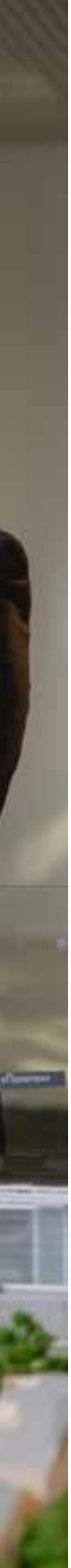
DISCOVER POLYTECH

PETER THE GREAT ST. PETERSBURG POLYTECHNIC UNIVERSITY

CONTENTS

RECTOR'S FOREWORD



Dear friends!

Today we are living in a rapidly changing world. A new economy is being formed in Russia – the economy of knowledge, leadership and innovation. It is based on the integration of education, science and industry. The result of this integration is new, competitive products in demand on the world market, which provides Russia with a competitive place in the global economic system. And higher education plays a key role in this process, being a supplier of highly qualified personnel, a source of new technologies and innovative developments.

Polytechnic University is changing along with the whole world, instantly responding to global challenges of economy, science, education and even outpacing them. Today the university has managed to multiply its scientific and educational potential. Our research activities every year yield results in the form of new technological ideas, developments, and scientific discoveries for the benefit of Russia.

All the changes that have occurred at SPbPU in recent years allow us to say that St. Petersburg Polytechnic University, taking into account its long history, continuity of traditions, scientific schools and generations of scientists, is one of the leaders in multidisciplinary research, cross-industry technologies and world-class science-intensive innovations.

One of our main goals is the creation and enhancement of human capital through the training of world-class specialists capable of working with advanced production lines, combining research, design and entrepreneurial activities to ensure sustainable development and economic prosperity of countries and regions.

Today SPbPU is a part of the global world, maintaining contacts with the world's leading universities and companies from all continents. We are developing our international activities and highly appreciate the support of our foreign partners, many of whom have already become our friends. And we are always ready for joint activities and steps to work together for the benefit of world science, education and technology.

Sincerely yours,

Andrei Rudskoi
Rector of Peter the Great
St. Petersburg Polytechnic University,
Academician of the RAS,
Chairman of the St. Petersburg Branch of the RAS

UNIVERSITY HISTORY IN BRIEF

Peter the Great St. Petersburg Polytechnic University, better known in Russia and abroad as the Polytechnic Institute, was founded in 1899 by an order and with great support of the Russian Minister of Finance S.Yu. Witte. The grand opening of the Institute took place on October 1, 1902.

The Institute was aimed at training highly qualified engineers and economists. For this reason, the first departments of the Institute were established: electrotechnical, metallurgical, shipbuilding and economic. A prominent scientist in the field of applied mechanics, Prince A.G. Gagarin, was appointed the first director of the Institute.

The St. Petersburg Polytechnic Institute was inaugurated on October 01, 1902. The first lecture for students of technical departments was delivered on October 2 by I.V. Meshchersky on theoretical mechanics; for students of the economic department – by A.A. Volkov – on general chemistry. The students, (the vast majority were high school medalists) studied with great willingness and diligence, which was facilitated by their living in comfortable dorms far from the temptations of the capital city. The instructors were aware of each student's progress to such an extent that no exams were necessary.

In 1907, new departments were established: Civil Engineering, Mechanical and Chemical. Already on October 25, 1907, 350 new freshmen started their studies at these departments.

In December 1907, first defenses of graduate papers took place.

In January 1910, the St. Petersburg Polytechnic Institute was named after Peter the Great

By 1914, the St. Petersburg Polytechnic Institute already had 6 thousand students – three times more than its founders had expected.

The war that began in 1914, interrupted the educational process at the Polytechnic Institute. Many dozens of students of different years of education did not show up for the beginning of classes: they volunteered to participate or were mobilized as reserve officers. Already in August, the Institute started to work for the war front-line: aircraft workshop produced spare parts and repaired aircraft engines, chemical laboratory produced medicines, X-ray machines were tested for war hospitals, two-month courses for military pilots were opened, etc. In the buildings of the 1st and 3rd dormitories a hospital for 900 beds was equipped. Many students went to work to the reception centers for the wounded. On October 1, the first batch of wounded arrived at the institute hospital.

In the course of several decades between the two world wars, the Institute's scientists made significant contributions to various spheres of Russian science and technology. A noticeable part of Polytechnic Institute graduates emigrated from Russia after the revolution and contributed to the development of science abroad.

In the 1920s, the graduates of the Institute contributed to the development of the project for the construction of the first large-scale hydroelectric power plant built within the frame of the plan of electrification of Russia (GOERLO) – the Volkhovskaya HPP, which is still in operation. Academician A. Winter, 1912 graduate of the St. Petersburg Polytechnic Institute, supervised the construction of the Dneprovskaya HPP, then Europe's largest in terms of capacity.

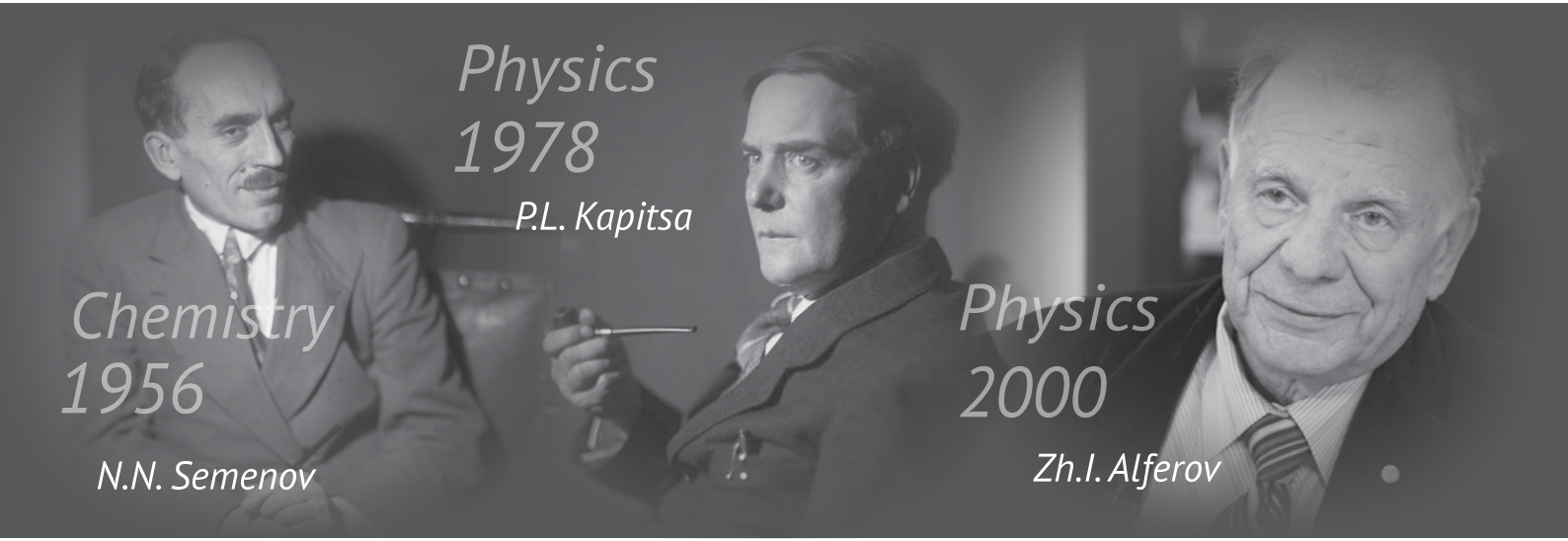
The St. Petersburg Polytechnic Institute underwent several major reorganizations. In 1930 it was divided into twelve independent branch institutes, and formally the original St. Petersburg Polytechnic Institute ceased to exist. It was reconstructed as early as 1934 as the Leningrad Industrial Institute, and in 1940 the institute was given back the name of Polytechnic Institute.

During World War II, the Institute never stopped functioning. It continued to train students and conduct scientific research. Scientists working at the Institute achieved great results in the design and development of military equipment. The Polytechnic Institute played a huge role in the establishment and development of the military industry and the defense capability of the country. The contribution of Polytechnic Institute graduates to the victory in World War II is hard to be overestimated. Soviet aircraft designer O.K. Antonov brought much to the improvement of the most mass-produced Soviet Yak series fighters, and his military gliders played an important role in in serving as an air

bridge with Soviet partisans. Another aviation engineer and aircraft designer, N.N. Polikarpov, who had worked with Igor Sikorski in 1916, was named “King of Fighters” for his famous I-15 and I-16 (“Ishak”) series of fighters. The T-34 tank, created by prominent Soviet tank designer M.I. Koshkin, was named the best tank of World War II. Hundreds of graduates became war heroes, commanders-in-chief of the Red Army, and leaders of the post-war reconstruction.

was organized, headed by Professor T.N. Sokolov. The OKB LPI created equipment for processing orbital data of artificial Earth satellites and developed control systems.

