MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
NATIONAL TECHNICAL UNIVERSITY OF UKRAINE
«Igor Sikorsky Kyiv Polytechnic Institute»

APPROVED

by the Academic Council
of the Igor Sikorsky KPI
(meeting protocol # 6 of 07.09.2020)

Head of the Academic Council
Mykhailo ILCHENKO

Electric Power Engineering, Electrical Engineering and Electromechanics

EDUCATIONAL AND SCIENTIFIC PROGRAM

of the third (educational and scientific) degree of the higher education

in the specialty 141 “Electric Power Engineering, Electrical Engineering and Electromechanics”

of the field of knowledge 14 “Electrical Engineering”

qualification: PhD in electric power engineering, electrical engineering and electromechanics

Enacted by the decree of the
Igor Sikorsky KPI Rector
decree #1/282 of 17.09.2020

Kyiv – 2020

PREAMBLE

DEVELOPED by the project team:

Project team leader:

Oleksandr Stanislavovych YANDULSKY – doctor of technical science, professor, dean of the Faculty of Electrical Power Engineering and Automatics

Members of the project team:

Volodymyr Andriyovych BAZHENOV – senior lecturer of the Department of electrical networks and systems of the Faculty of Electrical Power Engineering and Automatics, candidate of technical science (PhD), associate professor.
Serghiy Oleksandrovych BURYAN– senior lecturer of the Department of automation of electromechanical systems and electrical drives of the Faculty of Electrical Power Engineering and Automatics, candidate of technical science (PhD), associate professor.
Yevgheniy Oleksandrovych TROTSENKO – senior lecturer of the Department of theoretical electrical engineering of the Faculty of Electrical Power Engineering and Automatics, candidate of technical science (Ph.D), associate professor.
Serghiy Petrovych DENYSIUK – director of the Institute of Energy Saving and Energy Management, doctor of technical science, professor.

Heads of the Departments:

Valeriy Valentynovych KYRYK – head of the Department of electrical networks and systems of the Faculty of Electrical Power Engineering and Automatics, doctor of technical science, professor.
Stepan Oleksandrovych KUDRIA – acting head of the Department of renewable energy sources of the Faculty of Electrical Power Engineering and Automatics, doctor of technical science, professor.
Mykola Yakovych OSTROVERKHOV– head of the Department of theoretical electrical engineering of the Faculty of Electrical Power Engineering and Automatics, doctor of technical science, professor.
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Volodymyr Andriyovych POPOV – head of the Department of power supply of the Institute of Energy Saving and Energy Management, doctor of technical science, associate professor.
Viktor Petrovych ROZEN – head of the Department of automation of electrotechnical complexes operation of the Institute of Energy Saving and Energy Management, doctor of technical science, professor.

Olgha Ivanivna TOLOCHKO – acting head of the Department of power systems automation of the Faculty of Electrical Power Engineering and Automatics, doctor of technical science, professor.
Stepan Prokopovych SHEVCHUK– head of the Department of electromechanical equipment of energy-intensive industries of the Institute of Energy Saving and Energy Management, doctor of technical science, professor.
Vasyl Fedorovych SHYNKARENKO– head of the Department of electromechanics of the Faculty of Electrical Power Engineering and Automatics, doctor of technical science, professor.
APPROVED:

Scientific and methodical commission of the Igor Sikorsky KPI of the specialty 141 "Electric Power Engineering, Electrical Engineering and Electromechanics"
Head of the commission Oleksandr YANDULSKY
(meeting protocol #3 of 19.06.2020)

Methodical council of the Igor Sikorsky KPI
Head of the council Yuriy YAKYMENKO
(meeting protocol #1 of 03.09.2020)

TAKEN INTO ACCOUNT:
external approbation of the program (reviews are received and attached), proposals of stakeholders and recommendations of professional associations.

