

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ  
НАЦІОНАЛЬНИЙ ТЕХНІЧНИЙ УНІВЕРСИТЕТ УКРАЇНИ  
«КИЇВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ  
імені Ігоря Сікорського»

ЗАТВЕРДЖУЮ

Голова Вченої ради  
КПІ ім. Ігоря Сікорського



М.З. Згуровський

«02» 04 2018 р.

М.П.

## ОСВІТНЬО-НАУКОВА ПРОГРАМА

**Електромеханічні та мехатронні системи  
енергоємних виробництв**

**Electromechanical and mechatronic systems  
of energy-intensive industries**

третього (освітньо-науковий) рівень вищої освіти

за спеціальністю	141 - "Електроенергетика, електротехніка та електромеханіка"
галузі знань	14 - "Електрична інженерія"
класифікація	Доктор філософії з електроенергетики, електротехніки та електромеханіки

Ухвалено на засіданні Вченої ради університету  
від «02» 04 2018 р. протокол № 4

КПІ ім. Ігоря Сікорського  
Київ - 2018

**Розроблено робочою групою:**

**Голова робочої групи**

*Шевчук Степан Прокопович, д.т.н., професор, завідувач кафедри електромеханічного обладнання енергосмних виробництв*



**Члени робочої групи:**

*Сліденко Віктор Михайлович, д.т.н., доцент кафедри електромеханічного обладнання енергосмних виробництв*



*Поліщук Валентина Омелянівна, ст. викладач кафедри електромеханічного обладнання енергосмних виробництв*



**Завідувач кафедри електромеханічного обладнання енергосмних виробництв**

*Шевчук Степан Прокопович, д.т.н., професор, завідувач кафедри електромеханічного обладнання енергосмних виробництв*



**Голова науково-методичної підкомісії університету зі спеціальності**

*Яндутьський Олександр Станіславович, д.т.н., професор, декан факультету електроенерготехніки та автоматики*




Освітня програма розглянута й ухвалена Методичною радою університету (протокол № 7 від «29» 03 20 18р.)

Голова Методичної ради

 Ю.І. Якименко

Вчений секретар Методичної ради

 В.П. Головенкін

## CONTENT

1. Profile of the educational program .....	4
2. List of components of the educational program .....	9
3. Structural and logical scheme of the educational program .....	10
4. Form of final certification of higher education applicants .....	10
5. Matrix of correspondence of program competences to components educational program .....	11
6. Matrix for providing program learning outcomes with relevant components of the educational program .....	12

**1. PROFILE OF THE EDUCATIONAL PROGRAM**  
**in specialty 141 - "Electric power, electrical engineering and**  
**electromechanics »**

<b>1 - General information</b>	
Full name of ZVO and institute / faculty	National technical university Of Ukraine "Kyiv Igor Sikorsky Polytechnic Institute ", Faculty of Energy Conservation and Energy Management
Degree of higher education and title of qualification in the original language	Degree - Doctor of Philosophy Qualification - Doctor of Philosophy in Power Engineering, Electrical Engineering and Electromechanics
Level with NRC	NRC of Ukraine - level 9
Official name educational program	Electromechanical and mechatronic systems of energy-intensive industries
Type of diploma and scope of educational program	Doctor of Philosophy, single, 30 credits of educational component, 210 credits of scientific component, term of study 4 years Accredited for the first time
Availability of accreditation	
Prerequisites	The presence of a master's degree
Language (s) of instruction	Ukrainian / English
Term of educational programs	Until the next accreditation
Internet address permanent placement educational program	<a href="https://epa.kpi.ua">https://epa.kpi.ua</a>
<b>2 - The purpose of the educational program</b>	
Training of highly qualified competitively integrated specialists of the degree of Doctor of Philosophy in the field of knowledge integrated into the European and world scientific and educational space 14 - Electrical engineering, capable of independent research, research - innovation, organizational - management activities in the industry.	
<b>3 - Characteristics of the educational program</b>	
Subject area (branch of knowledge, specialty)	Field of knowledge: 14 - "Electrical Engineering" Specialty: 141 - "Electric power, electrical engineering and electromechanics"
Educational orientation programs	Educational and scientific
The main focus educational program	Special education in the field of power engineering, electrical engineering and electromechanics Keywords: electromechanical systems, mechatronic systems, energy-intensive production
Features of the program	Implemented in English for foreign graduate students
<b>4 - Suitability of graduates for employment and further study</b>	
Suitability for employment	According to the classifier of professions DK003: 2010 graduates can perform various types of professional work. Professional certification is possible.
Further training	Graduates have the right to continue their studies at the scientific level of higher education