In 1968, an experimental design bureau was founded at the Institute for the development of industrial robotics in the USSR. Today, it is one of the most famous scientific centers in our country: Central Research Institute of Robotics and Technical Cybernetics.



Reconstruction of the Institute’s buildings began immediately after f the Siege of Leningrad was lifted. In the 1950s, the Institute became open for international students. In 1965, the Institute’s Preparatory Department for foreign students was established.

The Institute’s employees were involved in the development of the first satellites, and also took part in the launch of the first Vostok spaceship with Yuri Gagarin on board. In December 1961, on the basis of the Laboratory of Computing Machines and Electronic Computer Engineering, the Experimental Design Bureau (OKB LPI)

Polytechnic University is justifiably proud of Nobel Prize winners N.N. Semenov (Chemistry, 1956), P.L. Kapitsa (Physics, 1978) and Zh.I. Alferov (Physics, 2000) who had studied or worked at Polytechnic University. The famous physicist A.I. Ioffe was the teacher of P.L. Kapitsa and a senior colleague of N.N. Semenov. A.I. Ioffe founded in 1919 and for many years headed the Physics and Mechanics Department of the St. Petersburg Polytechnic Institute and the famous Physics and Technical Institute, which now bears his name: Ioffe Institute of Physics and Technology of the Russian Academy of Sciences.

Since the 1970s, the Institute's employees have made major breakthroughs in hydroelectric engineering, power engineering, physics, nuclear physics and other fields. In particular, university's scientists Yu.S. Vasiliev, R.A. Suris, V.E. Golant, L.P. Nayman, G.N. Alexandrov made a significant contribution to the development of these fields.

In 1975, the Polytechnic Institute became the first Soviet technical institution of higher education to be internationally recognized and accepted by the International Association of Universities.

In September 1989, a decision was made to rename the Polytechnic Institute to the State Technical University. However, since the name of the St. Petersburg Polytechnic Institute was a world-famous brand, in 2002 the Technical University returned to its historical status of "Polytechnic" and the name of St. Petersburg Polytechnic University. In 2015, the name of Peter the Great was also restored and rightfully incorporated into the name of the University.

In 2007, Polytechnic University won the Innovative University competition financed under the National Project "Education". In 2010, SPbPU received the status of a National Research University. This reinforced the implementation of the SPbPU Strategic Development Program for 2010–2019. As part of this program, a number of innovative development areas were introduced, such as modern materials and nanotechnologies, information technologies, energy technologies, power engineering and environmental science.

In 2013, SPbPU was one of the fourteen laureates of the Russian Academic Excellence Project "5-100". The goal of the Project was to improve the competitiveness of leading Russian universities in the global research and education market.

In 2018, the Advanced Manufacturing Technologies Center of the National Technology Initiative was established on the basis of the SPbPU Institute of Advanced Manufacturing Technologies. The Center is a reference point, a leading Russian center of competence and the largest consortium in the field of advanced manufacturing technologies. By combining the cross-sector and interdisciplinary competencies of SPbPU engineers and researchers, as well as pooling the expertise of 85 consortium members, the Center develops solutions for creating state-of-the-art products such as automobiles, electric vehicles, engines, airplanes, helicopters, etc.

In 2020, SPbPU won the competition and gained the status of a World-Class Research Center (WCRC) for advanced digital technologies as a part of a consortium of four organizations. The Center was established within the framework of the national project "Science" and performs R&D in the priority areas of Russia's scientific and technological development, which are defined by the RF Presidential Decree "On the Strategy for Scientific and Technological Development of the Russian Federation".

In 2021, the University won in the category "Academic Leadership" within the framework of the Federal program of Strategic Academic Leadership "Priority-2030".

In 2022, SPbPU was among the winners of the competition of the federal project of the Russian Ministry of Education and Science "Advanced Engineering Schools" aimed at solving frontier engineering problems and training qualified engineering personnel for high-tech industries. The partners of the creation and development of the SPbPU Digital Engineering NSP were Rosatom, Rostec Gazprom Neft and others.


WELCOME TO
PETER THE GREAT
ST. PETERSBURG
POLYTECHNIC
UNIVERSITY

UNIVERSITY TODAY

Today, Peter the Great Polytechnic University is a driver of Russian engineering education, training highly qualified personnel, carrying out scientific research and innovative developments in the interests of high-tech industries, providing comprehensive development of young people and communities around the university.

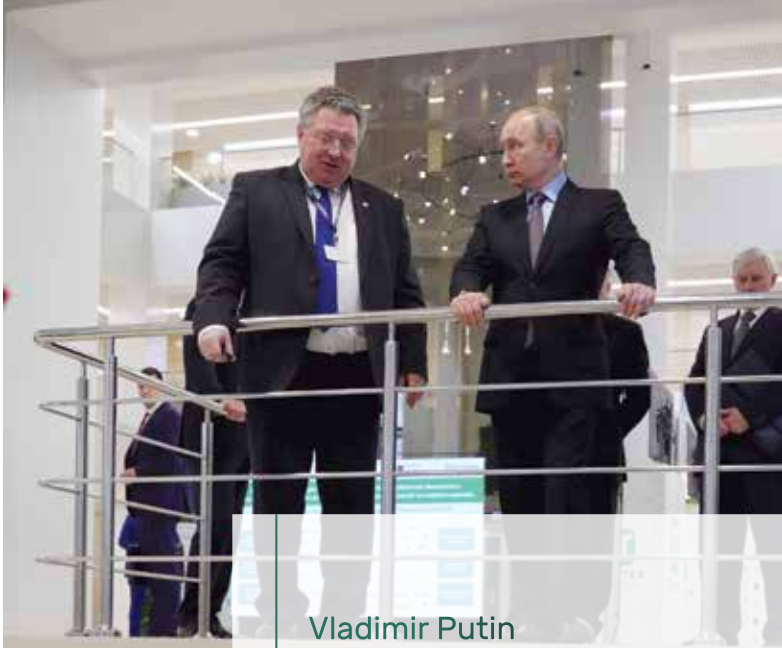
Polytech mission is to develop human potential and professional competencies that can ensure the Russia's technological and cognitive sovereignty.

The University consists of 11 institutes and 34 graduate schools. More than 33,000 students study at Polytech; about 6000 of those are international students. The University maintains partner relations with more than 300 universities from 70+ countries and more than 200 leading companies around the world.

The University Campus is a unique campus with an area of over 120 hectares, which has all the necessary infrastructure for educational and scientific activities, comfortable living, similar to the territory of a small city. There are more than 170 educational and scientific buildings, administrative buildings on the campus. In walking distance from any point of the campus there are stops of public ground transportation and 4 metro stations.

The Fundamental Library of Polytechnic University is one of the largest research libraries in Russia, and one of the top three libraries in St. Petersburg. The library has a collection of more than 4 000,000 volumes; its information services are developed and maintained by the Center for Open Library Systems.

SPbPU develops unique models of engineering education, participates in building new approaches to reforming industry and economy within the framework of Russia's National Technology Initiative and is in close partnership with global leaders of higher education. The University offers bachelor's and master's degree programs in more than 50 areas of study, postgraduate and doctoral training programs in 77 scientific areas.



Vladimir Putin

President
of the Russian Federation

Across the country, universities are called upon to become centers of technology and human resources development, as well as, true intellectual engines for industries and our regions. Communities of people passionate about technological breakthroughs should be formed around higher education institutions.