CONTENTS

1. PROFILE OF THE EDUCATIONAL PROGRAM

of the specialty 141 “Electric Power Engineering, Electrical Engineering and Electromechanics”

1 – General information	
Full name of ZVO and institute / faculty	National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute», Faculty of Electrical Power Engineering and Automatics
Higher education degree and title of qualification in the original language	Degree – Ph.D Qualification – Ph.D in Power Engineering, Electrical Engineering and Electromechanics
The official name of the program	Electric Power Engineering, Electrical Engineering and Electromechanics
Type of diploma and scope of the program	Doctor of Philosophy, single, 40 credits of EKTC educational component, term of study 4 years The scientific component involves conducting your own research and design of its results in the form of a dissertation.
Availability of accreditation	Accredited for the first time
Cycle / level of VO	NRC of Ukraine - level 8; FQ-EHEA - the third cycle, EQF-LLL - level 8
Prerequisites	The presence of a master's degree, specialist’s
Language (s) of instruction	Ukrainian, English
Validity of the the program	Until the next accreditation
Internet address of the permanent placement of the educational program	http://osvita.kpi.ua/op
2 – The purpose of the educational program	
Training of highly qualified, competitive, integrated into the European and world scientific and educational space professionals capable of independent research, scientific and organizational, pedagogical and organizational and practical activities in the field of electricity, electrical engineering and electromechanics, teaching in higher education. The purpose of the educational program corresponds to the development strategy of KPI. Igor Sikorsky for 2020-2025 on the formation of the society of the future on the basis of the concept of sustainable development.	
3 – Characteristics of the educational program	
Subject area	*Field of knowledge*: 14 "Electrical Engineering" *Specialty*: 141 "Electric power, electrical engineering and electromechanics" *Object of activity*: processes of production, transmission, distribution and consumption of electric energy at power plants, in electric networks and systems; processes of conversion of electric energy in electromechanical systems; safety analysis, increase of reliability and increase of service life of electric power, electrotechnical and electromechanical equipment; means of information and measuring equipment; methods of measurement, control, testing and diagnosis; regulatory documentation related to the processes of production, transmission,

	distribution and consumption of electricity; information technologies of experimental researches. *Objective of training*: training of specialists in the field of electrical engineering, which involves the formation and development of general and professional competencies in power engineering, electrical engineering and electromechanics, which provide the ability to solve complex problems in professional and / or research and innovation, involving deep rethinking and the creation of new holistic knowledge and / or professional practice. *Theoretical content of the subject area*: concepts and principles and concepts of fundamental knowledge of the theory of electrical engineering, modeling and the programtimization of electrical, electrical and electromechanical systems and complexes, their use for innovation and research of power plants, networks and systems, electric machines and electric drives; the programtimal ways to automate experimental research in order to obtain reliable information about the objects of study; principles of professional activity aimed at improving the reliability and energy efficiency of systems and complexes. *Methods, techniques and technologies*: methods and means of conducting research of processes in electric power and electromechanical systems and complexes; automated design, engineering and production control; teaching and training; team management in solving problems in power engineering, electrical engineering and electromechanics; creation and research of information technologies, software of measuring instruments and software for processing of measurement results. *Tools and equipment*: software and hardware, devices, systems, technologies of design, control, monitoring, modeling, creation, research and the programeration of electric power, electrotechnical and electromechanical equipment.
Orientation the program	Educational and scientific
The main focus of the the program	Special education in the field of power engineering, electrical engineering and electromechanics. The program is based on well-known scientific principles, taking into account the current state of development of the country's energy. Keywords: electricity, electric power, electrical engineering, electromechanics, energy saving, energy management, automation
Features of the program	The implementation of the program involves mandatory pedagogical practice. A semester of academic mobility is possible within the framework of research on the topic of dissertations. The high level of the research part of the training is provided by scientific schools of the specialty, the availability of research centers and laboratories,