<b>5 - Teaching and assessment</b>	
Teaching and teaching	Lectures, practical and seminar classes, computer workshops and laboratory works; technology of blended learning, practice; execution of the dissertation
Evaluation	Rating system, assessment, oral and written exams, testing
<b>6 - Program competencies</b>	
Integral competence	A person's ability to solve complex problems electromechanics and mechatronics and / or research and innovation, which involves a deep rethinking of existing and the creation of new holistic knowledge and / or professional practice.
<b>General Competences (LC)</b>	
ZK 1	Ability to abstract thinking, analysis and synthesis. Ability to conduct
ZK 2	research at the appropriate level .. Ability to be creative.
ZK 3	
ZK 4	Ability to solve scientific and technical problems. Ability to initiative
ZK 5	and entrepreneurial activity. Ability to professional ethics of
ZK 6	communication.
ZK 7	Expansion of the general cultural worldview.
ZK 8	Ability to communicate in the state language both orally and in writing.
ZK 9	Ability to orally and in writing present the results of their own research.
ZK 10	Ability to apply information technology in scientific activities.
ZK 11	Ability to manage research projects and / or provide proposals for research funding, registration of intellectual property rights. Communication in a foreign language (English or other according to
ZK 12	the specifics of the specialty) to the extent sufficient to present and discuss the results of their research in oral and written form. Ability to work in an international context.
ZK 13	
<b>Professional competencies of the specialty (FC)</b>	
FC1	Ability to demonstrate knowledge and understanding of scientific facts, concepts, theories, principles and methods of experimental computer science.
FC2	Ability to apply a systematic approach to solving scientific and technical problems of mechatronics and electromechanics.
FC3	Ability to demonstrate an understanding of the specifics of mechatronics and electromechanics as a science and be able to properly apply it when working with technical literature and other sources of information.
FC4	Ability to analyze, discuss and evaluate scientific papers and projects in the field of mechatronics and electromechanics.
FC5	Ability to apply appropriate mathematical methods, computer technology, as well as the principles of standardization and certification to solve problems in the field of mechatronics and electromechanics.
FC6	Ability to apply a comprehensive approach to solving experimental problems with the use of information and measurement technology and application software.
FC7	Ability to analyze technical and economic indicators and examination of design solutions in the field of mechatronics and electromechanics using computer modeling.

FC8	Ability to develop software and hardware for computerized information and measurement systems.
FC9	Ability to implement the latest achievement for designing automated production and automated development or design of elements of mechatronic and electromechanical systems.
FC10	Ability to demonstrate practical skills in the field of mechatronics and electromechanics.
FC11	Ability to demonstrate an understanding of technical aspects reliability and efficiency of mechatronic and electromechanical objects and systems functioning.
FC12	Ability to manage projects and control the quality of their implementation.
FC13	Ability to plan and manage the process of commercialization of an intellectual product and assess the risks of commercialization of research results.
FC14	Ability to demonstrate an understanding of the requirements for the reliability and efficiency of mechatronic and electromechanical objects and systems due to the need to ensure sustainable development.
FC15	Ability to manage projects and startup projects and evaluate their results. Ability to demonstrate
FC16	awareness of intellectual property issues. Ability to organize and plan the work of the team of
FC17	performers, making managerial decisions in the context of dissenting opinions and professional discussion. Ability to formulate and correctly set tasks and manage technical staff; to coordinate
FC18	the work of technical and management units of the organization, as well as to take an active part in staff training.
FC 19	Ability to demonstrate systematic knowledge on the organization of the pedagogical process in higher education institutions and the use of pedagogical technologies in higher education; demonstrate basic knowledge of pedagogy and psychology of higher education.
FC 20	Ability to practical application of theoretical foundations of pedagogical activity; ability to carry out systematic analysis of educational processes and phenomena; methodical readiness to teach a set of special disciplines in the process of training specialists in mechatronics and electromechanics.
<b>7 - Program learning outcomes</b>	
KNOWLEDGE	
3H 1	Philosophical concept of scientific worldview, the role of science, an explanation of its impact on social processes.
3H 2	Ukrainian language, both oral and written, for professional activities.
3H 3	Foreign language, including special terminology, for the presentation and discussion of scientific results in oral and written forms, as well as for scientific discussion.
ZN 4	Methods of conducting research, organization and planning of the experiment, computerized research methods and processing of measurement results.
3H 5	Basic concepts of measurement theory, their application in practice and in computer modeling of objects and phenomena.
ZN 6	Forecasting development trends in the field of mechatronics and electromechanics.

