

**«...global economy requires  
high-quality and efficient  
energy management,  
awareness of the need  
for efficient use of energy ...»**



## **INFORMATION PACKAGE**

**EDUCATIONAL AND  
RESEARCH INSTITUTE  
OF ENERGY SAVING  
AND ENERGY MANAGEMENT**

**Kyiv, 2022**

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**\*\*\* Information is current as for the 2022/2023 academic year. In the next academic year, there may be minor changes in the list of training specialties and educational programs.**



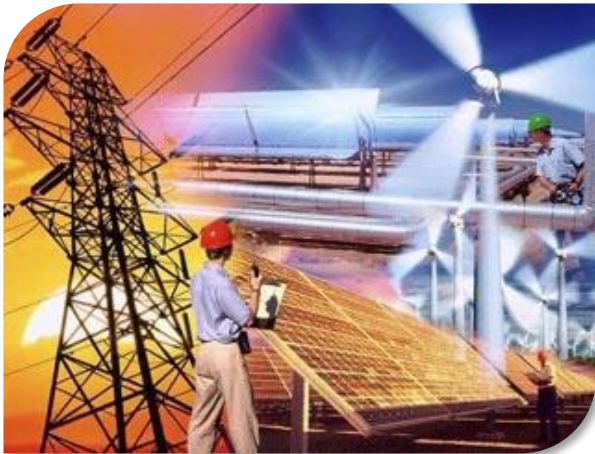
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# 1. COMMON DESCRIPTION OF THE INSTITUTE

The modern global economy requires high-quality and efficient energy management,



awareness of the need for efficient use of energy. For this very reason, the **Educational and Research Institute of Energy Saving and Energy Management (IESEM)** trains students in perspective and actual areas of power engineering, which opens up new opportunities in the labor market for young professionals-graduates.

During its existence, the Institute has trained more than 10,000 engineers and masters. Departments of the Institute train specialists from many countries: Albania, Algeria, Vietnam, Cuba, Iraq, Jordan, Nepal, Syria, and others. Students from Germany, Spain, Italy, Norway, and other countries trained at the IESEM at various times within the framework of international projects. IESEM professors undertook an internship and taught the students in Belgium, Brazil, Cambodia, Colombia, and Norway.

**Institute trains specialists** for electric and fuel power complexes, civil engineering works, and environmental protection. Graduates are capable of developing, designing, and operating energy complexes and systems and creating modern energy-saving systems for eco-friendly energy management.

**Institute graduates** work at the enterprises and organizations of various industries of Ukraine, the CIS, Asia, Europe, and America in the positions of:

Experts on energy efficiency

Energy auditors and inspectors in the energy sector

Heads, leading experts of structural divisions of enterprises and organizations on electric energy of fuel and energy complexes

Leading experts in mining, building and operation of urban underground structures

Experts in institutions for ecological monitoring that provide consulting and engineering services



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## 2. STRUCTURE

The institute consists of 3 graduating departments:

1. Department of Electricity Supply;
2. Department of Automation Control of Electrotechnical and Mechatronic Systems;
3. Department of Geoengineering, as well as
  - Department of Labor Protection, Industrial and Civil Safety;
  - Energy Managers Training Center
  - Research Center for Energy Saving Pulse Wave Structures and Technologies and Training Systems;
  - Research (Experimental) Interactive Laboratory for Diagnostics of Operating Materials in Power Engineering and Transport;
  - Educational and Research Laboratory of Thermomolecular Power Engineering;
  - Educational and Research Laboratory of Resource and Energy Saving.

