

**«Graduates of the faculty
work as project development
managers and leading
specialists in the operation
of technological processes,
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and software at enterprises of
various forms of
ownership...»**



**INFORMATION
PACKAGE**

**FACULTY
OF CHEMICAL ENGINEERING**

Kyiv, 2021

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***** Information is current as for the 2021/2022 academic year. In the next academic year, there may be minor changes in the list of training specialties and educational programs.**



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Faculty of Chemical Engineering

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1. COMMON DESCRIPTION OF THE FACULTY

Faculty of Chemical Engineering (FCE) was established in 1938 and provides training in the field of mechanical engineering, resource-saving, ecology, and computer-



integrated technologies that allow one to design, explore and operate technological processes, equipment, and control systems for chemical and oil-refining industries, enterprises of building materials, pulp and paper production, plants for the processing of polymer, environmental protection institutions.

Graduates of the faculty work as project development managers and leading specialists in the operation of technological processes, equipment, control systems, and software at enterprises of various forms of ownership.

2. STRUCTURE

Faculty of Chemical Engineering consists of:

- **Automation Hardware and Software Department;**
- **Department of Ecology and Plant Polymers Technology;**
- **Department of Chemical Engineering and Oil Refining Industry;**
- **Department of Chemical, Polymer and Silicate Engineering**
- **Research Center "Resource-Saving Technologies".**

3. EDUCATIONAL PROGRAMS

Levels of higher education. Training of students at the **FCE** is carried out at three levels of higher education.

At the first level (Bachelor's course, I–IV academic years) the students acquire fundamental knowledge in chemistry, physics, mathematics, mechanics, computer engineering, and special disciplines. During the fourth year, they prepare and defend the bachelor's thesis and acquire a bachelor's degree.

At the second level, (Master's course, I-II academic years) students acquire relevant professional skills including laboratory practice. Applicants prepare and defend a master's theses and acquire a master degree

The third educational-scientific level – postgraduate studies, I-IV academic years. Applicants defend their dissertations and they are awarded the educational qualification of Doctor of Philosophy (PhD).

Terms of training: Bachelor – 4 years; Master (education-professional program) – 1.5 years; Master (education-scientific program) – 2 years: PhD – 4 years.



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1. Automation Hardware and Software Department provides training under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	Second	Third
Automation and Computer-Integrated Technologies	Automation Hardware and Software	Bachelor <i>EPP</i>	Master <i>EPP</i>	–
	Automation and Computer-Integrated Technologies		–	
				PhD <i>ESP</i>

*Comment: EPP – Educational-Professional Program
ESP – Educational-Scientific Program*

Computer control systems are an integral part of any industrial enterprises, financial institutions, telecom operators, government institutions, and business (private) companies. Therefore, the development, rapid deployment, maintenance, and upgrade of these systems require highly skilled professionals who will design, develop, and operate such systems.

Graduates who have undergone a training program at the department gained fundamental knowledge on:



- theory of automatic control;
- adaptive and Robust Systems;
- statistical analysis;
- the design of SCADA systems;
- programming (Java, C, C ++, PHP);
- intelligent data processing technologies;
- decision theory;
- technical means of automation;
- modelling and optimization systems.

Department graduates work in many world-renowned companies, including

- Microsoft,
- Google,
- Siemens,
- National Instruments,
- Mathworks,
- Samsung and others.



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2. Department of Ecology and Plant Polymers Technology provides training under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	Second	Third
Chemical Technologies and Engineering	Industrial Ecology and Resource-Efficient Cleaner Technologies	Bachelor <i>EPP</i>	Master <i>EPP</i>	–
			Master <i>ESP</i>	
	Chemical Technologies and Engineering	–	–	PhD <i>ESP</i>
Ecology	Environmental Safety	Bachelor <i>EPP</i>	Master <i>EPP</i>	
			Master <i>ESP</i>	
	Ecology	–	–	PhD <i>ESP</i>

*Comment: EPP – Educational-Professional Program
ESP – Educational-Scientific Program*

In course of training students of "Ecology" obtain a comprehensive knowledge of environmental protection, which is key to the successful implementation of them as experts in the sphere of their activity.



Graduates who are trained in "Chemical Technologies and Engineering", become specialists in the field of chemical technology and can work on the development and implementation of new or upgrading of existing process streams of producing pulp or carton board and paper products. Specialists and Masters, also, are capable of solving scientific problems of the above-mentioned industries, carry out investigations to improve manufacturing processes and end-product quality.