	cooperation agreements with leading industrial and scientific institutions. Implemented in English for foreign graduate students.
4 – Suitability of graduates for employment and further study	
Suitability for employment	Graduates are able to hold positions whose qualification requirements include a doctorate: - research and teaching work in higher education institutions; - research work in research institutions. Graduates can be employed in positions (according to the current Classifier of Professions of Ukraine DK 003: 2010): 2143.1 Researchers (electrical engineering): 2143.1 Research Engineer in Agricultural Energy 2143.1 Junior researcher (electrical engineering) 2143.1 Researcher (electrical engineering) 2143.1 Researcher-consultant (electrical engineering) 2310.1 Professors and associate professors: 2310.1 Doctoral student 2310.1 Associate professor 2310.1 Professor of the Department 2310.2 Other teachers of universities and higher educational establishments: 2310.2 Assistant 2310.2 Teacher of a higher educational institution
Further training	Continuing education in doctoral studies and / or participation in postdoctoral programs
5 – Teaching and assessment	
Teaching and learning	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
6 – Program competencies	
Integral competence	Ability to solve complex problems during professional and / or research and innovation activities in the field of power engineering, electrical engineering and electromechanics, which involves a deep rethinking of existing and the creation of new holistic knowledge and / or professional practice.
General competencies (ZK)	ZK01. Ability to abstract thinking, analysis and synthesis. ZK02. Ability to search, process and analyze information from various sources. ZK03. Ability to work in an international context.
Professional special competencies (SC)	SK01. Ability to perform original research, achieve scientific results that create new knowledge in electrical engineering and related interdisciplinary areas and can be published in leading scientific journals in electrical engineering and related fields. SK02. Ability to orally and in writing present and discuss the results of research and / or innovative developments

	in Ukrainian and English, a deep understanding of English scientific texts in the field of research. SK03. Ability to solve problems of increasing the reliability and efficiency of electric, electrical and electromechanical facilities and systems due to the need to ensure sustainable development. SK04. Ability to use modern information technologies, databases and other electronic resources, specialized software in scientific and educational activities. SK05. Ability to identify, pose and solve research problems in the field of electrical engineering, evaluate and ensure the quality of research. SK06. Ability to initiate, develop and implement comprehensive innovative projects in the field of electrical engineering and related interdisciplinary projects, leadership in their implementation. SK07. Ability to adhere to research ethics, as well as the rules of academic integrity in research and scientific and pedagogical activities.
7 – Program learning outcomes	
RN01. Have advanced conceptual and methodological knowledge in electrical engineering and at the subject line, as well as research skills sufficient to conduct scientific and applied research at the level of the latest world achievements in the field, gain new knowledge and / or innovate. RN02. Freely present and discuss with specialists and non-specialists the results of research, scientific and applied problems of electrical engineering in state and foreign languages, qualified to reflect the results of research in scientific publications in leading international scientific journals. RN03. Develop and research conceptual, mathematical and computer models of processes and systems, effectively use them to gain new knowledge and / or create innovative products in electrical engineering and related interdisciplinary areas. RN04. Plan and perform experimental and / or theoretical research in electrical engineering and related interdisciplinary areas using modern tools, critically analyze the results of their own research and the results of other researchers in the context of the whole set of modern knowledge about the problem. RN05. Deeply understand the general principles and methods of technical sciences, as well as the methodology of scientific research, apply them in their own research in the field of electrical engineering and in teaching practice. RN06. Be able to organize joint work with specialists from different fields in the framework of research projects in power engineering, electrical engineering and electromechanics. RN07. Be able to formulate the basic psychological and pedagogical principles and teach professionally-oriented disciplines in electrical engineering, electrical engineering and electromechanics. RN08. Be able to develop a feasibility study of projects in electricity, electrical engineering and electromechanics and assess the economic efficiency of their implementation.	
8 – Resource support for program implementation	
Staffing	In accordance with the personnel requirements for ensuring the implementation of educational activities for the relevant level of HE, approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 №1187 (current) in the wording dated 23.05.2018 №347.
Logistics	In accordance with the technological requirements for material and technical support of educational activities of

