

"Faculty of Heat and Power Engineering is the leading educational and scientific division in the system of technical higher education institutes of Ukraine in the field of nuclear and thermal power, heat engineering and thermal physics"



INFORMATION
PACKAGE

**FACULTY
OF HEAT AND POWER
ENGINEERING**

Kyiv, 2021

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***** The information is current as for the 2021/2022 academic year. Next academic year, there may be minor changes in the list of specialties and educational programs.**



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1. COMMON DESCRIPTION OF THE FACULTY

Faculty of Heat and Power Engineering (FHPE) is the leading educational and



scientific division of the system of technical higher education institutes of Ukraine in the field of nuclear and thermal power, heat engineering, and thermal physics. 120 academic groups of students on five specialties are training at the faculty. The total number of students exceeds 1770 persons. The foreign undergraduate and graduate students from developing countries: Iran, Vietnam, Tunisia, Iraq, China, India, and Turkey are

traditionally trained at the faculty.

Highly qualified teachers and educational support staff in a total of 204 persons provide the educational process. Among them: 13 professors, 60 associate professors, 25 assistant professors, 15 lecturers, and 95 persons of teaching and support staff.

2. STRUCTURE

Faculty of Heat and Power Engineering is a large educational and scientific complex that consists of four departments:

- **Department of Automation of Heat and Power Engineering Processes;**
- **Department of Nuclear Power Stations;**
- **Department of Automation of Power Processes and Systems Engineering;**
- **Department of Heat Power Engineering.**

The faculty also has an extensive system of research units.

3. EDUCATIONAL PROGRAMS

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

At the first level (Bachelor's course, I-IV academic years) students acquire fundamental knowledge in physics, mathematics, mechanics, computing, informatics, 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 to defend a master's thesis and acquire a Master's degree.



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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.

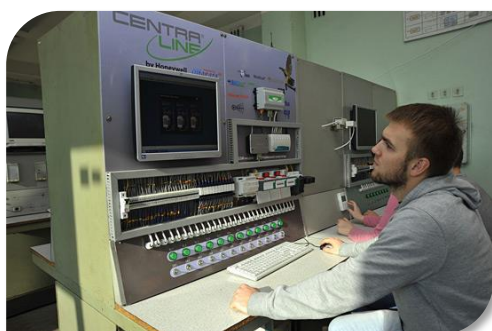
1. Department of Automation of Heat and Power Engineering Processes provides training under the following Educational Programs:

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

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

Graduates are capable of performing the work on:

- automation and computerization of control processes in all areas of industrial production;



- development, design, and implementation of computer-integrated energy management systems for TPPs, NPPs, in institutions that use solar, wind, various types of biofuels, etc.
- management of life support processes in industrial and public buildings (artificial climate, safety, engineering systems, etc.).

Specialists from many countries have been trained at the department, including citizens of Bulgaria, Germany, Poland, Cuba, Vietnam, Mongolia, China, Egypt, and Sweden.



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2. Department of Nuclear Power Stations provides training under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	Second	Third
Power Machinery	Engineering and Computer Technology of Thermal Power Systems	Bachelor <i>EPP</i>	Master <i>EPP</i>	–
			Master <i>ESP</i>	
	Power Machinery	–	–	PhD <i>ESP</i>
Nuclear Power Engineering	Nuclear Power Plants	Bachelor <i>EPP</i>	Master <i>EPP</i>	–
			Master <i>ESP</i>	
	Physical Protection, Accounting, and Control of Nuclear Materials	–	Master <i>EPP</i>	–
	Nuclear Power Engineering	–	–	PhD <i>ESP</i>

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

Graduates of an educational program "Nuclear Power Plants" are focused, first of all, on the most important and perspective sphere of energetics – nuclear power



engineering. They are trained to carry out the nuclear power plant control, are engaged in the modeling of neutron-physical and heat-hydraulic processes in the equipment of NPP, solve the problems of NPP reliability and safety. This activity requires thorough engineering, physicomathematical and computer skills, ability to work with modern software codes, knowledge of foreign languages.

Graduates of the department have the exclusive right to obtain a license that allows one to manage nuclear power plants. They may occupy positions from engineer to Director General of the NPP, work in other subdivisions of the NNEGC "Energoatom"; the State Inspectorate for Nuclear Regulation, in scientific and technical institutions for the support of nuclear power plants operating and nuclear safety issues in international organizations such as the IAEA, VANO et al.