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3. Department of Chemical Engineering and Oil Refining Industry provides training under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	Second	Third
Indusial Machinery Engineering	Computer-Aided Design of Chemical Equipment	Bachelor <i>EPP</i>	–	–
	Engineering and Computer-Integrated Technologies for Designing Innovative Industry Equipment	–	Master <i>EPP</i>	–
			Master <i>ESP</i>	
Indusial Machinery Engineering	–	–	PhD <i>ESP</i>	

*Comment: EPP – Educational-Professional Program
ESP – Educational-Scientific Program*

Graduates of the department obtain deep knowledge in:

- Computer-aided design (Compass, AutoCAD), modeling and control of technological processes (SolidWorks, Aveva PDMS)
- Programming in the Windows environment with the use of algorithmic high-level languages (Object Pascal, Delphi, Mathcad, MatLab) and computer systems hardware;
- Higher mathematics, physics, technical drawing;
- Processes and equipment of chemical, gas, oil-refining, biochemical, and refrigerating manufactures;
- Scientific research on processes;
- Engineering and technological fundamentals of ecological safety in the chemical, petrochemical, and refrigeration industries.

All students study economics, management, marketing, and ecology.

Department graduates are employed successfully as the managers of enterprises of various ownership forms that are engaged in designing and operating equipment of chemical, machine-building, petrochemical, pharmaceutical, pulp, and paper industries and the forestry industry; as the experts in organizations that monitor the demand for products of oil and gas industry, the ecological state of the environment, supervision of design, production, implementation, and operation of biotechnological equipment, sales of cardboard and paper products.



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During training, students acquire knowledge and skills to carry out advanced research; learn computer design of machines and devices, chemical and oil refining industries resource and energy saving, environmentally safe equipment of oil and gas refining, production and processing of polymers, membrane separation, intensification and optimization of technological processes; acquire operating skills of the installation, repair, and diagnostics of the equipment of chemical plants.

4. Department of Chemical, Polymer, and Silicate Engineering provides training under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	Second	Third
Applied Mechanics	Engineering of Packaging Products, Processes, and Equipment	Bachelor <i>EPP</i>	Master <i>EPP</i>	
			Master <i>ESP</i>	
	Applied Mechanics	–	–	PhD <i>ESP</i>
Industrial Machinery Engineering	Engineering of Equipment for the Production of Polymer and Building Materials and Products	Bachelor <i>EPP</i>	–	–
	Engineering and Computer-Integrated Technologies for Designing Innovative Industry Equipment	–	Master <i>EPP</i>	–
			Master <i>ESP</i>	
	Industrial Machinery Engineering	–	–	PhD <i>ESP</i>

*Comment: EPP – Educational-Professional Program
ESP – Educational-Scientific Program*

Training programs are built in such a way as to prepare a comprehensive developed, high-quality, and modern specialist. Much attention is paid to both the theoretical fundamentals of the specialty, as well as practical exercises in which students create their 3D designs, make their calculations, and testing. Laboratories of the department are equipped with modern devices that are used in the leading factories and enterprises of the sector.



Education provides learning in an expanded volume of computational mathematics, programming, simulation, and optimization of processes, methods of the search of technical solutions and experimental studies, as well as the development and operation of automated systems and computer-aided design technology.



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4. TRAINING AND LABORATORY BASE

Department uses both common Igor Sikorsky KPI and own premises for training sessions.

Department of Chemical Engineering and Oil Refining Industry



The following specialized laboratories operate at the department:

- Training and Scientific Laboratory of Hydrodynamics and Mass Exchange in Disperse Systems;
- Research Laboratory of Polymer Processing by Extrusion Techniques;
- Laboratory for Studies of Membrane Processes.

Training is carried out based on modern computer classrooms with the use of multimedia equipment.

Automation in modern society determines the innovative development of all spheres of human activity. Cars and home appliances, engineering, and ship fittings are equipped with microprocessor-based automation tools. Full automation of modern production in all industries combines industrial computers, components, communications and local area networks, computer control and management of technological processes and machines, imaging systems, and machine vision software. You can learn how to design and create complex technological management systems of production, with the help of modern SCADA-systems, at the Department of Automation of Chemical Industries.



Basic special disciplines for bachelors: Computer Technology (operating systems, C ++ Builder, Matlab, Mathcad, LabView, Simulink, AutoCAD, MS Visio, etc.), Technical Means of Automation (Siemens, Bosh, Segnetics, etc.), Programming, Theory of Automatic Control, Identification and Modeling of Technological Objects, Fundamentals of Computer-Aided Design Systems (SCADA systems).

Basic special disciplines of Masters' course: Technologies of Artificial Intelligence, Intelligent Systems, and Databases, Design tools for Automatic Information Systems, Optimization of Technological Processes and Management Systems, Computer Methods of Systems Design, Adaptive and Robust Systems.

Following the curriculum, all students have practice at the leading enterprises of mechanical engineering, the oil and gas industry, and industrial enterprises of Ukraine.



