internationalization: export-oriented educational program, joint educational programs, and scientific guidance.

## **2. *Program structure and contents***

***Criterion assessment: excellent***

### ***Strengths***

The competency model of the program corresponds to the Order of the Ministry of Education and Science of the Russian Federation of 20.11.2014 No. 1480 (ed. of 20.04.2016) "On approval of the Federal state educational standard of higher education in the field of training Energy- and resource-saving processes in chemical technology, petrochemistry and biotechnology (Master's level)".

The competency model of the program meets the requirements of employers and the needs of the region for the oil and gas industry.

The content of the program is aimed at developing competencies and takes into account the views of various parties concerned, namely, the state, regional labor markets, social partners, and students.

The content of the program provides for the development of training profiles agreed with employers, taking into account the regional needs of the labor market. The educational program is approved by the employees of Giprovostokneft and Srednevolzhsky Research Institute for Oil Refining.

## ***Recommendations***

To open basic departments/ university's units with similar functions in enterprises that are consumers of graduates, or on campus. Such units provide an opportunity to make the most of the infrastructure of an enterprise for better training of graduates.

## ***Additional information***

During the site visit, experts held meetings with students and alumni of the evaluated program. One of the issues discussed was the correspondence of the structure and content of the program to the expectations of the direct consumers of the programs - students. Upon the results of the meetings, experts conclude that students and alumni are fully satisfied with the structure and content of the program.

## **3. *Teaching and learning aids***

***Criterion assessment: excellent***

### ***Strengths***

All disciplines of the program are aimed at developing the competencies of the graduate. The syllabi of the disciplines (modules) formulate the final learning outcomes in relation to the competencies being formed.

All disciplines' syllabi are approved by the employers - employees of Giprostokneft and Srednevolzhsky Research Institute for Oil Refining.

The assessment tools funds (questions, tasks, situations, etc.) used in the current and interim control of academic performance contain materials developed on the basis of real practical situations, and allow assessing the formation of professional competencies.

The current control of academic performance during the semester and interim certification is implemented in the forms established by the work programs (including the student performance assessment tools fund) in the form of testing, problem-solving, written or oral answers to theoretical questions, a presentation on the chosen topic, project defense, etc. The training methods, evaluation methods, and assessment tools are described in the work programs of disciplines and are their integral part.

The Chair of Chemical Technology and Industrial Ecology and the supporting chairs are provided with T&L manuals, case studies, monographs, methodological instructions (for practical classes and laboratory work), educational and visual aids, educational and terminological dictionaries, T&L manuals for conducting work placement internship, pre-graduation practical training, and research work necessary for implementing the educational program.

### ***Recommendations***

1. To put into practice the defense of term papers, as well as final qualifying works in a project form. The graduation thesis in the form of a business project is a joint work performed by several students, demonstrating the level of readiness of students for independent professional activity.

2. To supplement the working schedules of the disciplines with modules dedicated to the world experience on the relevant issues.

3. To consider the possibility of introducing an additional discipline "Closed-cycle economy", which is a socio-economic paradigm of the transition from nature exploitation to careful nature management, resource-, and energy saving.

### ***Additional information***

During the site visit, the experts got acquainted with the T&L materials developed in the educational organization. Most of the teaching and learning materials used in the educational process are developed on the basis of real-life practical situations.

During the site visit, the experts analyzed the testing and assessment materials that are used by the educational organization for the current control of progress. This allowed the experts to make a conclusion about the compliance of the developed assessment tools with the tested competencies.

According to the results of the survey presented by the HEI, the results of which were confirmed during the site visit, most of the students believe that their opinion is taken into account in the development and update of the TLMs.

## ***4. Educational technologies and methods***

***Criterion assessment: excellent***



## ***Strengths***

To form entrepreneurial competencies, standard forms of classes are used, such as lectures, seminars, as well as a research practices. For example, the discipline "Economics and management of chemical, petrochemical and biological industries" aims at developing entrepreneurial skills.

In research and teaching activities at the university, the most advanced methods of the educational process are used, as well as elements of software and information and communication technologies that contribute to the achievement of the declared competencies.