ORGANIZATION

Structural Units

11
academic institutes

70+
research laboratories

34
graduate schools

20+
joint R&D centers with industrial companies

- Technopolis Polytech Research and Development Center
- Supercomputer Center
- Technopark Polytechnic
- Advanced Engineering School “Digital Engineering”
- FabLab Center for Youth Project Activities
- Co-working space “TBoil Polytech”

SPbPU International Offices in Shanghai and Nanjing

Digital Education Center “Open Polytech”

Institute of Nuclear Power Engineering in Sosnovy Bor

Institute of Secondary Vocational Education

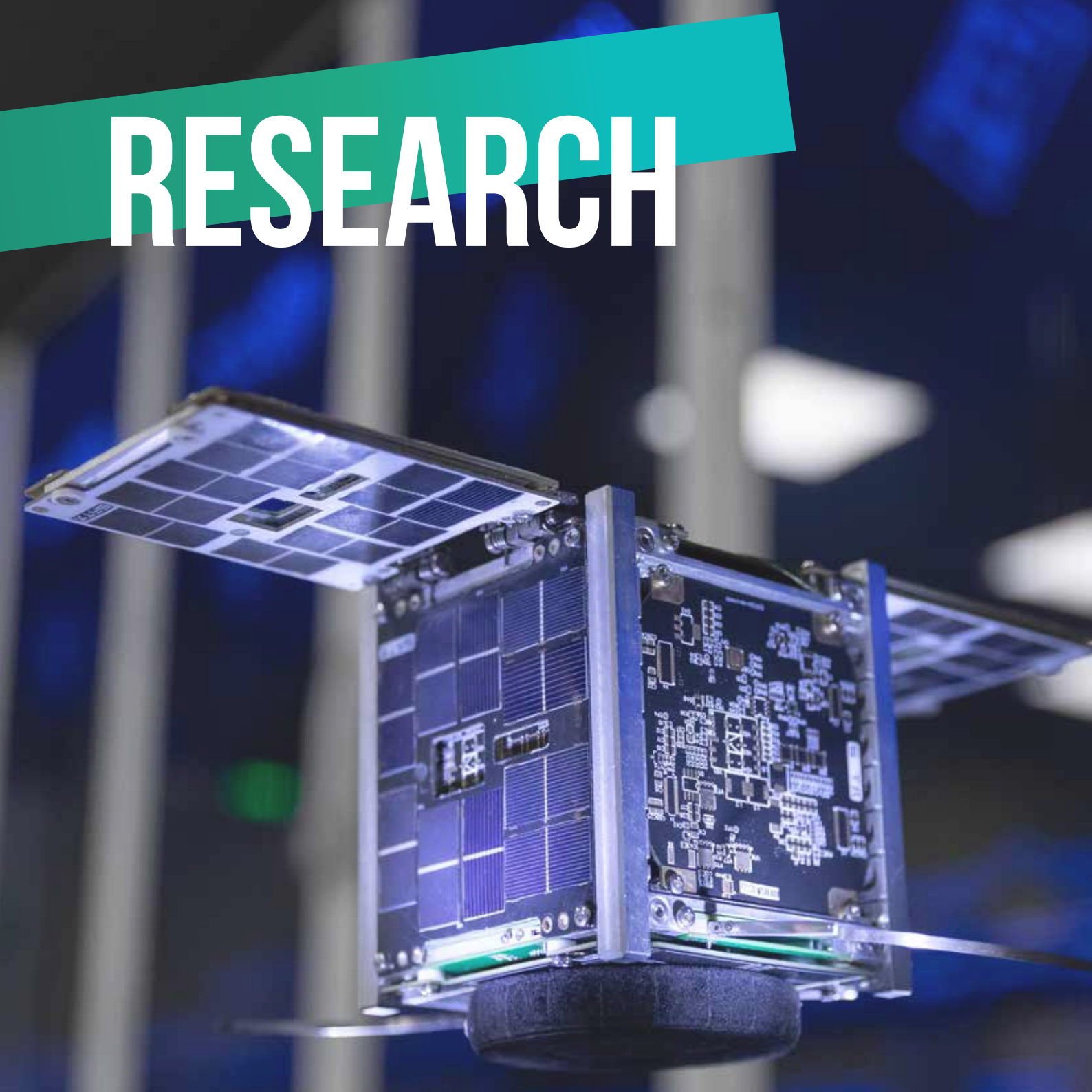
Career Development and Pre-University Training Center

Natural Science Lyceum

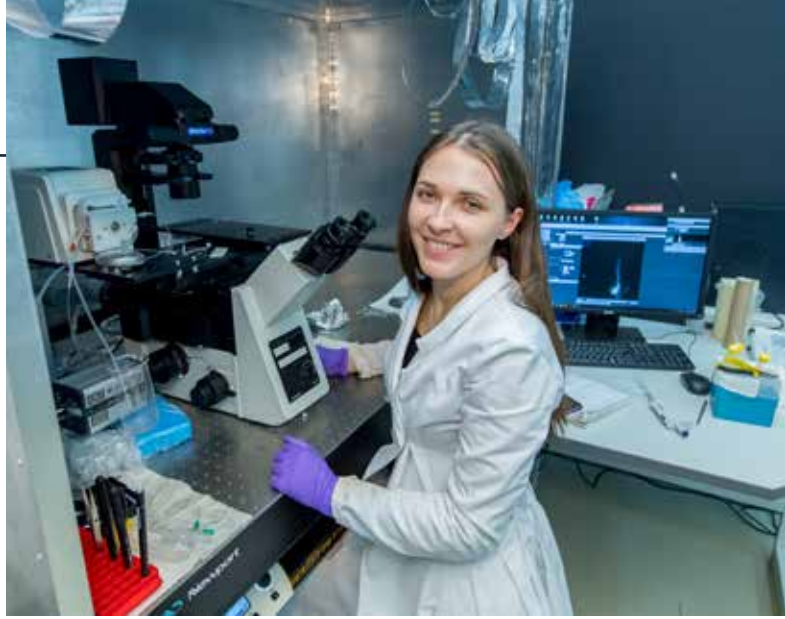
INFRASTRUCTURE

- **Sports and recreation facilities: stadium, gymnasiums, tennis courts, 25-meter swimming pool, etc.**
- **Student Campus (18 dormitories)**
- **Information and Library Complex**
- **Publishing House**
- **Training, sports and recreation centers in the Leningrad Region and Krasnodar Krai**
- **Medical Complex**
- **“House of Scientists” in Lesnoy**
- **Canteens and cafés**

RESEARCH



RESEARCH



In the sphere of scientific activity Polytechnic University positions itself as a large multidisciplinary scientific center, occupying leading positions in Russia and the world in a number of scientific areas.

In the 125 years of the University's existence, Polytechnic scientists have made a significant contribution to the development of fundamental and applied science. The works of A.F. Ioffe, P.L. Kapitsa, N.N. Semenov, M.A. Shatelen, A.A. Baikov, J.I. Alferov and many other scientists whose life is connected with the University are world famous.

The high status of Polytechnic University in scientific research is confirmed by the Order of the Government of the Russian Federation No. 812-r dated May 20, 2010, which established the category of National Research University for SPbPU, by SPbPU's victories in priority federal programs and projects, such as: 5-100 Program, Priority-2030 Program, Advanced Engineering Schools, as well as by obtaining the status of World Class Research Center (WCRC) for advanced digital technologies in 2020.

Polytechnic University has a certified quality management system in the field of scientific research.

University participates in federal programs – Russian Science Foundation and international competitions and grants of the Ministry of Science and Higher Education of the Russian Federation. SPbPU has signed agreements on cooperation with leading Russian companies and corporations, such as Rosatom, Gazprom, RusHydro, AvtoVAZ, ALROSA, Rostec, Rosneft, Kamaz and others.

The high prestige of the University attracts great attention of the scientific community to the conferences held at the University, a significant part of which has an international status. Conference proceedings are published in the editions indexed in the scientific bases Scopus and Web of Science, etc.

Active research activity provides fruitful training of scientific personnel of higher qualification in the form of postgraduate and doctoral studies. One of the main principles of the educational process organization at Polytechnic University is the mandatory participation of students in research work both on the basis of the University and in the laboratories of the RAS institutes and industry research organizations.

5100 priority2030^ leaders are made, not born WCRC ADVANCED DIGITAL TECHNOLOGIES Schools of Advanced Engineering Studies

FACTS:

100+ scientific projects with Grant support

>3 BILLION rubles annual R&D income

50+ international R&E centers and labs, authorized and testing centers

200+ R&D projects for industry

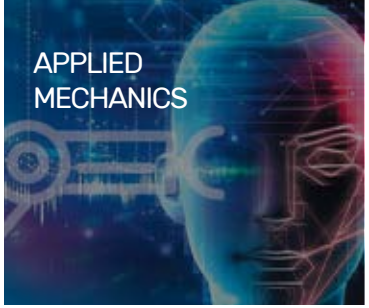
25 joint R&E centers with international companies