Students of the educational program "Engineering and Computer Technology of Thermal Power Systems" are focused on the study of heat and mass transfer processes, the development of heat exchangers, thermal stabilization systems in the objects of power,



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aerospace, transport, and construction. All this requires thorough physical and mathematical, computer and engineering training, language skills, ability to work with modern software (Compass, AutoCAD, MathCAD, ANSYS, Fluent, ESATAN). Due to the advanced scientific base of the department, students have the opportunity to take part in national and international research projects.

Graduates have real prospects of career growth of the researcher, the scientific degree of Doctor of Philosophy (PhD) and Doctor of Science. They occupy leadership positions in institutions of NAS of Ukraine, design organizations, leading local and foreign energy, and innovative companies. Under the guidance of such experts' energy efficiency and development of alternative energy, activities are implemented.

3. Department of Automation of Power Processes and Systems Engineering provides training under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	Second	Third
Software Engineering	Software Engineering of Intelligent Cyber-Physical Systems and Web Technologies	Bachelor <i>EPP</i>	Master <i>EPP</i>	–
	Software Engineering		Master <i>ESP</i>	
	Software Engineering	–	–	PhD <i>ESP</i>
Computer Science	Computer Monitoring and Geometric Modelling of Processes and Systems	Bachelor <i>EPP</i>	Master <i>EPP</i>	–
	Computer Science		Master <i>ESP</i>	
	Computer Science	–	–	PhD <i>ESP</i>

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

Students specializing in "Software Engineering" become high-level specialists in the following areas: advances of the newest systems of management of complex industrial energy systems; advancing the new technologies of the development and implementation of intelligent systems; meeting the challenges of improving the performance of any system using artificial intelligence.



Students explore the features of data mining technologies, use parallel computing tools, and create adaptive real-time distributed systems.



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Special attention is given to the basic disciplines of programming, modeling of complex systems, formation and use of databases and knowledge, development of translators, mathematical modeling, IT project management, as well as more specific, inherent in this direction: parallel computing, GRID and cloud technologies, post-relational databases, computer graphics, cross-platform programming, artificial intelligence systems, disciplines for the development of server and client parts of web-applications, creation of mobile clients of web-systems.

Students in "Computer Science" become IT experts in the automation of design and modeling of objects and systems in energy engineering. Students study various aspects of computer graphics, technical design to build complex graphical objects using technical drawings, and master computer-aided design systems, CAD design, modeling of various systems, visualization of geometric information, and real-time systems.

Graduates can design and implement specialized information-analytical, software-technical, intellectual, and geoinformation systems for computer ecological and economic monitoring to support decisions at various levels of sustainable development management of the country, enterprise, and business

Students gain in-depth knowledge in object-oriented analysis and design of complex distributed software systems using geoinformation tools and use them to design systems for monitoring the environmental and economic status of territorial associations.

The activity of the department is aimed at the development and widespread introduction of the latest information technologies, training of qualified specialists in the development of information, analytical and expert systems, as well as systems for automation of modeling and design of objects of different physical nature. The purpose of the training is to produce such professionals who will be able to perform almost any task that requires the use of computing and will be able to adapt to the constant changes and improvements of computer devices.

4. Department of Heat Power Engineering provides training under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	Second	Third
Thermal Power Engineering	Thermal Power Engineering and Thermal Power Installations of Power Plants	Bachelor <i>EPP</i>	Master <i>EPP</i>	–
			Master <i>ESP</i>	
	Thermal Power Engineering	–	–	PhD <i>ESP</i>

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



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Department trains heat power engineers to work on thermal power plants, in the installation and adjustment organizations, repair bases, energy associations, departments of the Ministry of Energy, design, research, and educational institutions of Ukraine.



In the educational process, the department paid a lot of attention to the use of clean and efficient energy-saving technologies for the production of electricity and thermal energy, computer technology, gas turbine and combined cycle power plant, the world experience in the field of new advanced energy technologies, on technical re-equipment, reconstruction, and modernization of energy assets.

Students of the department obtain universal education among similar departments of other universities. During training, the department uses modern teaching and laboratory and stand base, innovative computerized training methods, computer lab with free Internet access, Training and Scientific Center "KPI-BOSCH» with modern energy-efficient equipment (heat pumps, solar collectors, heat generators of the contact type and with the use of biomass.

Modern technologies of simulation and research of complex heat and power processes and systems, such as Solid Works, ANSYS, FlowVision, Dyrobes, Compas, AutoCAD, MathCAD, and others allow students to carry out complex and comprehensive studies. The study of such subjects as "CAD of Power Assets", "Methods of Optimization of Thermal Power Systems", "Energy and Environmental Management", "Monitoring and Analysis of the Ecological State of Energy Assets" allows graduates to solve complex production problems.