Practice-oriented teaching, active teaching methods, project activities, partially-search activities, and research methods in teaching contribute to the full exploration of the substantive aspects of the disciplines.

An Electronic Information-Educational Environment (EIEE) and e-learning technologies are used in the SamSTU, which provides:

- implementation of distance and online educational technologies;
- functioning of an open educational environment, including virtual educational platforms and online learning platforms;
- implementation of the practice of audio and video recording of classroom studies and scientific events with further upload on the webportal;
- testing of students' knowledge using open computer testing systems;
- provision of students and staff with free wireless access to internal information resources throughout the university;
- implementation of a unified video conferencing system in all buildings;
- provision of a unified automated database management system (personnel, scientific and educational activities);
- provision of electronic administrative and training regulations;
- provision of electronic document management.

## ***Recommendations***

*Reviewers recommend implementing in the educational process the use of the following:*

1. Advanced educational technologies: methods of project-based learning; methods of practice-oriented work in information environments and software used in employer organizations; and methods of mixed learning.
2. Various interactive educational technologies, including public online courses, and provide full information to students about the course title, the platform on which the massive open online course is located, and the duration of training when implementing the educational program.

### ***5. Teaching staff***

***Criterion assessment: excellent***

## ***Strengths***

1. The educational process involves personnel whose qualifications allow implementing the educational process using approved technologies and methods of educational activity.

2. Professional development of the SamSTU teacher is carried out whenever required but at least once every three years under the programs of the elective cycle with a labor intensity of at least 72 hours, which allows teachers of SamSTU to address professional problems.

3. Monitoring of the qualification level of university teaching staff is carried out through the procedure of the annual rating of academic staff based on the analysis of their job performance and achievements.

4. The main components of the succession pool development include the creation of conditions and incentives for the effective work of employees, providing opportunities for professional development, the implementation of creative activity, and career growth. This involves also:

- Working with potential applicants: schoolchildren, bachelors entering the Master's program, and Masters entering the postgraduate program.

- Revealing and conducting professional identification, motivation, and inclusion in the academic environment of potential highly professional succession candidates at any stage in the chain of the pupil-student-graduate student-young employee.

- Developing and supporting the talent density of the academic staff.

### ***Recommendations***

Transmission of the experience of the academic staff to the world stage: speaking at international conferences, publishing joint articles with leading foreign scientists, digitalization of disciplines taught, and cooperation with leading Russian universities.

### ***Additional information***

Analyzing the facts presented by the educational organization in the self-evaluation report, the experts concluded that the data presented was relevant and reliable.

After having analyzed the data presented, the experts conclude that the staff is strongly motivated and that the proportion of the teaching staff under 30 years of age is average and recommend that the head of the program optimize the composition of teachers, supplementing it with staff under the age of 30 years.

## ***6. Material, technical and financial resources of the program***

***Criterion assessment: excellent***

### ***Strengths***

1. Modernization of the material and technical resources is a priority aspect of the activities of the SamSTU and is focused on ensuring that the technical and technological condition and the level of property infrastructure meet the requirements needed for effective educational and scientific activities of the University, as well as its development.

2. The educational program is implemented with the use of the material and technical resources of the University, which ensure compliance with the current requirements (license requirements, Federal State Educational Standards of High Education), taking into account the needs of all types of educational and extracurricular activities. The quality of classrooms, chair rooms, library collections, and reading rooms, educational laboratories and equipment contributes to the achievement of expected learning outcomes and create an atmosphere favorable for students' learning. The territory of the educational institution properly meets the conditions for barrier-free, safe, and convenient movement of disabled people and persons with disabilities.

3. The premises for independent work of students are equipped with computers connected to the Internet, and are provided with access to the electronic information and educational environment of the organization. At that, 100% of the laboratories are equipped with modern devices and facilities. The scientific and analytical center "Industrial Ecology", created in 2000, serves as a form of integration of scientific, educational, and project activities of the Chair of Chemical Technology and Industrial Ecology.

4. The financial resources of the program, formed from the SamSTU budget, fully allow acquiring, maintaining, and operating the material and technical resources and equipment necessary for program implementation.