500+ doctors of science

1200+ PhD holders

RESEARCH PRIORITIES

NEW MATERIALS AND ADDITIVE TECHNOLOGIES



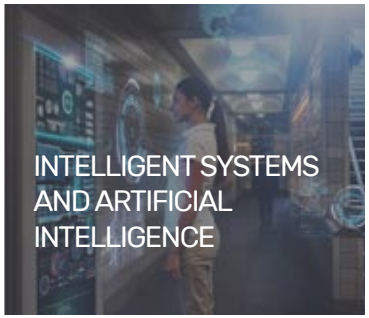
ADVANCED MANUFACTURING TECHNOLOGIES

INFORMATION SECURITY

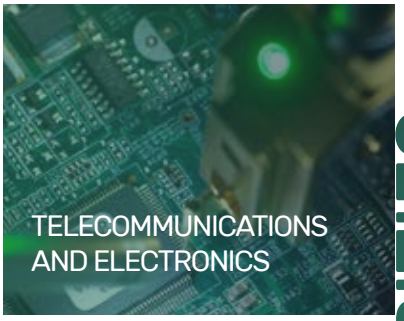
SOFTWARE ENGINEERING

ROAD & HYDROTECHNICAL CONSTRUCTION

ENERGY AND NEW ENERGY SOURCES

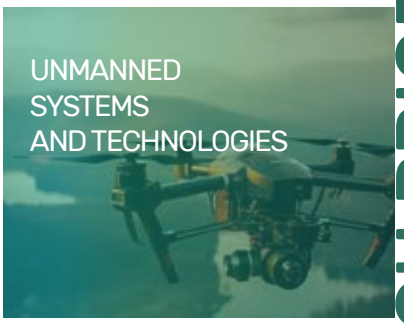


MACHINERY AND ROBOTICS

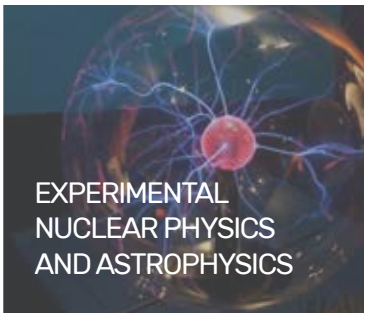


DIGITAL ECONOMY

APPLIED ECOLOGY, WASTE RECYCLING AND WATER TREATMENT



MARKETING AND LOGISTICS



PR, REGIONAL STUDIES

WORLD-CLASS RESEARCH CENTER FOR ADVANCED DIGITAL TECHNOLOGIES

WCRC
ADVANCED DIGITAL TECHNOLOGIES

In 2020, following the results of the competition, SPbPU received the right to form a World-Class Research Centre (WCRC) "Advanced Digital Technologies" within the framework of the national project "Science and Universities", leading a consortium of 4 organizations:

1. St. Petersburg Peter the Great Polytechnic University (consortium coordinator);
2. St. Petersburg State Marine Technical University;
3. Tyumen State University;
4. A.A. Smorodintsev Research Institute of Influenza of the Ministry of Health of Russia.

THE PURPOSE of WCRC activity is to ensure scientific and technological breakthrough of the Russian Federation through the application of fundamentally new knowledge-intensive technologies of modern digital production in accordance with the key priorities of the Strategy for Scientific and Technological Development of the Russian Federation.

The WCRC research program contains 35 scientific topics of research and development in 4 areas:

- Advanced digital technologies (Smart Design; Smart Manufacturing)
- Artificial intelligence
- Robotic systems
- Next-generation materials and additive technologies.

THE MAIN RESULTS OF THE CENTER INCLUDE:

- Methods of designing products for various fields of mechanical engineering have been developed: engine building, railway engineering, power engineering; development of a small-size turboprop engine CML-180/240 for UAVs and light airplanes is underway;
- Technologies of additive manufacturing have been developed: technology of direct laser growing of products, including functional-gradient and multimetal ones; technology of synthesis of high-entropy alloys in the process of direct laser growing; technology of arc growing;
- Methods for analysis of short-term variability of viruses, as well as data-based epidemiological modeling were created; elements of a digital decision-making support system (DMSS) in the field of vaccination activities were developed; elements of a digital twin of the production processes of RNA vaccines were developed; a proprietary tool for analysis of neurodegenerative diseases Neuro Info Viewer was developed;
- An automated stand for research and visualization of oil displacement processes in core microfluidic model was created, in particular the technology of creating high-pressure microfluidic chips with the required morphology of pore space and chemical composition of the material.

Denis Manturov

Minister of Industry and Trade
of the Russian Federation

We have a goal to develop human resources, technological and production capacities to be able to take a worthy place in the currently existing global markets. It is extremely important to create a community of engineering centers that could effectively cooperate with the existing R&D institutes, state corporations, and foreign partners – and Polytechnic University has a lot to be proud of in this field

COMPUTER-AIDED ENGINEERING CENTER OF EXCELLENCE (COMPMECHLAB®)

CML SPbPU COMPUTER-AIDED ENGINEERING CENTRE OF EXCELLENCE
CompMechLab

SUPERVISOR:

Aleksey I. Borovkov
Candidate of Technical Sciences, Professor,
Head of SPbPU World-Class Research Center
for Advanced Digital Technologies

SPbPU Computer-Aided Engineering Centre of Excellence (CompMechLab®) of SPbPU was established in 2013 on the basis of the first in Russia Computational Mechanics Education, Research and Innovation Laboratory (CompMechLab®) of SPbPU with the participation of SPbPU engineering spin-out company "Computational Mechanics Laboratory" LLC and small innovative enterprise "Polytech-Engineering" LLC.

SPbPU Computer-Aided Engineering Centre of Excellence (CompMechLab®) is a recognized national leader in the field of developments based on digital design and modeling, computer and supercomputer engineering, which performs knowledge-intensive R&D under the orders of leading high-tech industrial enterprises.

Among the industries in which original technologies, designs and equipment are being developed are: engine engineering; nuclear power and nuclear engineering, fusion power (fusion reactors); power engineering; automotive engineering; aircraft engineering (composite materials and composite designs/structures); metallurgy; mechanical engineering (heavy, metallurgical, oil and gas, petrochemical, transportation, etc.); shipbuilding and shipbuilding, rocket and space engineering, instrumentation and instrumentation, etc.).

EXAMPLES OF HIGH-TECH PROJECTS IMPLEMENTED BY THE ENGINEERING CENTER:

- Creation of "Smart" Digital Twin and experimental sample of a small-sized urban electric vehicle: pre-production sample of electric vehicle **"KAMA-1"** based on Digital Twin technology and Digital Twin Development and Application Platform **CML-Bench®**
- Development of a digital twin of an offshore gas turbine engine and gearbox as part of the unit
- Development of the Digital Platform for Conceptual Design and Optimization of Aeronautical Products
- Initiative development of **UAV "Snegir-1"** of hybrid layout combining the advantages of multi-rotor and airplane schemes, etc.

ENGINEERING CENTER FOR END-TO-END COMPUTER-AIDED DESIGN AND DIGITAL TECHNOLOGIES IN MECHANICAL ENGINEERING

SUPERVISOR:

Anatoliy A. Popovich
Doctor of Engineering Science, Professor, Director
of the Institute of Machinery, Materials and Transportation

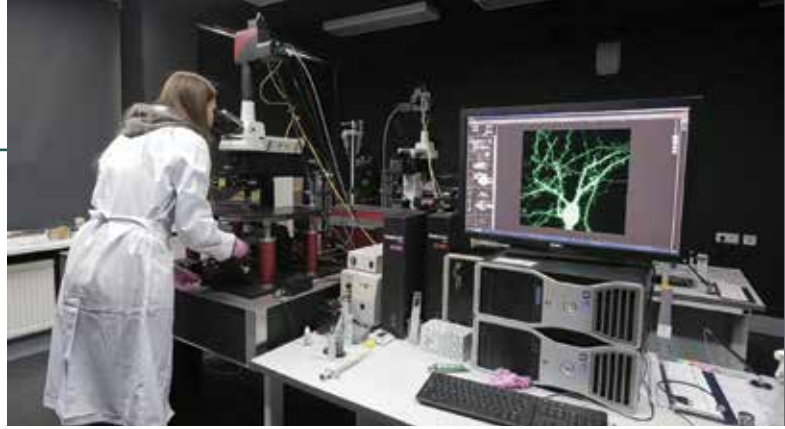
In 2024, SPbPU established the «Engineering Center for end-to-end computer-aided design and digital technologies in Mechanical Engineering», which is engaged in the development of sets of design documentation of critical components in the interests of the real sector of the economy in order to localize production in the territory of the Russian Federation, namely:

- Innovative rock-destroying tools and their armament based on the development of rock fracture theory;
- Equipment for oil and gas drilling, production, treatment, processing and transportation of oil and gas;
- Assemblies and components of machine-tool and machine-tool building industries.