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Department of Ecology and Plant Polymers Technology



A special feature of training "Ecology" is that the academic staff of the department consists of scientists, microbiologists, and a separation of highly skilled analytical chemists, who train students in modern methods of controlling environmental pollution levels. The students acquire special knowledge in such disciplines: Environmental Management, Environmental Assessment, Environmental Audit, Mathematical Modeling in Environmental Protection, Environmental Monitoring, Biology, Hydrology and Geology, General Ecology, Environmental Economics, Radioecology, Analysis of Natural and Waste Water, Water Purification and Water Treatment, Design of Water Utilization Schemes, Recycling and Recovery of Waste, and others. Future specialists are getting excellent chemical, biological, and engineering education. With the knowledge gained during the training, students can solidify in course of technological and pre-diploma practice in scientific institutions and enterprises of the sector:

- Dumansky Institute of Colloid Chemistry and Water Chemistry of the National Academy of Sciences of Ukraine (NASU);
- Ovcharenko Institute of Biocolloidal Chemistry of NASU;
- Chuyko Institute of Surface Chemistry of NASU;
- Vernadsky Institute of General and Inorganic Chemistry of NASU;
- Kyiv Cardboard and Paper Mill;
- State Environmental Inspectorate.

Students accumulate production skills during practice on the best companies in the industry and research institutes. The department has a branch in the Ukrainian Scientific - Research Institute of Paper. After completing the training, specialists get the chance to join a work at the 28 pulp and paper mills in Ukraine, enterprises of holding company "Ukrbumprom" and other organizations and institutions, specialized scientific - research and design institutes.

To date, the academic staff of the department consists of 3 professors, 21 associate professors, and 4 senior lecturers, 3 assistants, who teach more than 250 students in daytime and correspondence departments. Leading teachers of the department are the heads of research and development projects, who actively involve students. The best students of the department receive nominal scholarships from the President of Ukraine, the Verkhovna Rada of Ukraine, the Cabinet of Ministers of Ukraine, the Kyiv mayor, and Rector of Igor Sikorsky KPI.

The department has a postgraduate study on a specialty "Environmental Security", where eight Ph.D. and two doctoral theses were defended in the last 5 years.



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Department of Chemical, Polymer and Silicate Engineering



Specialization "Engineering of Equipment for the Production of Polymer and Building Materials and Products" provides the students' training in the modern design of manufacturing processes and equipment to implement them based on computer-aided design, computer modeling, and analysis, in-depth understanding of the physical phenomena of nature and possibilities of their rational use.

Students obtain the knowledge of general education, engineering and technical disciplines, information technology, as well as specialized courses. Education is built on a modern modular basis and includes not only theoretical studies but also laboratory work, computer workshops, field trips to relevant enterprises, in which students have the opportunity to decide on the future place of work and settle in the workplace.

Students of the specialization "Engineering of Packaging Products, Processes, and Equipment" have the opportunity to study with the use of packaging production equipment installed in the teaching laboratories, the study of related disciplines such as computer-aided design, and mechatronics. Students of the department regularly win the All-Ukrainian Olympiad on Mechatronics. Master's thesis students of this specialty are regular winners of the All-Ukrainian competition of student works in the field of packaging. Students can get practical skills during practice at the leading enterprises of the packaging industry and where the packaging is created, applied, and implemented, such as:

- Tetra Pak Ukraine;
- OJSC «Vetropack Gostomel Glassworks»;
- Procter & Gamble;
- Coca-Cola Ukraine;
- Roshen.

The best students of the department receive nominal scholarships from the President of Ukraine, the Verkhovna Rada, the Cabinet of Ministers of Ukraine, the Kyiv mayor, and Rector of Igor Sikorsky KPI.

Students, who exhibit the ability to scientific work, is widely involved in research and development activity of department, inventive activity, and by the time of graduation commonly has patents and publications, as well as the experience of participation in scientific seminars and conferences, capable of presenting and defending the results of their work.



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5. RESEARCH ACTIVITY

Department of Ecology and Plant Polymers Technology

- Development of new types of efficient, environmentally friendly reagents for purification of drinking and wastewater of all kinds of production.
- Recycling of certain waste types, including toxic, with the purpose of production of marketable products.
- Creation of technology and small-sized non-traditional plants for wastewater purification.
- Creation of technology for water purification from cesium and strontium radionuclides.
- Development of water purification technology from radioisotopes of cesium and strontium in the presence of surfactants.
- Development of physical and chemical technology of water treatment from petroleum.
- Development of effective processes of removing heavy metal ions from water.
- Development of technologies for integrated water treatment and the creation of water recycling systems.
- Development of catalytic gas cleaning methods from nitrogen and carbon oxides.
- Developing ecologically clean and efficient inhibitors for water treatment in companies' water supply working systems.
- Creation of technologies for the production of cellulose, hemicellulose, pulpwood, and non-wood raw materials, using them in the compositions of paper and cardboard.
- Investigation of environmentally friendly cellulose bleaching schemes.
- Improvement of existing and development of new methods for producing pulp suitable for chemical processing.
- Creation of new schemes for the microcrystalline cellulose from non-wood plant raw materials to meet the needs of the pharmaceutical industry.
- Development of technologies for production and application nanomaterials of vegetable origin in consumer products.
- Creating physical and chemical surface modification technology of plant polymers.
- Development of new technologies for the production of filter materials based on cellulose.
- Development of technologies for packaging consumer recycling of composite materials such as Tetra Pak.