3H 7	Methods of analysis of engineering products, processes and systems according to established criteria, selection and application of the most suitable analytical, calculation and experimental methods for research, interpretation of research results.
3H 8	Formulation and solution of problems in the field of mechatronics and electromechanics related to the procedures of object observation, measurement, control, diagnosis and forecasting taking into account the importance of social constraints (society, health and safety, environment, economy, industry, etc.) .
3H 9	Standards and regulatory and technical documents mechatronics and electromechanics.
3H 10	Stages of design and development of engineering products, processes and automated systems production, choice and application methods computerized experimental research.
ZN 11	Ways to build computerized databases, "cloud" and Internet technologies, scientific databases.
<b>SKILLS</b>	
UM 1	Apply methods of design and research, as well as analysis of the results.
UM 2	Carry out technical tests of engineering products.
UM 3	Assess the impact of mechatronics and electromechanics on the environment and human safety.
UM 4	Have modern methods of theoretical and experimental research to assess the accuracy of the measurement results.
UM 5	Apply hardware and software of modern information technologies to solve problems in the field of mechatronics and electromechanics and information and measurement technology.
UM 6	Use the basics of patent science and intellectual property protection.
UM 7	Adhere to the principles of professional ethics and academic integrity.
UM 8	Carry out joint work with specialists from various fields in the framework of research projects.
UM 9	Formulate the basic psychological and pedagogical principles and be able to teach professionally-oriented disciplines in mechatronics and electromechanics. Analyze the subject
UM 10	area, formalize management tasks and divide the global task into components.
UM 11	Develop a feasibility study for projects in electricity, electrical engineering and electromechanics and assess the economic efficiency of their implementation.
<b>8 - Resource support for program implementation</b>	
Staffing	In accordance with the personnel requirements for ensuring the implementation of educational activities for the relevant level of HE (Annex 2 to the License Conditions), approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187
Material and technical software	In accordance with the technological requirements for material and technical support of educational activities of the relevant level of HE (Annex 4 to the License Conditions), approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187

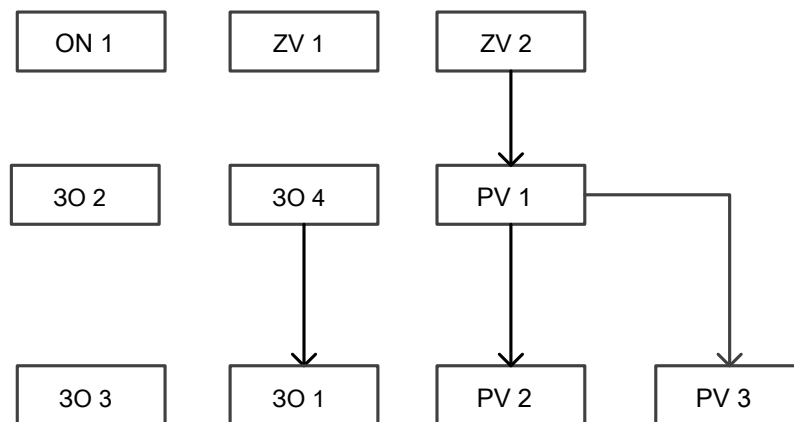
Information and educational and methodical software	In accordance with the technological requirements for educational and methodological and informational support of educational activities of the appropriate level of HE (Annex 5 to the Licensing Conditions), approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187
<b>9 - Academic mobility</b>	
National credit mobility	Possibility to conclude agreements on academic mobility, double graduation, etc.
International credit mobility	<p>It is possible to conclude agreements on international academic mobility, on double graduation, on long-term international projects that include inclusive postgraduate training, etc.</p> <p>International projects:</p> <p><b>Two-party agreement</b> with Harbin University of Technology, Harbin, China, Herbin, (Harbin Institute of Technology)</p> <p><b>Erasmus + project (KA1)</b> with Istanbul City University, Istanbul, Turkey (İstanbul Şehir Universitesi).</p> <p><b>Erasmus + project (KA1)</b> with Nantes High School, Nantes, France (Centrale Nantes)</p> <p><b>Erasmus + project (KA1)</b> with Dumlupinar University, Kutagya, Turkey.</p> <p><b>Erasmus + project (KA1)</b> with Łód (Technical University, Łód (, Poland (Politechnika Łódzka).</p> <p><b>Erasmus + project (KA1)</b> with the University of Zagreb, Zagreb, Croatia (Sveučilište u Zagrebu).</p>
Foreign training applicants for higher education education	Teaching in English