THE ENGINEERING CENTER PROVIDES A WIDE RANGE OF SERVICES:

- Design and technological support of projects in the field of **machine tool** and **oil** and **gas engineering**
- Designing, engineering, prototyping, development of working design documentation for components of i**mport-substituting oil** and **gas equipment** and **drilling tools**, **metal-cutting equipment** and **machine-tool complexes**.
- Development of complete working documentation for equipment for the implementation of **additive technologies**; manufacturing and commissioning
- Development of technology for manufacturing of domestic import-substituting **carbide** and **polycrystalline teeth** for PDC bits using additive technologies.
- Modernization and repair of heavy and precision metal-cutting machine tools, including numerical control systems
- Design and manufacture of mobile rod **deep well pump** drives with adaptive group control system for oil wells
- **Reconstruction** of inefficient systems with low productivity
- Development of **new materials** and technologies of their industrial production for modern metal-cutting tools of civil and dual application
- **Training and retraining** of specialists, including specialists of the highest category

MOLECULAR NEURODEGENERATION LABORATORY



HEAD OF LABORATORY:

Ilya B. Bezprozvanny
Professor of the Higher School of Biomedical Systems and Technologies, Doctor of Biology

The Laboratory of Molecular Neurodegeneration of SPbPU was opened in 2012, is the first in St. Petersburg in the field of advanced issues of modern molecular medicine and neurodegeneration and plays an important role in the development and practical application of achievements of traditionally strong physiological school of St. Petersburg.

THE MAIN AREAS OF WORK ARE:

- Application of the latest techniques of control of functional activity of nerve cells based on the optogenetics method
- Analysis and visualization of neuronal activity using modern technology of miniature fluorescence microscope (Miniscope), which allows to carry out a wide range of fundamental and preclinical studies of neurodegenerative diseases and mental disorders.
- Search for new molecular targets for the development of drug therapy of neurodegenerative diseases

MAIN RESEARCH AREAS:

- Investigation of molecular mechanisms of brain neurodegeneration
- Investigation of the role of calcium signaling in the pathogenesis of neurodegenerative diseases
- Search for therapeutic targets for the development of drugs for the treatment of NDDs
- Structural and functional studies of proteins involved in the processes of neurodegeneration
- Development of methods of optogenetic control of neuronal activity in vitro, in vivo

KEY PARTNERS:

1. Sechenov Institute of Evolutionary Physiology and Biochemistry of the Russian Academy of Sciences
2. Institute of Cytology of the Russian Academy of Sciences
3. Saint Petersburg State Chemical and Pharmaceutical University
4. Institute of Higher Nervous Activity and Neurophysiology of RAS

RESEARCH AND INNOVATION COMPLEX “NANOBIOTECHNOLOGIES”

DIRECTOR:

Mikhail A. Khodorkovskij
Ph.D. in Physics and Mathematics, Institute of Biomedical Systems and Biotechnologies

The RIC was established in 2008. The complex uses the most modern experimental approaches to study the composition and structure of the most complex biological objects, to reveal their functions at the cellular and subcellular levels, to determine trace amounts of metabolites in human products, to study the most complex biochemical processes at the molecular level, to study the dynamics of nanobiomachines at the single-molecule level, etc.:

- High-resolution NMR spectroscopy;
- High-resolution chromatography and chromatography-mass spectrometry; optical spectroscopy
- Super-resolution (subdiffraction) fluorescence microscopy;
- A unique method of studying biological structures at the single-molecule level;

KEY PARTNERS:

Skoltech

Российская Академия Наук

STRUCTURAL SUBDIVISIONS OF THE NANOBIOTECHNOLOGIES SRC:

1. Collective Use Center (CUC) “SPbPU Analytical Center of Nano and Biotechnologies”
2. Laboratory of Molecular Microbiology (LMM)
3. Laboratory of molecular biology of nucleotide-binding proteins.

MAIN RESEARCH DIRECTIONS:

- Investigation of molecular mechanisms of CRISPR-Cas systems
- Investigation of mechanisms of bacterial infection by giant bacteriophages, mechanisms of bacterial fission
- Study of restriction modification systems
- Investigation of molecular mechanisms of repair and transcription processes, including at the level of single molecules with the help of the unique “Laser Tweezers” facility
- Study of excitation and relaxation processes in high molecular compounds by laser spectroscopy in femtosecond range
- Development of diagnostic systems based on CRISPR-Cas technology

SCHOOL OF ADVANCED ENGINEERING STUDIES IN DIGITAL ENGINEERING

Schools of Advanced Engineering Studies

School of advanced engineering studies in digital technologies was established at SPbPU in 2022 as a result of winning the competition of the relevant federal project of the Russian Ministry of Education and Science.

The goal of the school is to solve urgent frontier engineering problems and create a new type of engineering training in the interests of high-tech companies in Russia through new educational programs of higher education and additional educational programs based on the implementation of breakthrough scientific and technological developments and research supporting them.

The mission of the School of advanced engineering studies in digital engineering is to create multidisciplinary scientific knowledge, knowledge-intensive technologies and world-class digital platform solutions based on the model of polytechnic engineering education, advanced training of leaders and scientific and technical elite (engineering "special forces"), in cooperation with leading industrial enterprises and scientific organizations.

KEY AREAS OF SPBPU AES ACTIVITIES:

- Cross-industry digital platform solutions and technologies
- System digital engineering in the engine industry
- Digital technologies in the nuclear industry
- Digital Technologies for Fuel and Energy Complex
- New Materials

The capabilities of the **CML-Bench® Digital Twin** Development and Application Platform are utilized as a primary tool.

>400 MILLION

As of December 2023, 20+ projects worth more than RUB 400 million are being implemented for the benefit of high-tech companies TVEL, Centrotech, CentrotechEngineering, Atomenergoproekt, ODK, Gazpromneft STC, and Severstal.

2023 DECEMBER


САНКТ-ПЕТЕРБУРГСКИЙ
1899
ПОЛИТЕХНИЧЕСКИЙ
НАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ
УНИВЕРСИТЕТ
ПЕТРА ВЕЛИКОГО

TBOIL CO-WORKING SPACE

In 2019, SPbPU opened a university TBoil Polytech co-working space. This format was developed by the Agency for Strategic Initiatives of Russia and has been in use since 2014. Today, there are more than 40 TBoils all over the country.

TBoil Polytech is located in the famous SPbPU Hydro Tower. Its main area of activity is projects within the National Technology Initiative markets, in particular, the Technet cross-market area (advanced manufacturing technologies).

TBoil Polytech unites scientists, students, technology entrepreneurs, government officials, members of public organizations and professional communities, education, science, and business and provides an opportunity to share educational content and best educational practices of universities with each other and to introduce modern digital technologies into educational activities with the help of partners and participants of the NTI ecosystem: development institutions, state corporations, and companies.

FABLAB POLYTECH

FabLab Polytech is a part of the Center for Scientific and Technical Creativity of Youth of SPbPU one of the leading laboratories for digital manufacturing in Russia. FabLab Polytech is an open and free workspace with CNC machines for students. The goal of the center is to provide students with an opportunity to implement their technical and creative ideas.

Areas of activities include robotic engineering, 2D and 3D modeling, 3D scanning, 3D printing, electronic device design and programming.

YOUTH RESEARCH AND DEVELOPMENT ACTIVITIES

Polytechnic University pays great attention to the involvement of young people in the actual tasks of the real sector of the economy, participation in project activities and development of digital knowledge and skills. The system is continuously improving and adapting to the requirements of the dynamically changing external environment to attract more young researchers, engineers and students to solve ambitious R&D tasks, unlock their potential and ensure stable professional growth.

SPbPU has managed to bring to a high level of readiness projects on unmanned solutions and software systems, which have already attracted the attention of leading organizations in the country.

Among the most advanced projects and developments in which SPbPU undergraduate and graduate students are involved are the following:

- Formula Student Series racing car (Formula SAE)
- SOLAR CAR Russia's first solar-powered car
- Russia's first electric concept car CML CAR
- SOLAR PANEL BOAT unmanned solar-powered steerable boat
- SOLAR DRONE crewless autonomous boat
- Unmanned solar-powered catamaran «Cadet M»
- Bionic prosthetic hand
- The first student satellite of the Polytechnic University
- Arduino-clock for teaching robotics and programming
- Braille trainer for students of teiflo departments, Braille teachers and blind people