Graduates of the department can operate, modernize, and design various power equipment for thermal and nuclear power plants.

Graduates of the department work in positions of chief engineers, heads of departments, and directors of the energy supply of industrial and municipal enterprises, agro-firms, heads of representative offices of famous brands Bosch, Viessmann, Siemens, Buderus, Wilo, Grundfos, Vaillant, General Electric and others. Graduates work in science and research and design institutes of Ukraine, as well as in Europe, Asia, and America.



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4. TRAINING AND LABORATORY BASE

The laboratories of the **Department of Automation of Thermal and Power Engineering Processes** are provided with the most up-to-date equipment from world leaders Phoenix Contact, Unitronic, Schneider Electric, Honeywell, Siemens, Advantech, and Ukrainian companies RAUT-Automatik and Microl.

When implementing modern systems for automatic control of technological processes, an important component is the adjustment of control algorithms in the laboratory. Therefore, it is relevant to create a software system using modern programmable logic controllers for simulation of the operation of automatic control of a technological object.

Advanced automation systems use sophisticated network connections between smart devices to control process equipment. The algorithms of such systems include the analysis of the state of the industrial network and the application of emergency protection in the event of emergencies. Therefore, it is important to study the configuration of modern industrial networks, programming the operation of equipment in different modes, and the application of technological protection in the presence of appropriate conditions.

The above-mentioned tasks were the main in the development of new laboratories:

- EDUNET International Training and Technology Laboratory.
- Honeywell Smart Home.
- Laboratory of Basic Programming and Embedded Systems.
- Laboratory of Technological Measurements and Devices
- Laboratory of Automation Systems for Intelligent Buildings
- SIEMENS Industrial Automatics Laboratory
- CISCO Network Technology Lab

Department of Nuclear Power Stations has a modern laboratory and technical basis for the study and general engineering disciplines. The department has two computer labs and two computer classes, equipped with modern technics. Computer classes have access to the Internet.

The department has six specialized laboratories for students' laboratory and workshop training. There is also an office for a course and diploma design with the library of the department.

The effectiveness of the learning process is enhanced by the use of the latest Internet technologies, and the "E-campus system."



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The following laboratories were created to carry out the educational process at the current information level at the **Department of Automation of Power Processes and Systems Engineering**:

- Laboratory of Geometric Modeling and Computer Graphics;
- Laboratory of Distance Learning Tools;
- Laboratory of Computer Networks;
- Laboratory of Software for Artificial Intelligence;
- Laboratory of Mathematical Modeling.
- Laboratory of Information Technologies of Design;
- Laboratory of Computer Ecological-Economic Monitoring;
- Laboratory of Systems with Distributed Databases;
- Training and Production Workshop.

Computers are equipped with the following software:

- Operating system Windows, Windows Vista Business Edition, Linux Mandriva;
- Soft developers' tools Borland Developer Studio, Microsoft Visual Studio, Borland Delphi;
- Specialized software products: Microsoft SQL Server, InterBase SQL Server for Windows, Microsoft Visual FoxPro, Autodesk Design Review, AutoCAD Mechanical, MathLab, MapInfo Professional.

Original means of creating and maintaining distance learning courses are introduced at the department. Works on the creation of education distance learning courses in the department's disciplines are carried out with the use of developed tools.

Students of the **Department of Heat Power Engineering** have 14 specialized training and research laboratories. The Department also in the framework of dual education widely use equipment of Kyiv Heat-Electric Generating Plant № 5, Laboratory of Equipment Diagnostic and Laboratory of Metals of JSC "Kyivenergo" in the educational process.

Department uses its laboratory facilities and research base of leading enterprises to carry out research work by the department staff, undergraduates, and graduate students, namely:

- Educational and research laboratory for physics of combustion and research of the characteristics of power equipment of TPPs, which includes the Department of Combustion Problems, has the appropriate technical equipment – a gas supply system with a gas pressure of up to 0.1 MPa, technical water supply, power supply, machine tool park, overpressure air blowers;
- Laboratory for diagnostics and automation of TPP and NPP (computer class);
- Laboratory of steam turbines, heat engines and blowers (computer class);



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- Laboratory of turbine equipment gas dynamics and energy ecology;
- Laboratory of regenerative equipment for TPP;
- Laboratory of thermal measurements of TPP and NPP;
- Laboratory for diagnostics and reliability of power equipment;
- Laboratory for modeling TPP and NPP and resource management of power equipment;
- Laboratory of pipelines and fittings;
- Laboratory of heat transfer processes in power equipment;
- Scientific and educational laboratory of modern energy efficient systems of heat and cold supply of buildings;
- Laboratory of industrial energy;
- Laboratory of heat exchange units;
- Laboratory for Renewable Energy Sources.