5. Monitoring and analysis of the required amount of funding are done at the level of the educational organization. Research laboratories of the chairs are equipped at the expense of funds from funded research projects.

### ***Additional information***

During the site visit, the experts interviewed the students and teachers participating in the program on their satisfaction with the quality of the classroom fund. The obtained data allows the experts to conclude that the interviewees are satisfied with the quality of the classroom fund.

During the site visit to the educational organization, the experts' team examined the facilities. The data obtained allows to conclude that the classrooms are fully equipped.

## ***7. Information resources***

### ***Criterion assessment: excellent***

#### ***Strengths***

1. When implementing the educational program, the unified electronic information and educational environment of SamSTU is used. In the educational institution, both electronic databases of educational and methodological materials and scientific literature are widely used (the repository of digital and scientific materials on the university portal, the library webpage, allowing access to an electronic catalog), and the paper-based library.

2. Within the framework of information systems, the services of EIEE and AIS University have been created that allows sharing information, creating online courses, conducting remote training, forming and monitoring the class schedules. The Anti-

Plagiarism system is used when checking graduation theses, dissertations, and teaching aids for incorrect borrowings (the presence of plagiarism).

3. A specialized "Thesis" resource ensures electronic document management.

### ***Recommendations***

During the site visit to the University, the experts interviewed the students. Students have access to the databases only from the university. It is necessary to provide access to the electronic information and educational environment for students not only from the university but also outside the university.

## **8. *Research and development***

***Criterion assessment: good***

### ***Strengths***

The scientific and analytical Ecology Center created in 2000, contributes to the integration of scientific, educational, and project activities of the Chair. Continuing education and independent learning in the course of work are carried out as a result of the interdisciplinary project implementation (teams are created based on the results of an annual competition and on the request of the university's industrial partner).

The strategic project of the Chair "Territory of Life" unites four interdisciplinary project teams (IPT) of SamSTU, consisting of specialists of environmental, pharmaceutical, and food profiles of the SamSTU teaching staff and students (bachelors, masters, postgraduates), as well as representatives of government authorities, business structures, and engineering corps of partner enterprises (Novokuibyshevskaya Petrochemical Company, Samaraneftgaz).

In 2018, the project was joined by the industrial IPT, which develops methods for assessing the state and technologies for restoring the geological environment affected by the petrochemical cluster of the Region. In August 2018, this team, under the terms of open tender procedures, signed a contract for implementing a three-year monitoring study of the geo-environment quality for Novokuibyshev Oil Refinery, followed by the development of technology for the environment remediation.

At the Chair of Chemical Technology and Industrial Ecology, from 2018 to the present, the IPT continues its activities on the topic "Development of technology for remediation of the geological environment in the zone of influence of oil refineries and linear structures". The industrial partner of the IPT is NC Oil Refinery.

A system of research units has been created in the university structure, namely, laboratories at faculties and chairs, research centers, involving not only teachers and postgraduates but also students, and project groups.

Scientific activities include participation in competitions for grants and programs; conclusion and implementation of business contracts with enterprises; preparation of scientific publications; scientific conferences organization; organization and conduction of research involving students (exhibitions, competitions, students' publications); organization of student conferences, etc.

Involvement of students and postgraduates in research allows mastering various research methods; developing independence in problems solving; teamwork skills when addressing particular problems; participating in the preparation of joint reports on the research results, writing articles, etc.

### ***Recommendations***

1. To extend international scientific and technical cooperation with scientific and educational organizations to ensure the sustainable position and development of the University in the world system of science and education.

2. During the visit, the experts found out that the educational institution has no scientific ties with foreign non-CIS countries.

2. For further internationalization, it is necessary to encourage the publication of articles in foreign languages, especially in English.

## ***9. Employer participation in the program implementation***

***Criterion assessment: excellent***

### ***Strengths***

Cooperation with social partners has allowed creating a modern basis for the formation of professional competencies in the training field of the educational program.