EDUCATION

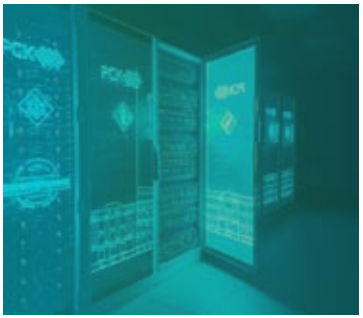
INSTITUTES

INSTITUTE OF CIVIL ENGINEERING

INSTITUTE OF CYBERSECURITY AND COMPUTER SCIENCE

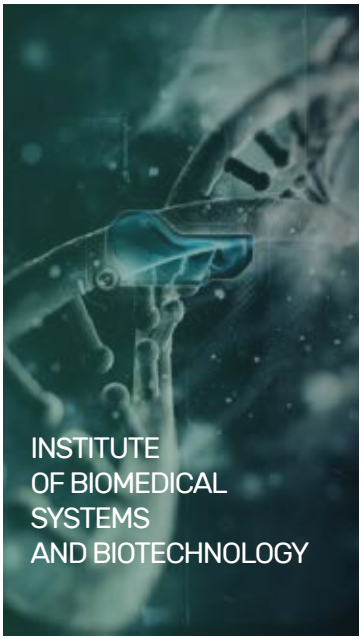
INSTITUTE OF MACHINERY, MATERIALS AND TRANSPORT

INSTITUTE OF ELECTRONICS AND TELE-COMMUNICATIONS



SCHOOL OF ADVANCED ENGINEERING STUDIES IN DIGITAL ENGINEERING

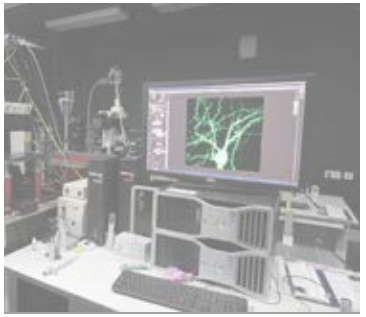
INSTITUTE OF INDUSTRIAL MANAGEMENT, ECONOMICS AND TRADE



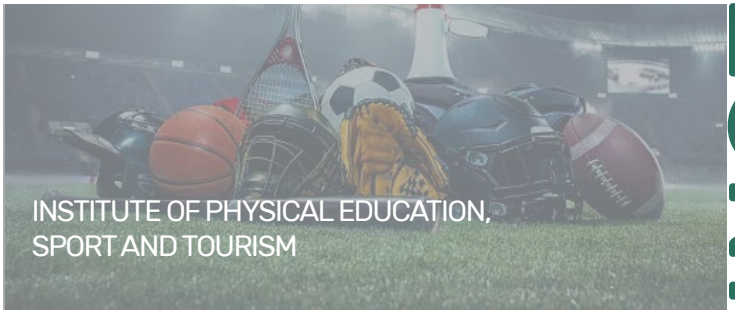
INSTITUTE OF BIOMEDICAL SYSTEMS AND BIOTECHNOLOGY

INSTITUTE OF PHYSICS AND MECHANICS

INSTITUTE OF ENERGY



INSTITUTE OF HUMANITIES



INSTITUTE OF PHYSICAL EDUCATION, SPORT AND TOURISM

FIELDS OF STUDY

(BSc, MSc)

INSTITUTE OF ENERGY

- Heat Power Engineering (BSc, MSc)
- Electrical Power Engineering (BSc, MSc)
- Power Machine Engineering (BSc, MSc)
- Nuclear Power Engineering and Thermophysics (BSc, MSc)

INSTITUTE OF CIVIL ENGINEERING

- Civil Engineering (BSc, MSc)
- Technosphere Safety (BSc, MSc)
- Design (BSc, MSc)
- Architectural environment design (BSc, MSc)
- Urban Development (MSc)

INSTITUTE OF ELECTRONICS AND TELECOMMUNICATIONS

- Radio Engineering (BSc, MSc)
- Infocommunications Technologies and Communication Systems (BSc, MSc)
- Electronics and Nanoelectronics (BSc, MSc)
- Technical Physics (BSc, MSc)

INSTITUTE OF CYBERSECURITY AND COMPUTER SCIENCE

- Mathematics and Computer Sciences (BSc, MSc)
- Mathematical Software and Information Systems Administration (BSc, MSc)
- Computer Science and Engineering (BSc, MSc)
- Information Systems and Technologies (BSc, MSc)
- Applied Information Science (BSc, MSc)
- Software Engineering (BSc, MSc)
- Control in Engineering Systems (BSc, MSc)

INSTITUTE OF MACHINERY, MATERIALS, AND TRANSPORT

- Mechanical Engineering (BSc, MSc)
- Automation of Technological Processes and Production (BSc, MSc)
- Design and Technology Support of Mechanical Facilities (BSc, MSc)
- Materials Science and Technology of Materials (BSc, MSc)
- Metallurgy (BSc, MSc)
- Transportation Technologies (BSc, MSc)
- Quality Management (BSc, MSc)
- Innovation studies (BSc, MSc)
- Nanotechnologies and Microsystems Engineering (BSc)
- Artistic Materials Processing Technology (BSc)
- Motor Transport and Technology Systems (MSc)

INSTITUTE OF PHYSICS AND MECHANICS

- Applied Mathematics and Informatics (BSc, MSc)
- Mechanics and Mathematical Modeling (BSc, MSc)
- Applied Mathematics and Physics (BSc, MSc)
- Physics (BSc, MSc)
- Applied Mechanics (BSc, MSc)

INSTITUTE OF BIOMEDICAL SYSTEMS AND BIOTECHNOLOGY

- Biotechnical Systems and Technologies (BSc, MSc)
- Biotechnology (BSc, MSc)
- Food Products of Animal Origin (BSc)
- Production Technology and Organization of Catering (BSc, MSc)
- High-tech production of healthy food products (MSc)

INSTITUTE OF PHYSICAL EDUCATION, SPORT AND TOURISM

- Physical Culture (MSc)

INSTITUTE OF INDUSTRIAL MANAGEMENT, ECONOMICS AND TRADE

- Economics (BSc, MSc)
- Management (BSc, MSc)
- Human Resource Management (BSc, MSc)
- State and Municipal Management (BSc, MSc)
- Business Informatics (BSc, MSc)
- Commerce (BSc, MSc)
- Tourism (BSc, MSc)
- Hotel Business (BSc, MSc)
- Statictics (BSc, MSc)
- Science-Intensive Technologies and Economics of Innovations (MSc)
- Government Auditing (MSc)

INSTITUTE OF HUMANITIES

- Jurisprudence (BSc, MSc)
- Linguistics (BSc, MSc)
- Advertising and Public Relations (BSc, MSc)
- Publishing (BSc, MSc)
- Psychological and Pedagogical Education (BSc, MSc)
- Foreign Regional Studies (BSc, MSc)
- Intelligent Systems in the Humanitarian Sphere (BSc, MSc)
- Sociology (MSc)
- Pedagogical Education (MSc)

DIGITAL ENGINEERING

- Technology Entrepreneurship (MSc)
- Applied Mechanics (MSc)

POSTGRADUATE PROGRAMS

SCIENTIFIC MAJORS

50+ PHD PROGRAMS

- Mathematics and Mechanics
- Computer Science and Informatics
- Physical Sciences
- Biological Sciences
- Earth and Environmental Sciences
- Civil Engineering and Architecture
- Electronics, Photonics, Instrumentation and Communications
- Information Technologies and Telecommunications
- Power Engineering and Electrical Engineering
- Mechanical Engineering
- Chemical Technologies, Materials Sciences, Metallurgy
- Law
- Economics
- Political Science
- Historical Sciences
- Philosophy
- Pedagogy

HIGHER SCHOOL OF INTERNATIONAL EDUCATIONAL PROGRAMS

POLYTECH
Institute of International Educational Programs

The Higher School of International Educational Programs (HS IEP) is a unified platform for all foreign students coming to SPbPU. Here they receive basic training and are then assigned to different areas of study.

HS IEP was established as a result of the transformation of the Institute of International Educational Programs, which had been operating since 1996. Over the years of its activity, the Graduate School of International Educational Programs has become one of the leaders in the field of international education and training of foreign students in St. Petersburg and the North-West region of Russia.

The Graduate School of International Educational Programs trains foreign citizens for admission to universities for undergraduate, graduate and postgraduate programs. SPbPU has been providing pre-university training since 1965. Over these years more than 20,000 foreign students from CIS, Asia, Africa, Central, North and South America have studied under these programs.

1500+
international students annually

25+
educational programs

HS IEP OFFERS THE FOLLOWING INTERNATIONAL EDUCATIONAL PROGRAMS:

- University Foundation Program
- Russian language study programs for the levels from A0 to C1: duration from 2 weeks to 9 months
- Russian language study programs for professional activities
- Russian language for business
- Professional development for teachers of Russian as a foreign language
- Short-term programs in the field of Russian Studies: courses in the English and Russian languages (summer and winter schools, internships and semester study)
- Customized programs for groups of students and adults
- Testing Center for Russian as a Foreign Language: TORFL I, II and III

INTERNATIONAL ACTIVITIES

INTERNATIONAL ACTIVITIES

For 125 years, Polytechnic University has been one of the leading engineering universities in Russia and economic education in the global world. Scientists who have made an outstanding contribution to the world science worked within the walls of our university. SPbPU combines the traditions of fundamental Russian science and the best international practices. Today Polytechnic University is proud to continue scientific traditions, develop the scientific, technological and educational potential of the country. We are part of the global world, maintaining contacts with more than 300 foreign partners, including the world's leading universities, research organizations and industrial companies.