## 3. EDUCATIONAL PROGRAMS

**Levels of higher education.** Training of students at the **IESEM** 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 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. Department of Electricity Supply** provides training under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	Second	Third
<b>141</b> Electric Power Engineering, Electrotechnics, and Electromechanics	Energy Management and Energy Efficient Technologies	Bachelor <i>EPP</i>	Master <i>EPP</i>	–
	Electric Power Distribution Systems Engineering	Bachelor <i>EPP</i>	Master <i>EPP</i>	–
	Energy Management, Electricity Supply and Engineering of Electrotechnical Complexes	–	Master <i>ESP</i>	–
	Electric Power Engineering, Electrotechnics, and Electromechanics	–	–	PhD <i>ESP</i>

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

Highly qualified graduates of the department are capable of developing, designing,



and operating both the intelligent energy complexes and systems, as well as centralized and decentralized integrated power supply systems, creating an energy management system for industrial and municipal objects based on the Smart Grid concept. They are skilled in designing microsystems and virtual power stations, creating modern energy management system, working according to modern energy-saving, energy-efficient

technologies, monitoring the energy consumption of industrial enterprises with the use of modern information and computer technologies.



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**2. Department of Automation Control of Electrotechnical and Mechatronic Systems** provides training under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	Second	Third
<b>141</b> Electric Power Engineering, Electrotechnics, and Electromechanics	Engineering of Intelligent Electrotechnical and Mechatronic Complexes	Bachelor <i>EPP</i>	Master <i>EPP</i>	–
	Energy Management, Electricity Supply and Engineering of Electrotechnical Complexes	–	Master <i>ESP</i>	
	Electric Power Engineering, Electrotechnics, and Electromechanics	–	–	PhD <i>ESP</i>

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

Graduates of department are universal specialists of a wide profile in the field of high-tech energetics, automation, computer science, and design. They are capable of reaching the acme of scientific, innovative, and commercial skills. Much attention is paid to the development of technical solutions for optimal energy-saving electric drive systems and processes with intelligent microprocessor control. The design of "smart house" management systems is a very important area of graduates' work.

**Specialists can perform the professional work of an electrical engineer in the process of designing systems for automation of technical processes, both in mining and in civil structures with subsystems using electricity.**

Department graduates are skilled in developing, design and operating the electromechanical systems of the energy complex, electric power supply systems, and work with the use of both the modern technologies of mining and energy sector and modern systems of renewable energy sources. The scopes of their professional activity are electromechanical service of fuel and energy enterprises, transport, construction of underground urban structures, construction and operation of subways, research institutions, design, and research geotechnical institutes.





**3. Department of Geoengineering** provides training under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	Second	Third
<b>184</b> Mining	Geoengineering	Bachelor <i>EPP</i>	Master <i>EPP</i>	PhD <i>ESP</i>

*Comment: EPP – Educational-Professional Program*

*ESP – Educational-Scientific Program*

Experts-graduates of the department are capable of operating the modern mining



equipment at the mining enterprises and objects of underground constructions. They are skilled in production process organization, designing of the technical documentation for the execution of mining and construction works, a methodology of statutory indicators calculation and drawing up of estimate documentation, calculation the cost of works, designing of underground structures and

organization of underground space, have modern technology of computer design and computer-aided system of underground structures design and geomonitoring.

**4. Department of Labor Protection, Industrial, and Civil Safety** are staffing with the top-ranked teachers, which provides training of the themes: Life Safety, Work Safety, Work Safety in the Branch, and Civil Protection.

The department operates in the following areas:

- fundamental scientific research on the most important problems of scientific, technical, and socio-economic development of different sectors of the economy, rational use of human resources for the sustainable development of society;
- protection of life and health of workers, new technologies of prevention and treatment of common diseases;
- energy and energy efficiency.



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**Energy Managers Training Center** is an independent organization founded on the base of the Igor Sikorsky KPI. The major purpose of the center is to transfer the experience and "know-how" of the EU in the field of energy management for energy efficiency in all sectors of the economy. The center is equipped with modern technologies and equipment in the field of energy-saving to demonstrate the benefits of energy efficiency and achievements of various countries.



The high-level professionals perform training at the department. Most of them are professors of the Igor Sikorsky KPI. Upon successful completion of training courses, students obtain the state certificate and the certificate of the European Union in English.