Appropriate test equipment is used for the analysis of the research results: potentiometers, water meters, gas meters, air meters, gas analyzers. Research results are processed by computers with the appropriate software. Research on the development of a coal dust supply system with a high concentration and the corresponding burners is performed on the research base of Tripolie TPP.

At the Research and training laboratory of energy-efficient heat and cooling systems of buildings the work of the inverter split system HISENSE with wall-mounted indoor unit and plate heat exchanger in the heating supply system is being studied, contact heat and mass transfer during cooling in cooling towers of water-based air conditioning systems and heliothermal hot water supply systems is being investigated.

Students study a range of specialized disciplines, such as: "Integrated Computer Technologies", "Mathematical Modeling and Optimization of Processes and Systems", "Heat Sources and Heat Consumers", "Energy Saving in Heat Supply", "Using of Secondary Energy Resources", "Systems and Units for Disposal of Industrial Emissions", "Use of Alternative Energy Sources" and others.

During training, the department uses modern teaching and laboratory and stand base, innovative computerized training methods, computer lab with free Internet access, Training and Scientific Center "KPI-BOSCH» with modern energy-efficient equipment (heat pumps, solar collectors, heat generators of the contact type and with the use of biomass.

The students of the department have an opportunity for education at foreign universities for one or two years under joint double degree programs and European grants in such countries as Germany, France, Sweden, Norway, Poland, South Korea. After grad



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school, graduates have the opportunity to continue their studies in postgraduate studies, including through grants at foreign universities.

5. RESEARCH ACTIVITY

The research activity of the Thermal Power Engineering Faculty is aimed at the solutions two major interrelated problems, namely:

- Implementation of current research, developmental and technological works for the needs of energetics, industry, and social services to improve the energy efficiency of material production, increase energetic efficiency, reliability, and security of power generation and other equipment, increasing the competitiveness of products, works and services in power, thermal power and thermal engineering.
- Improving the quality of training of engineers and scientists with an appropriate combination of cutting-edge fundamental and applied scientific research and development with the educational process.

Department of Automation of Heat and Power Engineering Processes conducts research and design works in the following directions of automation:

- Process control systems based on modern microprocessor technology;
- Computer simulators and their use for personnel training on management of process parameters;
- Modern technology of computer-aided design;
- Microprocessor control and regulation of energy processes and consumption of energy and resources.

According to the results of the last 5 years of scientific activity:

- 6 intellectual property rights certificates were obtained;
- 3 dissertations for the Ph.D. degree were defended;
- 7 international scientific conferences were organized;
- Two monographs and four textbooks were published.

Department of Nuclear Power Stations has a powerful research division. Teachers, researchers, and students jointly carried out a lot of investigations and development work in the field of conventional and nuclear energy, energy efficiency, reliability and safety of thermal and nuclear power plants, development of new high-efficiency heat exchangers, and methods of their calculation.



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The department developed equipment based on heat pipes for cooling and temperature stabilization of onboard electronics of artificial satellites, the first micro-satellites of the Igor Sikorsky KPI PolyITAN, compact heat exchangers for utilization of the waste heat gas of fuel consumptive devices, new types of advanced heat transfer surfaces, which give an opportunity to significantly reduce metal consumption of energy equipment.

At the **Department of Automation of Power Processes and Systems Engineering** research and development work is carried out on 4 priority areas of innovation development:

- New computer tools and technologies of society informatization;
- Technologies of evaluation and protection of the environment for sustainable development of industrial areas;
- The latest technology and resource-saving technologies in energy, industry, and agriculture;
- Diagnostic tools and treatments for common diseases.

The main directions of scientific activity of the **Thermal Power Engineering**:

- Theoretical and experimental investigations of hydrodynamics and heat and mass transfer in two-phase closed thermosyphons; development and creation of industrial heat transfer devices;
- Development of innovative clean technologies of burning gaseous fuel in the combustion chambers of gas turbines, boilers, furnaces, contact heat generators;
- Research of thermal technologies of water desalination and intensification of heat and mass transfer processes
- Development of new energy systems "Aquarius" type heat generating apparatus of the contact type and biofuel (wood chips, pallets, wood waste, straw, etc.), and hydrogen.
- Development, research, and placement into service delivery system of highly concentrated coal dust in power boilers;
- Development of new technologies and high-performance burners for cleaner-burning gaseous fuels with reduced emissions of toxic nitrogen oxides in boilers, furnaces, combustion chambers of high-gas-turbine plants, air heaters;
- Development of technologies and burners for combustion of secondary energy resources of vegetable origin.