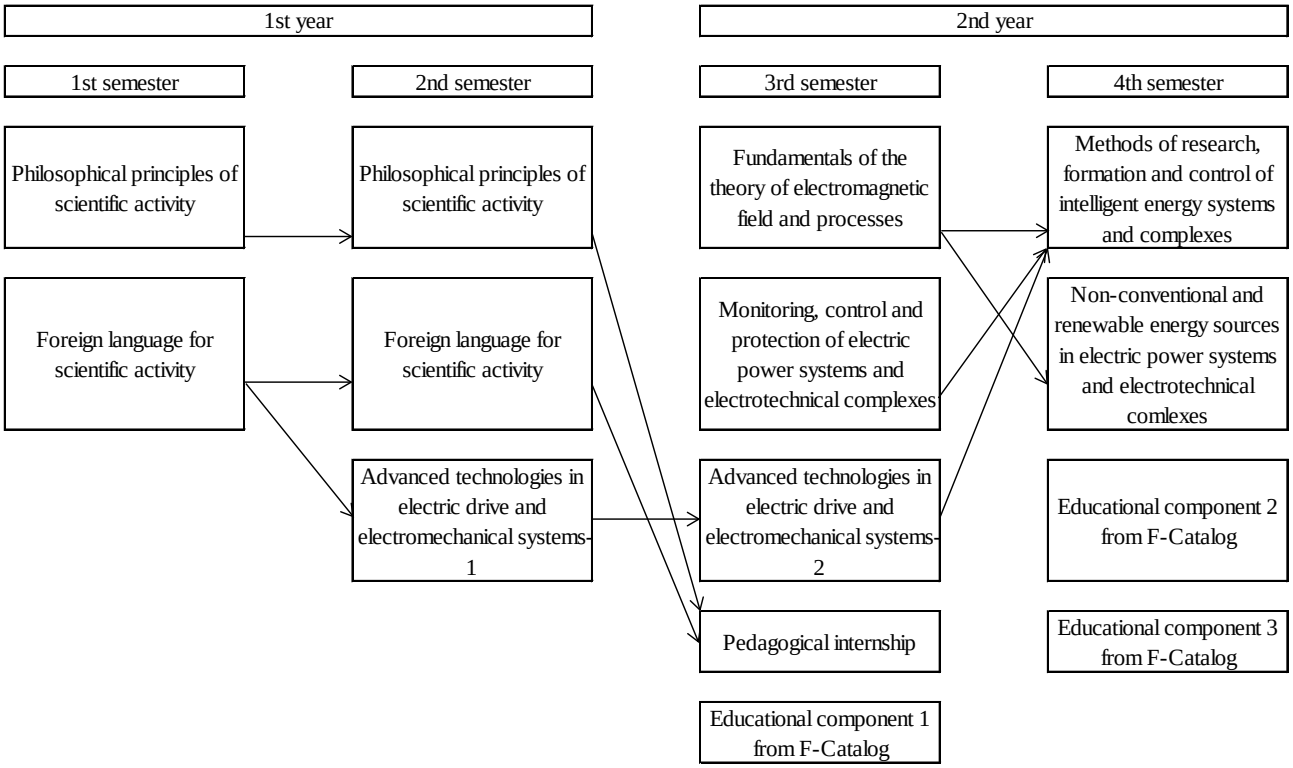
	the relevant level of HE (Annex 4 to the License Conditions), approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187
Information and educational and methodical support	In accordance with the technological requirements for educational and methodological and informational support of educational activities of the relevant 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
9 – Academic mobility	
National credit mobility	Possibility of concluding agreements on academic mobility, double graduation, etc.
International credit mobility	It is possible to conclude agreements on international academic mobility, double graduation, long-term international projects that include inclusive postgraduate training, etc. International projects: **Erasmus + project** (KA1) with West Pomeranian University of Technology in Szczecin, Poland **DAAD project** with Hessen University of Applied Sciences, University of Applied Sciences, Hesse, Germany (Technische Hochschule Mittelhessen - University of Applied Sciences) **Erasmus + project** (KA1) with the University of Lorraine, Minen Nancy High School, Nancy, France (Universite de Lorraine Ecole Nationale Superieur des Mines Nancy, ville Nancy, France) **Erasmus + project** (KA1) with the University of Le Mans, Le Mans, France **Erasmus + project** (KA1) with the University of Applied Sciences in Giessen, Germany (Technische Hochschule Mittelhessen)
Training of foreign applicants VO	Teaching in English

2. LIST OF COMPONENTS OF THE EDUCATIONAL COMPONENT OF THE EDUCATIONAL AND SCIENTIFIC PROGRAM

Code n/a	Components of the educational program (academic disciplines, practices, qualification work)	ECTS credits	Form of final control
1	2	3	4
Normative components of the program			
ZO 1	Philosophical principles of scientific activity	6	Examination
ZO 2	Foreign language for scientific activity	6	Examination
ZO 3	Methods of research, formation and control of intelligent energy systems and complexes	3	Examination
ZO 4	Fundamentals of the theory of electromagnetic field and processes	3	credit
ZO 5	Non-conventional and renewable energy sources in electric power systems and electrotechnical comlexes	3	credit