The participation of employers in quality monitoring is carried out in the following interaction forms:

1. membership in State Examination Board (SEB);
2. review of the educational program for compliance with modern requirements of the labor market;
3. provision of project challenges (topics, cases) to fill the project fund within the framework of the technological entrepreneurship track;
4. review of graduation theses of students;
5. involvement of representatives of industrial partners in teaching activities as external part-timers;
6. supervision of practical training of students.

Employers are involved in the formation of the matrix of students' competencies. The competency matrix is an integral part of the educational program. The educational program is developed and approved by the employees of Giprovtokneft and Srednevolzhsky Research Institute for Oil Refining.

Employers provide financing for works based on the contracts and grants, provide a platform for practical training of students.

### ***Recommendations***

For the integration into the global community, consider the possibility of creating international practical training bases.

### ***Additional information***

The self-evaluation report of the educational institution provides information on the results of a survey of employers on their satisfaction with the quality of graduates' training. This data allows stating the high level of graduate training for the labor market needs; not only the professional but also the communicative qualities of graduates were mentioned.

#### ***10. Students' participation in the program content determination***

***Criterion assessment: excellent***

##### ***Strengths***

Feedback is provided through an annual survey, conducted to identify satisfaction with the quality of training (including the quality of the educational program, the quality of the conditions and organization of training, conditions for extracurricular activities), as well as to assess the quality of teaching ("Teacher through the eyes of students"), implemented within the framework of various educational projects (feedback on the project outcomes). An effective feedback tool is an interaction with students within the framework of mentoring (curatorship, and tutor support).

Students take part in monitoring (surveys) that allows introducing new disciplines, as well as adjusting curricula of disciplines based on survey outcomes.

Changes can be made to the practical training assignments (technological, pre-graduate practice, research work), which are formed individually based on the topics of the graduate qualifying works. Students have the opportunity to independently suggest the topic of the graduation theses and choose a project-based educational track.

The assessment of the quality of training is formed taking into account the results of the annual survey of students.

##### ***Recommendations***

Chairs and faculty should consider developing a system for encouraging the participation of students in determining the content of the program and the organization of the educational process. To strengthen the role of students in determining the content of the program and the organization of the educational process, it is proposed to implement monitoring of student characteristics and trajectories using regular surveys. The obtained data will allow the university administration to evaluate the effectiveness of the educational program, make decisions on the program improvement, and evaluate the effectiveness of various teaching methods.

Reviewers recommend taking into account the opinion of students in the educational process management, bringing this indicator to 80-90%.

##### ***Additional information***

During the site visit, the experts analyzed the participation of students in the student self-government bodies. Based on the analysis of the data obtained, the experts conclude that the average level of interaction between students and the educational organization is 33%.

## ***11. Student services at the program level***

***Criterion assessment: excellent***

### ***Strengths***

Pertinent issues affecting the interests of students are discussed at meetings of the Students Union Organization and the Student Council, functioning at the SamTU. Representatives of the Union and Student councils take part in the work of Academic councils of faculties and the Academic Council of SamSTU, as well as scholarship commissions, in the discussion of issues related to the distribution of vouchers to recreation centers and the sanatorium of SamSTU.

The program aimed at forming the student corporate culture to preserve and multiply the traditions of the University has been developed. The "Code of honor of the SamSTU student" was adopted at the initiative of the students.

The university has 18 creative studios, student TV, the SamSTU TV studio, and the Open KVN league in Samara, as well as the Spiritual and educational center, the Typhoon military-patriotic club, the Polytechnic search team, the student operational law enforcement team Vector, the volunteer center "Look around you" and the Cultural and youth center, and the KVN team Volzhane SamSTU, which reached the final of the highest league.

In 2020, the Center for urban initiatives Urban Club was established, which is a public organization of SamSTU that unites students, postgraduates, and young professionals to address issues of urban environment development.

The University has more than 40 sports sections in 24 sports.

Students have equal rights to an increased academic scholarship for achievements in educational, research, social, cultural, creative, and sports activities.

Students living in cities and localities of the Samara Region are entitled to social support for paying for commuting on suburban and intercity (intra-regional) road transport, carried out at the expense of the regional budget in the amount of 50% of the fare for eight trips per month during the academic year.