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6. INTERNATIONAL PROJECTS AND COLLABORATION

The research and educational group of the **Department of Automation of Power Processes and Systems Engineering** joined the international consortium (coordinator – *SketchPixel*, Portugal) within the project *CRASH – Development of a high precision reconstruction system designed to be used in a professional simulation environment related to real crash events* on the program *Coopromotion projects – International Partnership, Notice N°12/ SI/2020, Research Collaboration Program Between Companies and National and European Politechnical Institutions*.

Employees of the department participate in international research projects within the research center *Smart City Research Center*, Polytechnic Institute of Tomar, Portugal (projects *Driver's Behavior Cognition Based on Mobile Phone Sensors* and *General Purpose Image Similarity Calculation for Heterogeneous Applications*).

Foreign partners of the department are Shandong Academy of Sciences (PRC) (Institute of Information, Institute of Science and Technology for Development of Shandong (ISTD), Shandong Computer Science Center, Institute of Oceanographic Instrumentation), Shenyang Polytechnic University, Shenzhen University, Guangdong University of Science and Technology (Guangzhou), Chongqing Liangjiang Innovation Center for Cyber Technology, Guangzhou International Sister-City Alliance, Huawei ICT Academy, SAP University Alliances (Germany), Polytechnic Institute of Tomar (Portuguese Republic), Norwegian University of Science and Technology (Gjøvik, Kingdom of Norway), University of Malaga (Kingdom of Spain).

The joint Chinese-Ukrainian scientific and innovative hydroacoustic laboratory, as well as the Chinese-Ukrainian center of engineering innovations, has been created based on the department and successfully functioning.

In the framework of cooperation between the Shandong Academy of Sciences and Igor Sikorsky KPI, Academy's employees are studying at the graduate school of Igor Sikorsky KPI.

Joint research is being conducted in the following areas: direction and classification of marine objects in the oceans, mathematical models of signals and interference, calculation of sound wave propagation parameters in the marine multilayer environment, underwater networks, data consolidation, text mining, large data analysis .

The Department of Automation of Heat and Power Engineering Processes has become a full member of the international educational network EduNet, which is created and developed by one of the world leaders-manufacturers of automation tools – the German company Phoenix Contact. Due to this, students have access to the latest training techniques for innovative equipment and can try their hand in world-class professional competitions.



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In 2018, the department had two winning Xplore New Automation Award 2018 student work projects:

- "Basanabar", created to save lives in an accident.
- "Smart-city garbage and logistic systems", which showed the benefits of unified information space of the city.

The department works in several directions within the framework of international activity:

- Cooperation with foreign scientific and educational institutions;
- Cooperation with international and foreign commercial and non-profit companies and institutions.

Within the framework of work with foreign scientific and educational institutions the departments established cooperation with the following institutions:

- KTH Royal Institute of Technology in Stockholm, Sweden;
- Auckland University
- Wrocław University of Science and Technology, Poland;
- Leipzig Higher Technical School, Germany;
- Belarusian National Polytechnic University – Minsk, Belarus;
- The National Academy of Sciences of Belarus (NASB) – Minsk, Belarus;

The department participates in the Erasmus + program, under which students have the opportunity to study in foreign universities, and the scientific and pedagogical staff to undergo internships.

Departments have established close mutually beneficial relations with commercial organizations – leaders in the fields of automation, namely:

- Phoenix Contact GmbH & Co.KG, Germany – automation tools and equipment for control systems;
- Klinkmann, Finland – all levels of Automated Process Control Systems and integration into the technological process ;
- Wonderware, USA – InTouch dispatching control systems, process modeling, MES systems;
- Honeywell, USA – a world leader in automation;

The department is a member of the Association of Industrial Automation Enterprises of Ukraine, which includes numerous international companies – <https://appau.org.ua/chleny-appau>.



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The **Department of Heat Power Engineering** has international agreements and contracts with the Warsaw University of Technology and the Opole Polytechnic University (Poland);- double diploma programs with the University of La Laguna (Spain), Zhejiang University of Science and Technology (Hangzhou, PRC), postgraduate scholarship double diploma program with Korea Institute of Science and Technology (Seoul).

Students of the department have the opportunity of studying and training under the ERASMUS+ program in Germany, Poland, Spain, France, as well as to participate in the second education program. Students from other countries, such as China, Ecuador, Venezuela and others study at the department. Graduates work in research and design institutes of Ukraine, as well as in Europe, Asia and America.

7. CONTACT INFORMATION

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