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Department of Chemical Engineering and Oil Refining Industry

- Investigation of the processes of dehydration and granulation of liquid systems to produce complex humic-mineral fertilizers.
- Development of the evaporation equipment and film sets.
- Investigation of polymer properties and creation of machines and equipment for their production and processing.
- Intensification of drying processes and the creation of new drying equipment.
- Investigation of the processes of wood processing and producing paper products.
- Purification of wastewater and emissions of industrial plants.
- Protection of metals from corrosion.
- Research new membrane processes of liquids separation.
- Development of new polymer coatings and methods of their deposition.
- The drying process the fine paste of titanium dioxin.
- Paper drying process using radiation energy.
- Improving the vibroextrusion of fiber-concrete products.
- Development of an energy-efficient process for producing the humic-organic-mineral fertilizers.
- Experimental study of fluid flow and heat transfer in rotor-film devices.

Department of Chemical, Polymer and Silicate Engineering

- Computer modeling of temperature and deformation fields.
- Development of energy-saving faucets.
- Technologies for the manufacture of composite materials.
- Software for simulation of nonlinear deformation.
- Software for 3D modeling.
- Modeling of the vortex stochastic processes.

Automation Hardware and Software Department

Creating a computer integrated automatic control and management systems providing resource- and energy-saving modes of operation of technological processes and productions:

- Development and research of adaptive control systems;
- The use of statistical methods in the quality control systems;
- Development of software for simulators and chemical production process management systems;



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- Modeling of objects with distributed parameters in various modes;
- Study the decentralized Automatic Control Systems for technological processes of paper and cardboard production;
- Integrated management and control systems of technological processes in production.

6. INTERNATIONAL PROJECTS AND COLLABORATION

Department of Chemical, Polymer and Silicate Engineering maintains communications with institutions from Russia, USA, Canada, UK, Germany, Japan, China, and other countries, and exchanges scientific information, experts, and students. Academic staff and students of the department carry out scientific orders of leading companies in the world to develop a computer-aided design, production of new materials, modern equipment, and others.

Automation Hardware and Software Department is actively involved in the project TEMPO under the EU program «Erasmus Mundus». In this project, students have the opportunity to study and practice at leading universities in Europe (Italy, Portugal, Spain). Today, there are agreements in force with the following universities:

- Polytechnic University of Milan (Italy);
- University of A Coruña (Spain);
- Polytechnic Institute of Tomar (Portugal).

Scientific and academic exchange is carried out within the framework of international cooperation. In particular, delegations from the Polish universities actively participate in the annual international conference "Automation and Computer-Integrated Technologies", which is held based on the department.

As part of the cooperation program with the European Union at the department operates several international agreements on cooperation:

- Agreement on scientific and technological, educational, academic cooperation with the Faculty of Natural Sciences and Technology of the University of Opole (Poland);
- Agreement within TEMPO project of the European Union program Erasmus Mundus Trans-European Mobility Project On Education for Sustainable Development (Armenia, Azerbaijan, Georgia, Belarus, Moldova, Ukraine);
- Agreement with UNIDO in the framework of the project on Resource Efficient and Cleaner Production.



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Department of Ecology and Plant Polymers Technology has partners:

- University of Central Europe, Skalica, Slovakia;
- International Institute for Industrial Environmental Economics, Lund, Sweden;
- Belarusian National Technical University, Minsk;

Department of Machines and Devices for Chemical and Oil-Refining Industries is actively involved in the project TEMPO under the EU program «Erasmus Mundus». In this project, students have the opportunity to study and practice at leading universities in Europe (Italy, Portugal, Spain).

Twice a year, an International scientific-practical conference of students, graduate students, and young scientists "Resource Saving Technologies and Equipment" is held at the department.

Several international agreements on cooperation are in force:

- Educational program for progressive method training of 3D modeling and design industries in cooperation with the firm of "AVEVA" (The agreement on cooperation with "AVEVA" (Russian Federation) number AB-021 50034);
- Agreement within EU TEMPO project for program Erasmus + Trans-European Mobility Project On Education for Sustainable Development (Armenia, Azerbaijan, Georgia, Belarus, Moldova, Ukraine).



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