For students who do not receive a social scholarship, but find themselves in a hardship life situation, an opportunity is provided to receive free meal vouchers in the university canteens at the expense of funds received from income-generating activities.

More than 1,600 students receive free admission vouchers to the SamSTU recreation center.

The SamSTU provides an opportunity to undergo extra training (programs "Translator in the field of professional communication", "Industrial safety", and "Oil and gas production operator").

In addition, the student is allowed to work on a flexible schedule within the framework of an employment contract. Places of work:

- Research laboratories (within the framework of external grants and research contracts);
- Resource centers of the Science Park;
- Educational Program Directorates;
- As a member of the admissions committees;

- As a member of the other administrative divisions.

### ***Recommendations***

1. To strengthen the students' motivation to take foreign language courses at the university. To consider the possibility of creating interest groups that would be conducted in a foreign language. The coordinator could also be an English teacher. Teachers of specialized disciplines can also be involved in these groups.

2. Insufficient language training of students significantly restricts the use of modern literature and articles, as well as limits the career opportunities of Masters. Employers confirmed the need for specialists with developed language skills.

### ***Additional information***

During the site visit, the experts were provided with documents confirming the students' attendance of supplementary courses and programs. Based on the analysis of the presented data, the experts conclude that students can choose and acquire a qualification within a further professional education if they wish.



## Curriculum Vitae of Experts

Name: Anna Kurbatova

Employer, position	RUDN, Faculty of Ecology, Associate Professor
Academic degree, title	Candidate of Biological Sciences, specialty Ecology, Associate Professor
Honors	International expert of the 10 <sup>th</sup> International Conference-Forum of Chinese and International Experts in the field of High Technologies in Weihai. Full Member of the Russian Geological Society (RosGeo), expert-analyst in the field of ecology of the Moscow Refinery Gazprom.
Education	Master of Chemistry, Faculty of Physical, Mathematical and Natural Sciences, RUDN. Translator from English and Spanish into Russian in natural science disciplines.
Professional achievements	<p>Authored more than 90 scientific articles, reviewed in the RSCI database, SCOPUS WEB of Science, including 3 monographs, 7 textbooks (2 in English, 1 textbook in Spanish), one textbook with the label of the Academic Methodological Association of the Higher Education. For 11 years, A. Kurbatova has been cooperating with the A.A. Dorodnitsyn Computing Center of the Federal Research Center "Informatics and Management" of the Russian Academy of Sciences, where she annually participates in the RFBR grant projects. Providing consulting services for Domodedovo Airport in the field of water supply and sanitation systems, wastewater transportation, quality control of drinking and tap water. Working as an expert in Ecostandart, taking part in the projects for monitoring the waste management of Tolyattiazot, and the Plant of Mineral Fertilizers in Berezniki.</p> <p>Guest lecturer at the advanced training course "Fundamentals and principles of closed-loop economy. The opportunities for implementation of German experience in the Russian Federation" in the framework of the Russian-German project "Climate-neutral waste management in the Russian Federation" of the German Society for International Cooperation (GIC) GmbH.</p>

	<p>Author of open online courses in English: MOOC "Climate Change: Adaptation and Mitigation Strategies", Iversity Springer, "Surface Water Quality: management and modeling", Open Learning, «Drinking Water: quality and treatment systems», «Advanced technologies in biological water treatment».</p> <p>In Spanish: "Monitoreo y evaluacion de la calidad ambiental", Stepik <a href="https://stepik.org/course/89007/reviews">https://stepik.org/course/89007/reviews</a></p>
Research interests	Integrated water resources management, solid waste management, climate change adaptation and mitigation strategies, closed-loop economy
Practical experience in the field of the program under review	<p>Since 2007 to present – Associate Professor at the Chair of Environmental Monitoring and Forecasting at the Faculty of Ecology, Head of the Bachelor's and Master's degree programs "Bioengineering of the Environment" in the field of training 18.03.02 and 18.04.02 Energy- and resource-saving processes in chemical technology, petrochemistry, and biotechnology, Head of the Joint Educational Program with Tomsk State University "Environmental quality assessment: Management and modeling", Head of the professional development program "Ensuring environmental safety when working with hazardous waste».</p>