1	2	3	4
ZO 6	Monitoring, control and protection of electric power systems and electrotechnical complexes	3	Examination
PO 1	Advanced technologies in electric drive and electromechanical systems	4	Examination
PO 2	Pedagogical internship	2	credit
Elective components of the program			
V 1	Educational component 1 from F-Catalog	3	credit
V 2	Educational component 2 from F-Catalog	3	credit
V 3	Educational component 3 from F-Catalog	4	Examination
TOTAL of NORMATIVE educational components:		30 credits	
TOTAL of ELECTIVE educational components:		10 credits	
TOTAL OF THE PROGRAM:		**40 credits**	

3. STRUCTURAL AND LOGICAL SCHEME OF THE EDUCATIONAL PROGRAM



4. SCIENTIFIC COMPONENT

YEAR	The content of the graduate student's scientific work	Forms of control
1st year	Choice and substantiation of the topic of own scientific research, determination of the content, terms of performance and volume of scientific works; selection and substantiation of the methodology of conducting own research, review and analysis of existing views and approaches that have developed in modern science in the chosen field. Preparation and publication of at least 1 article (usually a review) in scientific professional publications (domestic or foreign) on the research topic; participation in scientific and practical conferences (seminars) with the publication of abstracts.	Approval of the individual plan of the postgraduate student's work at the academic council of the institute / faculty, reporting on the progress of the individual postgraduate student's plan twice a year
2nd year	Conducting own research under the guidance of the supervisor, which involves solving research problems through the use of a set of theoretical and empirical methods. Preparation and publication of at least 1 article in scientific professional publications (domestic or foreign) on the research topic; participation in scientific and practical conferences (seminars) with the publication of abstracts.	Reporting on the progress of the individual postgraduate student's plan twice a year
3rd year	Analysis and generalization of the obtained results of own scientific research; substantiation of scientific novelty of the obtained results, their theoretical and / or practical significance. Preparation and publication of at least the 1st article in scientific professional publications on the research topic; participation in scientific and practical conferences (seminars) with the publication of abstracts.	Reporting on the progress of the individual postgraduate student's plan twice a year
4th year	Registration of scientific achievements of the post-graduate student in the form of the dissertation, summing up concerning completeness of coverage of results of the dissertation in scientific articles according to the current requirements. Implementation of the obtained results and receipt of supporting documents. Submission of documents for preliminary examination of the dissertation. Preparation of a scientific report for final certification (defense of the dissertation).	Reporting on the progress of the individual postgraduate student's plan twice a year. Providing an the programinion on the scientific novelty, theoretical and practical significance of the dissertation results.

5. FORM OF GRADUATE CERTIFICATION OF HIGHER EDUCATION APPLICANTS

Graduation certification of applicants for higher education under the educational-scientific program "Electrical Power Engineering, Electrical Engineering and Electromechanics" specialty 141 "Electrical Power Engineering, Electrical Engineering and Electromechanics" is carried out in the form of dissertation defense and ends with the issuance of a standard document. electric power, electrical engineering and electromechanics.

Qualification work is checked for plagiarism and after the defense is placed in the repository of NTB University for free access. Graduation certification is carried out the programenly and publicly.

6. MATRIX OF CONFORMITY OF SOFTWARE COMPETENCIES TO THE COMPONENTS OF THE EDUCATIONAL PROGRAM

	ZO 1	ZO 2	ZO 3	ZO 4	ZO 5	ZO 6	PO 1	PO 2	Scientific component
ZK 01	+							+	+
ZK 02	+							+	+
ZK 03		+						+	
SK 01				+	+		+		
SK 02		+					+		+
SK 03				+	+	+			
SK 04		+					+		
SK 05			+				+		+
SK 06			+		+	+			
SK 07	+							+	+

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

	ZO 1	ZO 2	ZO 3	ZO 4	ZO 5	ZO 6	PO 1	PO 2	Scientific component
RN 01			+	+	+	+	+		+
RN 02		+						+	+
RN 03					+				
RN 04			+				+		+
RN 05	+		+	+			+		+
RN 06	+	+							
RN 07	+							+	
RN 08			+			+			+