

"Heat & Power Engineering Faculty 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 "



INFORMATION PACKAGE

HEAT & POWER ENGINEERING FACULTY

Kyiv, 2016

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*** The information is current as for 2015/2016 academic year. In the next academic year, there may be minor changes in the list of training directions, specialties, and specializations.

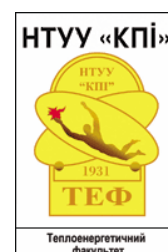


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1. COMMON DESCRIPTION AND THE STRUCTURE OF FACULTY

Heat & Power Engineering Faculty (HPEF) 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. 109 academic groups of students on 10 specialties are training at the faculty. A total number of students exceeds 1600 persons. The foreign undergraduate and graduate students from developing countries: Iran, Vietnam, Tunisia, Russia, Iraq, China are traditionally trained at the faculty.

The educational process is provided by highly qualified teachers and educational support staff in the total 206 persons. Among them: 12 professors, 52 associate professors, 39 assistant professors, and 103 persons of teaching and support staff.

Structure

The Faculty is a large educational complex that consists of 5 departments and an extensive system of research units.

1. Department of Automation of Heat & Power Engineering Processes trains



specialists with a degree in "Automation and Computer-integrated Technologies (specializations "Automatic Control of Heat Power Processes", and "Computer-Integrated Technological Processes and Productions").

The graduates are capable of performing the research, design and construction work on the creation and implementation of process automation systems based on standard solutions, using advanced electronic and microprocessor controls, develop software, as well as to carry out installation, commissioning, and maintenance of existing automation systems.

Specialists from many countries were 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 and Engineering Thermal Physics



trains specialists with a degree in "Power Engineering Industry" (specialization "Heat and Steam Power Generating Facilities"), in "Nuclear Power Industry" (specialization "Nuclear Power Plants"), and in "Heat Power Industry (specialization "Thermal Power Plants").

Graduates of a specialization "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 plants 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 a 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 specialization "Heat and Steam Power Generating Plants" study the processes of generation of heat and steam, principles of design and operation of power equipment, as well as modern efficient and clean fuel technologies. Particular attention is paid to the skills of computer design and computer software: Autocad, Compass, Mathcad, Solidworks, Ansys Fluent, 3D Max.

The gained knowledge will allow graduates to work with a variety of thermal units - energetic, industrial and household boilers, industrial furnaces, steam and gas turbines.

Graduates work in engineering and management positions in energy companies, the power stations, in the design and scientific organizations, well-known manufacturers of power equipment such as Vaillant, Bosch, Buderus. The activity of professionals is associated with the implementation of energy efficient technologies, the substitution of



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natural gas with alternative fuels, improving the efficiency of fuel consumptive equipment.

Students of specialization "Heat Power Industry" are focused on the study of heat and mass transfer processes, the development of heat exchangers, thermal stabilization systems in the objects of power, aerospace, transport, and construction. All this requires a 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 (Ph.D.) 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 Design Automation of Energy Processes and Systems, trains



specialists in "Software Engineering." (specialization "Software for Distributed Systems" and Software of the web-based Technologies and Mobile Devices"), and in "Computer Science and Information Technologies" (specialization "Geometric Modelling in Information Systems", and Information Technology of Environment Monitoring")

Department activity is aimed at the development of new information technologies and training of skilled professionals in the development of expert systems and automation modeling systems and design of different physical nature objects. The purpose of training is graduating of specialists who will be capable of performing almost all the tasks that require the use of computer technology and will also be able to adapt to constant change and improvement of computing devices.



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4. Department of Theoretical and Industrial Heat Engineering trains specialists with a degree "Heat Power Engineering" (specialization "Industrial and Municipal Power System and Energy Saving").

Graduates of the department work on 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.



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, Fluent, 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.

5. Department of Cogeneration Installations of Thermal and Nuclear Power Plants prepares specialists with a degree in "Heat Power Engineering" (specialization



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

In the educational process of 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 (AutoCAD, SOLIDWORKS, ANSYS, Fluent, etc.), gas turbine and

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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 have the opportunity to learn and to train according to the EU ERASMUS+ program in Germany, Poland, Spain, France, as well as take part in the program of the second education.

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

2. EDUCATIONAL PROGRAMS

Levels of higher education. Training of students is carried out at several levels of higher education. At the first level, (Bachelor's, I - IV academic years) students acquire basic knowledge of physics, mathematics, mechanics, computer science, informatics, and special disciplines. During the IV year, they defend bachelor course work and receive qualification degree "Bachelor". At the second level (Magistracy, V - VI academic years) training is carried out according to the "Master" program.

Special attention is paid to research training in specializations. In addition, in 2016 will be realized training in the 3-level scheme "Bachelor" - "Master" - "Doctor of Philosophy".