**Research Center for Energy-Saving Pulse-Wave Structures and Technologies and Training Systems** performs the following functions:

**in the field of educational process and methodical activity:**

- scientific and methodological advice to applicants for higher education in the conduct of research and development work in the preparation of calculation and graphic works and term papers, diploma projects and master's theses;
- submission of proposals to departments on the formation of current topics of calculation and graphic works, course and diploma projects, master's theses and ideas of startups;
- preparation of higher education students to participate in competitions, contests, conferences;

**in the field of scientific and technical activities:**

- creation of a database on scientific and technical solutions for energy saving and energy management;
- cooperation with international foundations and organizations, research institutes and other economic entities, regardless of ownership (including foreign ones);
- organization and holding of seminars, conferences and exhibitions;
- implementation of measures to create objects of intellectual property rights and protection - intellectual property rights, as well as technology transfer, in particular through the innovation environment of the Science Park "Kyivska Polytechnica", and the implementation of license agreements;
- implementation of research projects and programs, grants, including international ones;





- implementation of organizational and methodological measures to increase the citation of scientific papers of employees, increase the presence of their scientific publications in journals and conference proceedings included in international scientometric databases (Scopus, Web of Science, etc.);
- conducting basic and applied research, as well as creating a system of computer-aided design (hereinafter - CAD) in the direction of mining and oil and gas production;
- development of modern pulse-wave structures and technologies, development of technical and working projects in CAD, modeling of technical objects;
- studying the possibilities of making samples of new equipment in the productions of Ukraine, conducting tests of experimental samples on stands in the center;
- study of market infrastructures in Ukraine and abroad, modeling of interactions and rational adaptation of the center's products in market conditions;
- experimental and industrial research operation of the center's products.

### **Research (Experimental) Interactive Laboratory for Diagnostics of Operating Materials in Power Engineering and Transport:**

- supervises the quality of raw materials, basic and auxiliary materials, finished consumables, sanitary condition of production facilities, technological equipment, containers, inventory at enterprises
- assists in substantiation of technological schemes of raw materials processing aimed at ensuring stability and high quality of enterprises' products;
- supervises compliance with the norms of consumption of raw materials, losses, waste and outputs, established technical and technological regulations, instructions, technical conditions at enterprises;
- prepares expert opinions on air quality, identification, approval for production and use of consumables, including aviation fuels and lubricants and technical fluids; provides confirmation of compliance with modern requirements of traditional and alternative consumables;
- participates in the processes of technical regulation in the field of use of consumables in energy and transport;
- implements in the practice of the laboratory the latest advances in quality control methods;
- assists in the development of standards in the use of consumables in energy and transport;
- participates in training processes, in particular highly qualified personnel;



- organizes co-working for internships, trainings for energy and transport professionals;
- seeks and attracts additional funding through grant, tender activities at the national and international levels;
- involves participants in the educational process to perform scientifically applied work;
- promotes the publication of research results and tests "in leading national and foreign publications included in the rankings of Scopus and Web of Science;

**The Educational and Research Laboratory of Thermomolecular Power Engineering** performs the following functions:

- conducting laboratory-practical classes in academic disciplines in accordance with the current curricula;
- improving the quality of the educational process;
- creation of safe working conditions for all participants in the educational process in accordance with the requirements of the legislation;
- implementation of scientific research in order to promote the innovative activities of higher education in the field of thermomolecular energy;
- use of the results of completed research in the educational process, scientific-practical and organizational activities of the Institute of Energy Conservation and Energy Management, assistance in improving the educational process by involving faculty, graduate students and students
- use of the results of completed research in the educational process, scientific and practical and organizational activities of the Institute of Energy Conservation and Energy Management, assistance in improving the educational process by involving faculty, graduate students and students to conduct research in the laboratory;
- development of recommendations for the creation of samples of new energy devices and the use of research results in modern technical systems, as well as the implementation of author's supervision in the case of introduction of new equipment;
- implementation of the results of research and design work in the educational process:
  - in the development and improvement of academic disciplines;
  - in course and diploma design, master's dissertations;
  - to work with graduate students;



- to the laboratory base of the Department of Heat Engineering and Energy Saving.