INTERNATIONAL STRATEGIC PRIORITIES

- Unique international partnership with leading universities, research institutes and companies
- Internationalization of education and promotion in the CIS, Asia, Africa and Ibero-America through the creation of a network of representative and joint structures, organization and implemen-tation of unique international events
- Comprehensive internationalization: educational programs, number of international faculty and foreign students
- Networked international programs and projects

Within the framework of international cooperation, our university carries out the following activities:

- Academic cooperation and networking
- Joint research projects with industry
- Joint educational projects
- International joint Master's degree and PhD programs
- Joint R&E centers and labs with the involvement of leading world companies
- Foreign visiting professors and guest speakers
- Joint publications in international editions
- Joint workshops and conferences
- International summer and winter schools
- International academic mobility

Today, our university occupies one of the first places among Russian higher education institutions participating in international research projects. Effective partnership with the world's leading companies is the most important factor in entering the international knowledge-intensive market, increasing competitiveness, reputation and creating the image of the university in the global arena.

The University's partner network includes more than 200 foreign universities, 100 international companies, research centers, global industrial companies, government agencies and business communities from Asia, CIS countries, Africa and Latin America.

Cooperation with universities and scientific clusters of the Asia-Pacific region and Africa are the key areas of Polytech international activities. The university has over 100 partners from BRICS countries. Since 2022, SPbPU has been a strategic partner of the BRICS+ International Municipal Forum.

Since 2016, the official Representative Office of SPbPU in Shanghai has been successfully operating, and in 2022 the International Office in Nanjing was opened. In 2023, Polytechnic opened the Russian Language Center and Pre-University Training Center in Mali, as well as the Information Center of SPbPU and RAFU. The University plans to open information offices and joint structures in other countries.

KEY PARTNERS

R&D PARTNERS

INTERNATIONAL EDUCATION

TOP-3 **among Russian universities by number of international students**

in the QS ranking by number of international students

TOP-4 **among Russian universities in THE World Reputation Rankings 2023 (150th in the world)**

international educational programs

TOP-1 largest summer school in Russia

international faculty members annually

international students from 107 countries

of full-time students are foreigners

With strong scientific schools in IT, robotics, digital manufacturing technologies, construction, energy, ecology, physics, biotechnology, materials science, production management, the university offers a wide range of educational programs in different languages and is open to international students from all over the world.

Every year more than 6000 international students from over 100 countries study at SPbPU. The total number of Russian and foreign graduates over the last fifty years has exceeded 280,000.

Today, thanks to a systematic development strategy, SPbPU has a unique partner network that includes leading universities from the CIS, Asia, Africa and Latin America.

The University is focused on the development of joint educational programs, including those in English. The total number of international programs is more than 100, including bachelor's, master's and postgraduate degree programs in English.

Polytechnic University also implements summer and winter schools, Russian language programs, academic exchange, internships, etc. The International Polytechnic Summer School is the largest in Russia - more than 1500 students participate in these programs annually.

JOINT STRUCTURES

Gazpromneft – Polytech
Research and Education Center

Peter the Great
St. Petersburg
Polytechnic University

North-West Synergy
Interuniversity Regional Training
and Research Center

Network Laboratory of Intelligent Robotics
and Cyber-Physical Systems
with Belarusian-Russian University

Information Center
of SPbPU and RAFU, Morocco

Russian Language Center at the University
of Languages and Humanities, Kabala, Mali

Pre-university training center,
Bamako, Mali

Information Center
of SPbPU and RAFU, Mali

Engineering school
in Uzbekistan


Joint Innovation Science & Technology Center with ENV New Energy Technology Research Institute, China
Laboratory of Aerospace and Electronic Engineering at Tsinghua University, China
Joint Research and Education “Smart Materials and Intelligent Technologies” Center with ETRI Institute, China
Laboratory of Basic and Translation Neuroscience with Shanghai Jiao Tong University, China
Joint Engineering Institute with Jiangsu Normal University, China
Joint internship center «TU Xian-Polytech» in cooperation with Xi’an Technological University, China
Joint laboratory “Microprocessor technology” with Binh Duong University, Vietnam
Center for Russian Language and Culture, Vietnam
Joint Polytechnic Institute XATU-SPbPU with Xi’an Technological University, China
Russian Language Centers in China provinces: Henan, Shandong, Hebei
Joint Scientific and Educational Technology Center with Samarkand State University named after Sharof Rashidov

INTERNATIONAL OFFICES

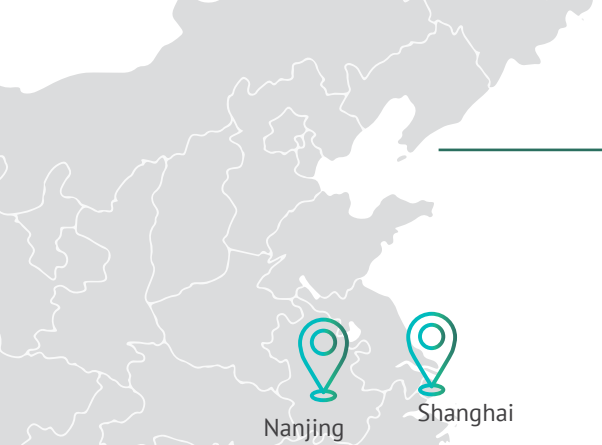
SPBPU REPRESENTATIVE OFFICE IN SHANGHAI

On April 21, 2016, the opening ceremony of the Representative Office of Peter the Great St. Petersburg Polytechnic University took place in the Pudong New Area, Shanghai (PRC).

Polytechnic University was the first Russian university to establish a representative office in China. The decision to establish a Representative Office in China was made in November 2015 in the course of the visit of the Pudong New Area (Shanghai) delegation to SPbPU.

The mission of the University's Representative Office in Shanghai is to represent and promote the interests of the University in the People's Republic of China (PRC) and other countries of the Asia-Pacific region; to promote international cooperation in education, research and public affairs; to promote contacts and cooperation with Chinese and international scholars, experts, academic and research institutions, industrial enterprises and companies, governmental agencies and NGOs; to provide international counterparts with up-to-date information regarding the University's activities; to compile and analyze information on cooperation opportunities with international partners and disseminate it via University communication channels, and to promote the University in this region.

The main goal of the Polytechnic University's Representative Office in Shanghai is to increase the competitiveness and reputation of the University as an innovative, entrepreneurial and international institution in the market of China and Asia-Pacific Region, to ensure efficient scientific and technical cooperation with universities and companies in China and other APR countries, to extend the capacities of technology transfer and commercialization of the results of intellectual activities, promote the educational programs of SPbPU in China and APR, and to ensure enrollment of talented students from China and other countries of the region in SPbPU.



INTERNATIONAL OFFICE FOR GLOBAL INNOVATION COOPERATION IN NANJING, JIANGSU PROVINCE

The office was established in 2022 at the Jiangsu Industrial Technology Research Institute (JITRI) in Nanjing, Jiangsu Province, a leading applied research organization in China, and is supported by the National Innovation Center of Excellence - Yangtze Delta

THE MAIN TASKS OF THE OFFICE ARE:

1. Development of partner network of Polytechnic University in Yangtze River Delta regions: Jiangsu, Anhui, Zhejiang provinces, Shanghai city.
2. Promotion of SPbPU scientific, technical and innovative projects at innovation exhibitions, thematic conferences, forums, symposiums, etc., held under the auspices of the National Innovation Center of Excellence – Yangtze Delta and the Governments of Jiangsu, Anhui, Zhejiang provinces and Shanghai.
3. Holding seminars and project sessions in areas relevant to SPbPU with partners from the Yangtze River Delta region.
4. Demonstration of models of the university's scientific, technical and innovative projects within the expo zone of global partners of the Jiangsu Research Institute of Industrial Technology.
5. Initiation and support of programs to support young scientists of SPbPU in partnership with Jiangsu Research Institute of Industrial Technology, as well as leading universities and research organizations of the Yangtze River Delta region.

STRATEGIC COOPERATION WITH CHINA

Cooperation with universities and scientific clusters of the Asia-Pacific region is a strategic direction of Polytech's international activities. SPbPU has more than 100 partners from China, including such strategic partners as Tsinghua University and Zhejiang University, National Innovation Center of Excellence of the Yangtze River Delta (NICE) and Jiangsu Industrial Technology Research Institute (JITRI).

