

## Registration

<https://winteruniversity.ru/en>

WINTER UNIVERSITY FOR ENGINEERS IN PSKOV

Dates: **25.11 - 09.12**

**for free.** Air tickets, accommodation, meals are paid by Pskov University.

Portrait of project participants:

**Bachelor's and Master's students aged 18 to 30**, who are currently studying at faculties of engineering specialties.

Specializations such as **mechanical engineering, automation, electrical engineering, materials science and robotics.**

Students participating in the project must have a high level of interest in specific heavy engineering topics and be committed to developing their skills in practical and theoretical aspects.

Experience in participating in scientific research, competitions and projects is welcome.

Students should also show an interest in cultural exchange and interaction with other cultures, which will supplement technical training with new experiences.

Language of communication: **English, Russian**

Lectures and the entire program are in Russian and English.

In the program: lectures, seminars, practical workshops, visits to factories and production enterprises in the Pskov region, a cultural program that includes a visit to the Pskov Kremlin, the Pskov Pechersky Monastery, a visit to the Savvo-Kripetsk Monastery of the Pskov Diocese (founded by the Serbian monk Savva Kripecki in 1455. ).

## Educational unit

### Educational program "Factories of the Future"

**Objective:** to form a system of knowledge among students about advanced production technologies, production management tools, basic concepts and tools of digital transformation, as well as key technological trends of the digital economy.

## *LECTURES*

### **Topic 1. Advanced training of engineering personnel in the context of production digitalization**

Familiarization with the basic conceptual ideas laid down in the federal project "Advanced Engineering Schools". An overview of the best practices of Russian universities in the training of engineers. Features of educational and scientific activities based on the network principle in

relevant scientific and technological areas and “cross-cutting” digital technologies. Priority areas of partnership with high-tech companies.

## **Topic 2. Commercialization of intellectual activity results**

The study and acquisition of skills in applying the results of intellectual activity and equated means of individualization of legal entities, goods, works, services and enterprises that are provided with legal protection, allowing them to independently solve engineering problems in conditions of continuous technical progress and improvement of production equipment, through the development and introduction of new production processes, technical means and technological processes.

## **Topic 3. Virtual modeling and manufacturing of products based on industry 4.0 technologies**

Formation of knowledge about the structure, principle of operation and characteristics of modern measuring, laboratory, additive equipment, CNC machines, 3D design programs and methods of creating electromechanical products using programmable microcontrollers.

## **Topic 4. Quality control and evaluation of the automated engineering products technological effectiveness**

Introduction to the features of technological preparation of automated production of machine-building products of medium complexity and high complexity. Features of the design of technological processes for the automated manufacture of parts from ferrous and non-ferrous metal alloys, polymers and composite materials. Ensuring the quality of products of medium complexity in mechanical assembly production.

## **Topic 5. Set theory and graph theory in solving digital information processing problems**

Improving knowledge in the development of algorithms for solving information processing problems. Introduction to logical functions and logical elements. Study of the basic concepts of set theory, graph theory, introduction to combinatorial analysis.

## **Topic 6. Fundamentals of international protection of intellectual property results**

Study of issues of international regulation of relations referred to the ownership, use and disposal of intellectual property.

## **Topic 7. New materials**

Technologies and new multifunctional materials for the formation of coatings for various functional purposes using plasma and laser processing methods.

## **Topic 8. Additive technologies**

Application, capabilities and main advantages of additive technologies in the manufacture and repair of mechanical engineering parts.

## **Topic 9. Global industrial trends**

Overview of key technological trends that shape the future of the global economy.

## **Topic 10. The concept of factories of the future: digital factory, smart factory, virtual factory**

Developing students' knowledge in the field of new business models, business processes and technologies in high-tech industries. Understanding advanced manufacturing technologies, production management tools, familiarization with the basic concepts and tools used for digital transformation.

## ***PRACTICES***

### **Workshop 1. Master class in holographic modeling**

Introduction to the technology of holographic representation of a design object. Demonstration of the internal structure of the product. Breaking down the holographic model into its component parts, working with the parts, displaying mechanical movements.

### **Workshop 2. Master class in Deep Machine Learning**

Introduction to the implementation of control through reinforcement machine learning. Generative adversarial networks, neural networks: image generation based on text and other images, and also computer vision: object classification, use of transfer learning.

### **Workshop 3. Industrial automation using programmable logic controllers**

Use of automation technologies based on PLC. Open-type automation projects capable of integrating various components of a complex of technical and software tools based on a single standard.

Purpose, design and characteristics of modern programmable logic controllers, including domestic controllers. Techniques for working with PLC in an integrated development environment and the basics of programming languages. Control of a real electric drive or a virtual industrial facility.

### **Workshop 4: Master class in Gas-Flame Spraying**

Master class on gas-flame spraying of powder materials and surface laser processing in the laser and plasma technologies laboratory.

### **Workshop 5: Master class in Direct Laser Deposition**

Introduction to the technological preparation of the process of direct laser deposition of metal products and powder materials.