Terms of specialists training: Bachelor (b) - 4 years; Master (m) - 2 years (standard terms of training in Bachelor course and Magistracy), Graduate course / Doctoral candidacy - 3 years (4 years by the correspondence study).

Training of specialists is carried out on the full-time and correspondence forms of education.



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Areas and specialties of students training:

Doctor of Sciences

- Automation of Control Processes
- Technical Thermal Physics and Industrial Heat and Power Energetics
- Thermal and Nuclear Power Plants

Doctor of Philosophy (Ph.D.)

Master's course

- Automatic Control of Heat Power Processes
- Computer-integrated Technological Processes and Industries
- Heat and Steam Power Generating Facilities
- Nuclear Power Plants
- Thermal Power Plants
- Software for Distributed Systems
- Software of web-based Technologies and Mobile Devices
- Geometric Modeling in Information Systems
- Information Technology of Environment Monitoring
- Industrial and Municipal Power Systems and Energy Saving

Bachelor's course



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3. TRAINING AND LABORATORY BASE

Training laboratories of the **Department of Automation of Heat & Power Engineering Processes** are provided by modern equipment for the construction of automatic control systems and process control (native controllers Remicont, Lomikont, FC 5001. Microl, and controllers from the world-renowned manufacturers Octagon, Advantech, Schneider Automatic, Siemens).

To study the course of ACS there were established Laboratory of Software and Hardware of ACS on the basis of equipment Schneider Electric. Laboratory equipped with two laboratory stands with the PLC Modicon TSX Momentum controllers, one stand with the PLC Modicon TSX Micro controller with frequency-controlled fan drive by means of the frequency converter Activar, and also stand on the controller Octagon Systems MicroPC 4000 using a remote terminal unit by the firms ICP DAS and Advantech.

Training stands on the basis of controllers Siemens Logo and Sipar were created as a result of cooperation with the company Siemens-Ukraine.

Department of Nuclear Power Stations and Engineering Thermal Physics 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 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 "E-campus system."

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

- Laboratory of Geometric Modeling and Computer Graphics;
- Laboratory of Remote Teaching Technics;
- 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 Distributed Databases Systems;



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- Training Workshop.

Computers are equipped with 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 a distance learning course are introduced at the Department. Works on the creation of educational distance learning courses in the department's disciplines are carried out with the use of developed tools are.

Students of the ***Department of Theoretical and Industrial Heat Engineering*** study complex specialized disciplines, such as: "Integrated Computer Technologies", "Mathematical Modeling and Optimization of Processes and Systems", "Sources of Heat 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.

Department of Cogeneration Installations of Thermal and Nuclear Power Plants has 7 specialized training laboratories. In addition, the Department is widely used in the educational process equipment of Kyiv Heat-Electric Generating Plant № 5, Laboratory of Equipment Diagnostic and Laboratory of Metals of JSC "Kyivenergo."

Department uses its own laboratory facilities and research base of leading enterprises to carry out research work. Research are conducted by the department staff, students, undergraduates and graduate students.

Educational and Research Laboratory, including the sub-department "Problems of Burning" has the appropriate technical equipment: gas supply system with a gas pressure of 0.1 MPa, technical water supply, power supply, machine-park, air blowers with the excessive pressure.



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An 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 appropriate software. Research on the development of coal dust supply system with a high concentration and the corresponding burners are performed on the research base of Tripolie CHP.

4. RESEARCH ACTIVITY

Research activity of the Heat & 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 consumer's equipment and heat technologies, 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 & Power Engineering Processes conducts research and design works in 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.

Department of Nuclear Power Stations and Engineering Thermal Physics 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 PolyTAN, 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 Design Automation of Energy Processes and Systems** 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 **Department of Theoretical and Industrial Heat 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;
- 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.

Areas of research activity of the **Department of Cogeneration Installations of Thermal and Nuclear Power Plants**:

- development, research, and placement into service delivery system of highly concentrated coal dust in power boilers;
- development of high-performance low-emission burners for combustion of highly concentrated coal dust;
- 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;



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- development of technologies and burners for combustion of secondary energy resources of vegetable origin;
- assessment of residual resource and prolongation of operation of steam turbines with a capacity of 200-800 MW, exhaust their economic life.
- diagnostics of high-temperature steam turbine components, analysis of the stress-strain state of the steam turbines of high power.

5. INTERNATIONAL PROJECTS AND COLLABORATION

Department of Design Automation of Energy Processes and Systems has become one of the most active participants of the EC project Tempus «Establishing Modern Master-level Studies in Industrial Ecology» - «IEMAST», which is being implemented in the Igor Sikorsky KPI. The project coordinator is the KTH Royal Institute of Technology (Sweden) - one of the largest leading technical universities in Europe.



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