### **The Educational and Research Laboratory of Resource and Energy Saving**

performs the following functions:

- study of technological features of functioning and demonstration of regime characteristics of new and alternative technologies of production and utilization of thermal and electric energy;
- engineering of structural elements and units of low-power technological installations (up to 10 kW), suitable for use in low energy systems, combined (hybrid) power supply systems, in particular focused on using the benefits of dispersed generation / supply under the "micro-grid" and / or "mini-grid";
- experimental testing of new structural elements and inventive activity through the registration of intellectual property rights to inventions or scientific works;
- preparation of university-wide projects for the development, implementation of energy-saving hybrid technologies and their use to meet the needs of KPI. Igor Sikorsky, organization of demonstration sessions, exhibitions in KPI. Igor Sikorsky and beyond;
- performance of scientific research of technical and economic indicators of autonomous hybrid energy supply systems in market conditions;
- study of technological features and research of regime characteristics according to the programs of master's dissertations, agreed by the scientific supervisors of the educational-scientific institute of energy saving and energy management;
- organization of seminars and presentation events on energy efficiency indicators;
- training in educational programs for higher education qualification and educational level Doctor of Philosophy in the specialty "141 - Electric Power Engineering, Electrotechnics, and Electromechanics ";
- measures to improve the quality of educational services, acquaint higher education seekers and teachers with the latest technologies, using existing modern energy technology systems.



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## 4. TRAINING AND LABORATORY BASE

**IESEM** uses both the university-wide and own training rooms. The following specialized laboratories are in operation in Institute:

- Laboratory of Distributed Energy Sources;
- Intersectoral Complex Laboratory of Engineering Ecology;
- Laboratory of Electrical Measurement and Control of Power Consumption Modes;
- Laboratory of Electrical Equipment Installation and Operation;
- Laboratory of Power Supply Systems;
- Laboratory of Electricity Consumers;
- Laboratory of Electric Apparatus;
- Laboratory of Relay Protection and Automation;
- Training Laboratory for Heat Engineering Disciplines;
- Energy Managers Training Center Laboratory for Measurements and Energy Audit;
- Training Laboratory for Heat Engineering and Thermal measurements;
- Computer classes.

**University's Laboratory  
for Upgrading of Training  
Modules is creating  
within the framework of  
international project  
CENEAST**

## 5. RESEARCH ACTIVITY

### *Department of Electricity Supply:*

- development of concepts and strategies of energy saving in the short-medium term;
- development and implementation of methods and techniques of management of energy consumption modes and their control;
- development and implementation of methods and systems for multi-criteria power and electricity distribution at different levels of spatial, temporal, and situational control of power consumption in the new economy;
- development of methods of control and normalization of energy;
- development and implementation of methods and systems for energy-saving integrated management (active and reactive power, voltage) of modes of industrial electric supply systems;
- development and implementation of the existing in Ukraine systems of differentiated tariffs for electric energy;
- development and implementation of energy control systems, including control of the amount used of thermal energy, gas, water, oil, etc.;



- development of guidance documents for electricity metering in terms of the energy market, energy audit of industrial enterprises.

### ***Department of Heat Engineering and Energy Saving:***

- energy management and audit of industrial facilities and public utilities;
- investigation of heat supply efficiency in the municipal area;
- modeling of complex radiation and convective heat transfer at high temperatures;
- development and creation of a new class power generating units based on thermomolecular energy;
- usage of renewable energy sources in energy supply systems.

***Department of Control of Electrotechnical and Mechatronic Systems*** today has five science schools:

- The latest and resource-saving technologies in energy, industry and agro-industrial complex; theory of pulse-wave rock destruction. Development, reliability, and diagnostics of mining machines;
- contacting the working bodies of machines for the construction of underground structures of the city with the treating medium;
- infrafrequent vacuum-wave synergyvector systems with intelligent control and their implementation in the oil and gas industry;
- cleaning of edge-water by physical fields;
- study of the nonlinear differential equations stability.