### **Workshop 6: Master class in Industrial Robot Programming**

Training in the basics of industrial robot programming. Working in VR glasses in the intelligent industrial robotics laboratory.

### **Workshop 7: Master class in Prototyping and Reengineering**

Creation of digital models of objects and virtual modeling based on 3D scanning and printing.

### **Workshop 8: Master class in Database Basics**

General idea of databases: relational model, SQL language, accessing databases using data query languages.

## **Project Unit**

The project unit program is aimed at developing students' practical skills in the field of engineering systems and machines design, development and optimization. Participants study modern technologies, design and analysis methods, and also have the opportunity to work on real industry-based cases. The course includes lectures, master classes and team projects, and allows students to apply theoretical knowledge in practice. Particular attention in the course is paid to the basics and methods of effective project management. Participants will study the project life cycle, planning, risk assessment, teamwork organization, project execution control and project completion.

information on projects and areas of their implementation.

1. “Development of a “smart” transformer with a self-diagnostic function”. The information module will transmit data on current operating characteristics, environmental condition, wear condition, etc. A function for predicting the working resource is possible.
2. “Development of a navigation module for UAS for surveying power transmission lines”. The UAS, with a loaded map of the power transmission line and a dataset of marked defects, automatically conducts surveys for the presence of damages (ice, breaks, cable sagging, tilt of supports, etc.) of individual elements of the transmission line structure (insulators, wires, supports). The module uses computer vision technologies and multi-class segmentation models.
3. “Development of a training stand for a robot manipulator”. A real industrial manipulator with a control controller allows one to study the basics of industrial robotics, methods of programming and controlling a robot.
4. “Development of a dataset with images of 10 kV power transmission line damage using computer vision”. Development of a method for obtaining a dataset of damage and defects under various weather conditions. The obtained samples of elements and their damage should be labeled in accordance with the task of semantic segmentation. It is possible to implement a semi-automatic annotation process using neural networks of the YOLO Family or Supervisely or LabelMe tools.
5. “Career guidance platform for future engineers”. Creation of a single platform for the exchange of information among university students, graduates and future applicants. The platform will contain photographic materials and minute-long videos about the university's capabilities in various technical areas of training. Moderation of comments using AI.
6. “Development of the university interactive building maps application”. It makes it easier for freshmen to find a building, a classroom, and classmates. It contains a map of buildings, adjacent territories, and a video sequence of interior spaces, food outlets. The user has the opportunity to view the building and the classroom in panorama mode. It is possible to communicate with classmates by means of the links to the map.

## **Cultural and leisure unit**

A brief description of the unit

### *The excursion program*

- Sightseeing tour of the city of Pskov
- Pechory-Izborsk tour
- “On the other side of the screen” (an excursion to the operating cinema village in Pskov region, where the film “Kholop” (“The Bond Slave”) was shot)
- “An island in the middle of the Velikaya River”

### *Night of Hospitality*

This event will be an important part of the program aimed at creating a comfortable atmosphere for the exchange of knowledge and establishing contacts among participants.

The Night will include a meeting with organizers and representatives of industrial partners, various interactive events, and discussions where students and teachers will be able to ask questions and

talk about their ideas. Participants will be able to get acquainted with the culture of the region and participate in exciting team games.

The “Night of Hospitality” will create an opportunity for informal communication, which will be an important step to create a friendly and positive atmosphere

### ***TOURS TO ENTERPRISES***

1. ООО «СКТ Групп», г. Псков
2. ООО «ПЭРКО», г. Псков
3. ООО «Техносвар КС», г. Псков
4. ЗАО «ЗЭТО», г. Великие Луки
5. ООО «ВЕЛМАШ-С», г. Великие Луки
6. ЗАО «Опытный завод «Микрон», г. Великие Луки
7. АО «ВОМЗ», г. Великие Луки

### **About Pskov**

Pskov State University is the oldest and largest university in the Pskov region.

The university has a unique geopolitical location: it is located on the border of 3 countries, and in fact it is a presenter of Russian higher education for the Baltic States and the Republic of Belarus. The structure of the University includes 6 institutes, Advanced Engineering School of Hybrid Technologies in Machine Tool Building of the Union State, College, Military training center, and a branch of the University in Velikiye Luki in Pskov region.

About 10,000 students from more than 30 countries are studying at the University. There are 197 PhD and 34 Doctors of Sciences among the teaching staff.

Pskov State University implements more than 150 educational programs. The educational process includes implementation of all levels of basic professional educational programs.

The University is among the winners of the Priority-2030 strategic academic leadership program of the Russian Ministry of Education and Science. Pskov State University is the only Russian educational organization of higher education that has created jointly with the Belarusian National Technical University the international Advanced Engineering School of Hybrid Technologies in Machine Tool Building of the Union State.

! Two students from the University of Belgrade and the University of Pristina have already participated in the summer university in July this year, also for two weeks, in the Russian language program. They received professional knowledge. They were satisfied with the quality of the entire program.