Name: Irina Yefimova

Employer, position	Silkway International University, Rector European Chemical Thematical Network expert
Academic degree, title	Candidate of Economic Sciences, Associate Professor
Honors	EPAN member
Education	<p>1989-1994 Kazakh Chemical Technology Institute Specialty - Economics and Management in Industry</p> <p>1998-2001 Post-graduate studies at M.Auezov South Kazakhstan Technical University Defence of thesis for the degree of Candidate of Science in the Institute of Economics of the Academy of Sciences of the Republic of Kazakhstan (Karaganda)</p>
Professional achievements	She is the author of more than 70 scientific articles, peer-reviewed in the RSCI and SCOPUS, including two monographs, seven textbooks (two in English).

	She is a Professor of the Jean Monnet International Program (ERASMUS+).
Research interests	- development of internal quality assurance system in the university; -development and examination of educational programs based on competency-based approach; - implementation of advanced learning technologies
Practical experience in the field of the program under review	1994- Kazakh Institute of Chemical 1996 Technology, Teacher Auezov South Kazakhstan State 1997- University, Deputy Dean 2004 Auezov South Kazakhstan State University, Dean 2004- Auezov South Kazakhstan State 2005 University, Advisor to the Rector, Director of Teaching and Learning 2006- Department 2010 Director of the Bologna Process and Academic Mobility Center Rector of SILKWAY International 2011- University (Kazakhstan) 2018.  2018- 2021

Name: Alena Basamykina

Employer, position	Areal Engineering, Head of the Technical Department
Academic degree, title	N/A
Honors	N/A
Education	Bachelor's degree in the field of Energy- and resource-saving processes in chemical technology, petrochemistry, and biotechnology, Faculty of Ecology of the RUDN. Master's degree in the field of Ecology and nature management, profile Recycling of production and consumer wastes, Faculty of Ecology of the RUDN.
Professional achievements	MOOC coauthor of "Advanced technologies in biological water treatment"; Participant in international conferences; Guest lecturer at masterclasses in the training

	field Energy- and resource-saving processes in chemical technology, petrochemistry, and biotechnology.
Research interests	Water resources management at the enterprise and in the field of housing and communal services, wastewater treatment technologies, waste management, economic strategies in the field of waste and wastewater management, energy- and resource-saving technologies.
Practical experience in the field of the program under review	<p>Since 2019 to present – Project Manager at Areal Engineering (part of the Russian-German group of companies Infrastrukturgesellschaft 2055 mbH);</p> <p>2016-2019 – employment by the German company "Huber Technology" as an intern, then as an Assistant Project Coordinator.</p> <p>Professional competencies:</p> <ul style="list-style-type: none"> <li>• Assessment of the sources of wastewater and the development of technological schemes of treatment and wastewater management scheme, taking into account the characteristics of a particular enterprise or locality;</li> <li>• Technological audit of wastewater treatment facilities;</li> <li>• Design of treatment facilities (Project manager);</li> <li>• Development of technological solutions for the solid and liquid wastes processing (including toxic waste);</li> <li>• Commissioning of technological lines for wastewater treatment and waste processing;</li> <li>• Study of innovative solutions for wastewater treatment, as well as their implementation at facilities in Russia;</li> <li>• Selection of equipment, development of technological schemes for water treatment, water conditioning and purification, and treatment of sewage sludge;</li> <li>• Sampling for laboratory tests, laboratory testing, selection of proper reagents;</li> <li>• Translation of technical documentation (manuals, operating instructions, technical data sheets of equipment) and other texts (including legal contracts and equipment warranties) from English and German.</li> </ul>

Name: Oleg Korovin

Employer, position	Student, RUDN university
Academic degree, title	N/A
Honors	N/A

Education	4th year Bachelor's degree student in "Energy and Resource Saving Processes in Chemical Technology, Petrochemistry and Biotechnology".
Professional achievements	Participant of international conferences
Research interests	Development of energy-efficient technologies
Practical experience in the field of the program under review	Development of carbon-neutral energy cycles. Study of new methods of acetylene carbon black production using energy-efficient technologies