Joint engineering institutes and laboratories have been established in Jiangsu and Xi'an. Polytechnic actively develops areas of scientific and educational cooperation with universities, enterprises, industrial and innovative companies from Zhangjiang Science City. In 2023, SPbPU Rector Andrei Rudskoi, as Chairman of the St. Petersburg Branch of the Russian Academy of Sciences, signed a cooperation agreement with the Shanghai Branch of the Chinese Academy of Sciences.

The University has 2 official international offices in the PRC: the Representative Office in Shanghai in the high-tech district of Pudong (opened in 2016) and the International Office of Global Innovation Cooperation in Nanjing, Jiangsu Province (opened in 2022).

STRATEGIC COOPERATION WITH AFRICAN COUNTRIES

Russian-African Network University

Africa has always been a priority area of cooperation for our university. Thousands of students from Africa have studied at Polytechnic University. Our professors have taught in many African countries, for example, in Egypt, Algeria, Morocco, Mali, Angola and others.

Now, together with African universities, SPbPU is developing new educational programs, Russian language and pre-university training centers, and implementing joint projects.

In 2023, Polytechnic University became the coordinator of the Russian-African Network University (RAFU) consortium, which is a strong basis for joint scientific and educational activities and gives a new impetus to join forces and open new horizons of interaction.

RAFU PARTICIPANTS:

AREAS OF ACTIVITY OF THE RAFU CONSORTIUM:

- Cooperation between higher education institutions in Russia and Africa
- Joint educational programs and research projects
- Targeted training together with industrial partners
- Academic mobility
- Open access to educational resources of RAFU participants

SUMMER MULTIDISCIPLINARY UNIVERSITY «RUSSIA-AFRICA» AND OTHER EDUCATIONAL PROGRAMS:

150 students annually

20+ countries

50+ programs and tracks

Online school for applicants: 500+ participants

RU ENG FR Teaching languages: Russian, English, French

SLAVIC UNIVERSITIES

In 2014, Polytechnic University became one of the key partners in the unique project of the Ministry of Education and Science of the Russian Federation on the creation and development of Slavic universities, becoming the curator of the Russian-Armenian (Slavic) University (RAU), Yerevan, and the Belarusian-Russian University (BRU), Mogilev.

Starting from 2023, SPbPU signed strategic partnership agreements with the third university of this project - Kyrgyz-Russian Slavic University (KRSU), Bishkek.

The programs for the development of Slavic universities are designed, first of all, to assist them in the development and testing of specific mechanisms and tools for entry and positioning in the national and world markets of educational services and R&D results, to promote the formation of conditions and competencies in Slavic universities for their sustainable development.

Every year Polytechnic University together with the Ministry of Science and Higher Education of the Russian Federation organizes the Summit of Slavic Universities "Slavic Horizon".

Russian-Armenian (Slavic) University

Belarusian-Russian University

Kyrgyz-Russian Slavic University

Summit of Slavic Universities "Slavic Horizon" at Polytech

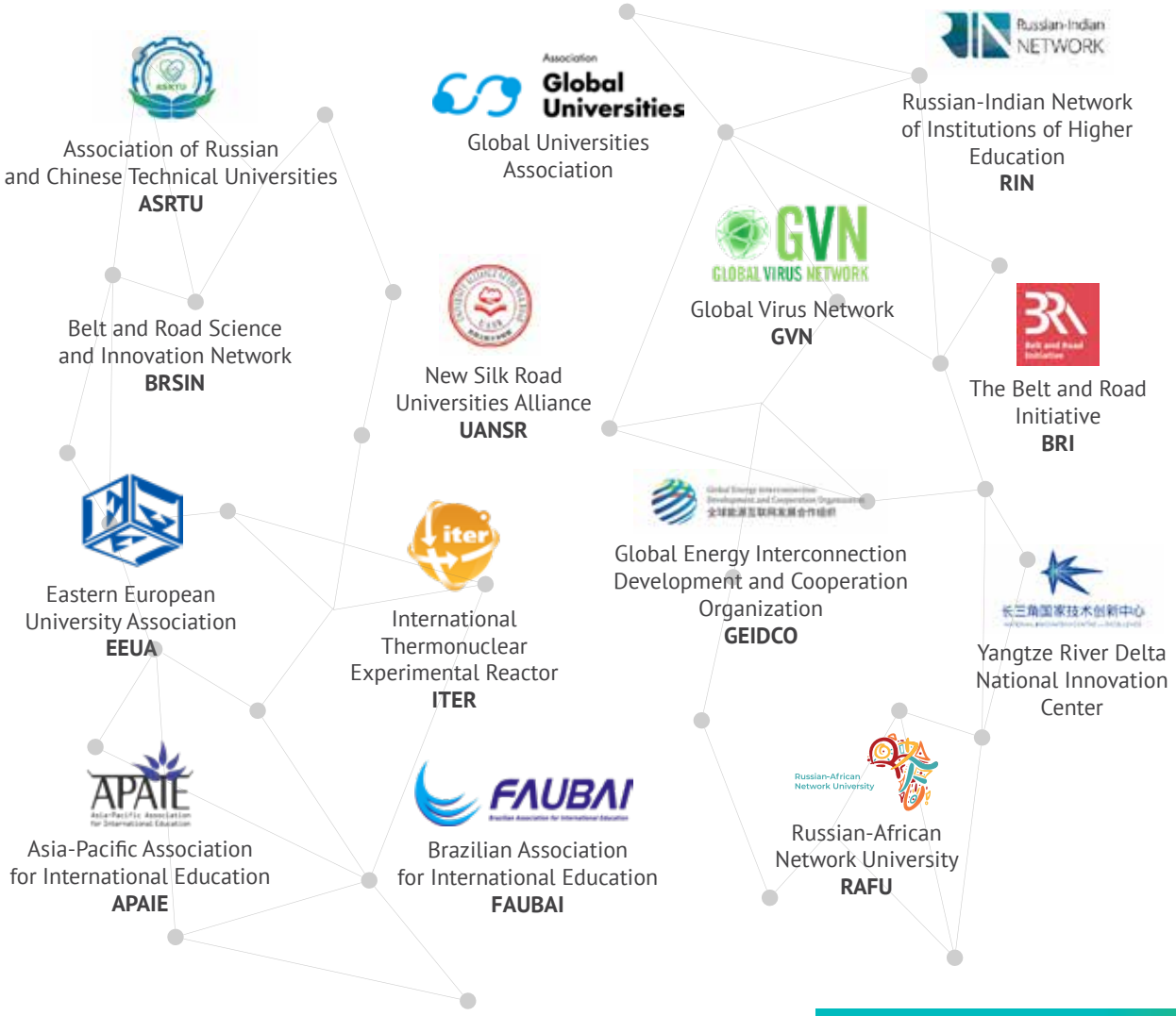
Signing of an agreement with the Belarusian-Russian University

Signing of an agreement with the Russian-Armenian (Slavic) University

Signing of an agreement with the Kyrgyz-Russian Slavic University

MEMBERSHIP IN INTERNATIONAL ASSOCIATIONS

SPbPU IS A MEMBER OF THE FOLLOWING INTERNATIONAL ASSOCIATIONS:



STUDENTS' LIFE

The Polytechnic University campus is a **unique place** on the map of St. Petersburg, where frontier scientific research, advanced engineering education and vibrant student life intertwine. Modern academic buildings neighbor historical buildings, while the Hydro Tower and Polytechnic Park create a special atmosphere.

Polytechnic University provides a wide range of social, sports and cultural activities for students and employees.

Polytechnic's sports complex includes a stadium, swimming pool, volleyball and basketball courts, sports and gyms, tennis courts, etc. The university offers every student the opportunity to unlock their potential by joining various teams: hockey, soccer, handball and many others, as well as visiting gyms, practicing rowing, yoga or becoming an active fan.

And for fans of cybersports, the university has opened the first university phygital center in Russia named "Berloga".

THINK FORWARD

Polytechnic University provides students and staff with a wide range of opportunities to get involved in art and creativity. The center of cultural and concert life of SPbPU is the White Hall - one of the best university ceremonial halls in St. Petersburg, striking with the perfection of architectural forms and unique acoustics. For more than 50 years the stationary university theater Glagol (Verb) has been successfully working, having performed more than **1500 performances.** Polytechnic is also known for its musical and choral groups.

Student organizations and communities are active at the university. The active Student Club includes 15 studios and associations: from sports to science. To support international students, the international club PolyUnion and student association Tutor Forces have been created at the University. PolyUnion is a place for communication and cultural exchange, and the members of the Tutor Forces provide assistance in adaptation and social integration. These associations jointly contribute to the comfortable stay and education of international students at Polytechnic.

At our university everyone can find themselves and implement their ideas in creativity and sports.

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