## 2. LIST OF COMPONENTS OF THE EDUCATIONAL PROGRAM

Code n / a	Components of the educational program (academic disciplines, practices, qualification work)	Number loans	Form final control
1	2	3	4
<b>1. General training cycle Mandatory components of the OP</b>			
30 1	Methods of research, formation and management of intelligent energy systems and complexes	3	Exam
30 2	Fundamentals of the theory of electromagnetic field and processes	3	Exam
30 3	Unconventional and renewable energy sources in power systems and electrical complexes	3	Test
30 4	Monitoring, management and protection power systems and electrical complexes	3	Exam
<b>Selective components of OP</b>			
ZV 1	General scientific (philosophical) disciplines of the graduate student's choice	4	Exam
ZV 2	Educational discipline of language-practical training	6	Exam
<b>2. Cycle of professional training Mandatory components of OP</b>			
ON 1	Pedagogical practice	2	Test
<b>Selective components of OP</b>			
PV 1	Academic disciplines on advanced technologies in electric drive and electromechanical systems (taught in a foreign language, at the choice of the graduate student)	2	Test
PV 2	Academic disciplines on modern methods of synthesis, analysis and research of dynamic systems (at the choice of the graduate student)	2	Test
PV 3	Academic disciplines in mathematical modeling of power systems and electrical systems (at the choice of the graduate student)	2	Exam
The total amount of <b>general training cycle:</b>		22	
The total amount of <b>training cycle:</b>		8	
The total amount of <b>required components:</b>		14	
The total amount of <b>selective components:</b>		16	
including <b>at the choice of graduate students:</b>		Not less than 6 cr.	
<b>TOTAL VOLUME OF THE EDUCATIONAL PROGRAM</b>		<b>30</b>	

### 3. STRUCTURAL AND LOGICAL SCHEME OF EDUCATIONAL PROGRAMS



### 4. FORM OF GRADUATION CERTIFICATION OF HIGHER APPLICANTS EDUCATION

Graduation attestation of higher education students according to the educational-scientific program "Electromechanical and mechatronic systems of energy-intensive industries" specialty 141 - "Electric power, electrical engineering and electromechanics" is carried out in the form of dissertation defense and ends with the issuance of a standard document. and electromechanics according to the educational and scientific program "Electromechanical and mechatronic systems of energy-intensive industries".

Graduation certification is open and public.

**5. SOFTWARE COMPLIANCE MATRIX**  
**COMPETENCIES OF EDUCATIONAL COMPONENTS**  
**PROGRAMS**

	30 1	30 2	30 3	30 4	ZV 1	ZV 2	ON 1	PV 1	PV 2	PV 3
ZK 1	+							+	+	+
ZK 2	+								+	+
ZK 3	+		+						+	+
ZK 4				+					+	
ZK 5	+				+					
ZK 6					+	+	+			
ZK 7					+	+	+	+		
ZK 8					+	+	+			
ZK 9						+	+	+		
ZK 10	+			+	+	+			+	
ZK 11		+						+	+	
ZK 12						+	+	+		
ZK 13					+	+		+		
FC 1		+			+				+	
FC 2					+				+	+
FC 3		+	+	+						
FC 4		+	+	+		+			+	
FC 5									+	+
FC 6	+									+
FC 7	+								+	+
FC 8	+			+					+	+
FC 9		+			+					
FC 10	+	+	+	+						
FC 11				+					+	
FC 12	+			+	+					
FC 13				+		+		+		
FC 14	+	+	+	+						
FC 15		+	+		+					
FC 16	+								+	
FC 17					+		+			
FC 18					+	+	+			
FC 19					+		+			
FC 20		+			+		+		+	

**6. MATRIX OF PROVIDING SOFTWARE LEARNING RESULTS  
BY THE RELEVANT  
COMPONENTS OF THE EDUCATIONAL PROGRAM**

	3O 1	3O 2	3O 3	3O 4	ZV 1	ZV 2	ON 1	PV 1	PV 2	PV 3
3H 1		+			+					
3H 2					+	+	+			
3H 3						+			+	
ZN 4	+	+	+	+						
3H 5	+	+							+	
ZN 6	+	+	+	+	+					
3H 7	+								+	+
3H 8					+		+		+	+
3H 9	+		+	+						
3H 10								+	+	+
ZN 11	+			+					+	+
UM 1	+	+							+	+
UM 2	+								+	+
UM 3	+	+	+	+						
UM 4	+							+	+	+
UM 5	+									+
UM 6					+				+	
UM 7					+	+	+			
UM 8		+	+		+	+	+	+		
UM 9					+	+	+	+		
UM 10	+	+			+				+	+
UM 11	+	+	+	+						