Research work at the ***Department of Geoengineering*** is performed in the one priority line of research: "Fundamental research on the most important issues of the development of scientific, technical, socio-economic and human potential to ensure Ukraine's competitiveness around the world and sustainable development of society and the state."



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## 6. INTERNATIONAL PROJECTS AND COLLABORATION

**IESEM carry out international cooperation in the framework of the following partnership agreements on cooperation and scientific exchange with:**

- The Department of Geomechanics, Underground Construction and Management of Surface Protection of Faculty of Mining and Geology of the Silesian University of Technology "Polytechnica Silesia", Gliwice, Poland;
- The Open University of Varna, Varna, Bulgaria;
- The Mining Faculty of the National University of the mineral resource "Mining", St. Petersburg, Russia;
- The South-Russian State Technical University (Novocherkask Polytechnic Institute), Shakhty Institute (Branch), Shakhty, Russia;
- The Scientific and Technical University Krakow Mining and Metallurgical Academy (Akademia Gorniczo-Hutnicza im. Stanislaw Staszica), Krakow, Poland;
- The Clermont-Ferrand's Superior National School of Chemistry (Ecole Nationale Supérieure de Chimie de Clermont-Ferrand).

**According to international programs, IESEM obtained scientific and educational equipment:**

1. Joint venture "Altera" provides the electrical equipment for the creation of modern laboratory scientific research stands.

2. Klinkmann provides microcontrollers for the modernization of the laboratory "Microprocessor technics."

3. Intergraph Corporation (USA) and Design Institute "Ukrneftehimproject" transfer the software to upgrade the "CAD" laboratory in the field of testing instruments design for the pipeline industry.

4. Cooperation between the Department and Research Laboratory of electrification of industrial enterprises of the University M'Hamed Bougara of Boumerdes (Algeria) within the frameworks of the definition of an overall strategy and creation a modern laboratory of the automated electric drive.



IESEM over the years has participated in several large-scale international projects.

### ***Department of Electricity Supply:***

- International project Ukrainian-Norwegian Collaboration in Higher Education for Sustainable Energy Development. The aim of the project is to build out common and international platforms for the development of education for sustainable development of energy production.



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- Project CENEAST "Modernization of curricula in the field of the built-up area in the Eastern Neighbourhood." This project was implemented within the framework of the Tempus program.

- GEF/UNIDO "The implementation of energy management systems in the industry of Ukraine." Specialists of the

**Department of Electricity Supply** are the project experts.

- International project "Manager of energy-efficient rehabilitation of buildings." The project aims to transfer German know-how in the field of rehabilitation of buildings and residential property management.
- PROMITHEAS-4 project "Transfer of knowledge and the necessary research for the preparation of policy proposals for mitigation actions and adaptation to climate change" was implemented with the support of the European Commission towards the Environment (climate change including) of the 7th Framework Program.
- Power Engineering. EU-Project (7th FP) PROMITHEAS-3.
- EU-BSEC Energy and Climate Policy Network. EU-Project (SSA) PROMITHEAS-2.
- TACIS Project EUK9701: Strengthening Energy Management Training Actions throughout Ukraine (NIFES Consulting Group, UK, March Consulting Group, UK, Tebodin Consultants & Engineers, Holland).
- INCO-COPERNICUS Program. Project «DEMOSOLAR EAST-WEST».
- Energy Efficiency at Primary and Secondary Schools. BISTRO Project BIS/97/005.
- Modernization of Heating. Grant of the Danish Government.
- DSM-95, 97. International Conferences on Demand Side Management. BISTRO Projects.



***Department of Labor Protection, Industrial, and Civil Safety:***



- international mobility project Erasmus Mundus Action 2 EUROEAST; Contract #2012-2740/001-001-EMA2; recording date at the University – 11/5/2012.



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### 2. Department of Power Supply

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### 3. Department of Automation of Electric and Mechatronic Complexes

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### 5. Department of Labor Protection, Industrial and Civil Safety

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